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INTERNATIONAL EVIDENCE ON INCOME AND GOVERNMENT EXPENDITURE CAUSALITY: A TEST OF DEVELOPMENT ECONOMICS

Panayiotis C. AFXENTIOU and Apostolos SERLETIS

Abstract. The commonly hypothesized influence of government spending and investment expenditure on economic development was tested over the period 1950–1980 for a sample of 63 countries, 21 industrial and 42 developing, using constant international prices. Causality tests revealed a uniform pattern of behaviour in both industrial and developing countries, and found no statistical significance for either government or investment spending. This finding appears to be indicative of the low-productivity government services and the dominance of consumption in government spending, whereas from the point of view of investment it suggests that capital alone cannot bring about economic development.

I. INTRODUCTION

Taxonomically the member countries of the International Monetary Fund are classified into industrial and developing.[1] In the absence of identical characteristics among countries in each group this classification inevitably entails a degree of arbitrariness, which apparently increases when all developing countries are treated as belonging to a single group. Certainly science and modern technology are nowadays universal and impose uniform patterns of production behaviour. But these patterns are more visible in the industrially competitive countries than in the highly protected and technologically backward poor countries. Tendencies for a global uniculture can easily be identified, but these tendencies are much stronger in the advanced than in the developing countries and they fade gradually along with declines in per capita incomes.

From the point of view of methodology, it is imperative that the first step of uniformity of phenomena be satisfied before further steps and hypotheses are formulated in the advancement of scientific knowledge. The relatively homogeneous industrial culture may have contributed to the general acceptability of economic theories which revolved around the Keynesian paradigm. However, recently theoretical developments in rational expectations have cracked the edifice of Keynesianism and created scepticism and doubt in the basic tenets of the discipline. In the theory of economic development the preconditions for confidence in its message were never well satisfied from the very beginning owing to the

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[1] The International Monetary Fund classification is used in our empirical work.

heterogeneity of the relevant statistical population. The mosaic of underdevelopment always stood out as an obstacle to the generation of stable responses from identical stimuli and to the establishment of generalized patterns of economic behaviour. And if there is now a significant element of doubt in the application of economic theories in the industrial countries, this element is magnified by a large factor when applied to economic development, producing uncertainty and confusion that tend to throw the entire subdiscipline in a state of theoretical disarray.

The weak methodological foundations of the theory of economic development has not dampened the inflated expectations for betterment that engulfed the newly created countries after the second world war. These expectations were rooted not only in the change of their status from colonies to independent countries, but also in the spirit of international co-operation which sprang from the destruction of war. Hopes for prompt technological transfers and generous aid from advanced countries fueled further the rhetoric of development at the same time that models of the Harrod-Domar variety were used to estimate the capital requirements and the flow of resources from abroad needed for the attainment of development targets. Planning was strengthened by Leontief input-output models and assumed unprecedented popularity in poor countries while its acceptability increased in the capitalist countries of the West to the extent that it became a precondition for their foreign aid policies.

Development successes were sometimes interspersed with disappointments, which frequently emanated from the vulnerability of poor countries to external shocks. But even when successes measured in rates of growth of GNP were recorded, frustrations over income distribution and the state of absolute and relative poverty gave rise to a movement pioneered by Seers [1969] that called for a re-orientation of development effort and a redefinition of development itself. The movement was quickly embraced by the International Labour Office and popularized by Streeten [1979; 1980; 1984] and other writers under the name of "Basic Needs." In the meantime, the success stories of countries like Taiwan, Singapore, Hong Kong, and South Korea that relied extensively, if not entirely, on the private market mechanism, the Russian initiative for glasnost and perestroika and the chaotic conditions in certain economies where planning was widely used, were all factors indicative of possible failure of planning in particular and the public sector in general as instruments of economic development. Because of these factors, Hirschman [1981] questioned the very essence and relevance of traditional development economics despite his earlier countributions to this field of inquiry. Soon after Hirshman's assault on development economics Sen [1983] came to its defense.

The principal foundations of development economics as explained by Sen are examined in the following section together with the counterpart concepts based on available data that correspond to them. The model used in testing these foundations and the statistical issues arising from it are examined in the next

section. Subsequently the statistical results are analyzed, and finally the paper ends up with some concluding remarks.

II. STRATEGIC THEMES OF DEVELOPMENT ECONOMICS

Economics as a discipline is fundamentally an empirical science despite the trend toward abstraction and mathematization in certain quarters of the profession.[2] This empirical orientation is closely intertwined with the issue of relevance. And if economics is presently in a state of minor turmoil, the root of the anxieties can most readily be traced to the success or failure of economic policies. It is true that sometimes the intellectual challenge of abstraction has led many theorists into the uncharted waters of unreality. Yet, this deviation from realism can hardly be seen to be pursued by development economists, who, as a rule, are down to earth pragmatists.

It is, therefore, not surprising that Sen feels comfortable with the four major strategic themes of development economics since the beginning of the subject, namely, (1) industrialization, (2) rapid capital accumulation, (3) mobilization of underemployed manpower, and (4) planning and an economically active state. Only a few words are needed in justification of these themes, and these in the context of the tests carried out later in the paper.

In the mind of many, industrialization is co-terminous with economic development. And there are good reasons for this perception. Overpopulation and high unemployment, either overt of disguised, that plague most developing countries are in constant search for an outlet other than agriculture, whose output is practically maximized through the combined use of the plentiful labour supply and the locally available complementary inputs. Invoking the difference in income elasticities between manufacturing products and food staples, the imperative of industrialization is further strengthened and becomes a necessary condition for sustainable economic growth. The successful implementation of industrialization policies is, of course, predicated on the ability of developing countries to raise their saving/investment ratios to levels which make takeoff a feasible proposition.[3] Enhanced capital accumulation and the pursuit of profit maximization by the dynamic capitalist sector enable the economy to expand and absorb the surplus labour from agriculture and the other sectors [Lewis, 1954]. Although in some models, especially the dual economy models, capital accumulation and labour mobilization appear to respond automatically to market forces, the dominant opinion, is that the primary responsibility of co-ordination of the entire development effort lies squarely on the shoulders of government.

[2] For the crisis of abstraction and the popularity of the normative approach in economics, see Hutchison [1977].

[3] The term "takeoff" is taken from Rostow [1960] whose name is associated with the stages of economic growth. One may disagree with Rostow's stages on the grounds of operationality, but no economist disagrees with the need for higher investment ratios in developing countries.

The functions of government in the process of development are definitely far more extensive than those recommended by Adam Smith [1937, p. 651] and adopted by the classical school.[4] Except for communist ideoloques few would subscribe to the adage that "there is nothing that a government cannot do in developing countries," but certainly many would convincingly argue that "there is a lot that a government can and should do." What government does, becomes part and parcel of planning, which collectively incorporates its development strategy.

The wide scope of government activities is justified in a variety of ways that range from theoretical to ethical, and from historical to expedient.[5] On top of its stabilization duties, which indirectly contribute to economic development, government is expected to be the educator of the public, but also its protector from the evils of monopoly power; it is expected to rectify market price distortions, but also to use the price system to facilitate the spread of expansionary momentum [Myrdal, 1956], to rectify the imperfections in the capital markets [Tobin, 1964] but also to interfere in the market to raise the savings ratio, to evaluate private returns to investment, but also to concentrate on social returns [Balogh, 1964]. It must encourage private entrepreneurship but it must also be prepared to initiate the big push and exploit the benefits of external economies [Rosenstein Rodan, 1943; Scitovsky, 1956]. Acting in response to these expectations, and in discharge of its development responsibilities, government does not depend on simple exhortation, but relies on direct participation, and in the process increases its relative size in the economy. The importance of government role cannot be exaggerated and remains one of the central pillars of development economics as set forth by Sen.

Compiling from the World Development Report, 1982, two samples, one of 'low-income economies' and the other of 'middle-income economies,' with population of at least 10 million people for the period 1960–1980 and, juxtaposing figures pertaining to GNP per capita, investment and industry shares, Sen claimed tentative support for the four major themes of development economics. Since then Summers and Heston [1984] produced time series data for 63 countries, 21 industrial and 42 developing, for the period 1950–1980 in constant international prices that allow a more rigorous statistical examination of these strategic themes. These data are comparable across time as well as across countries and by and large eliminate certain biases inherent in conventional data, especially the ones arising from wide fluctuations in exchange rates and from significant variations of relative prices of services, as those provided by the public sector, at different levels of economic development.

[4] According to Adam Smith, the legitimate areas of government intervention were defense, the administration of justice, and the maintenance of certain public works. In all justice to him, however, one finds in the *Wealth of Nation* several other areas of government intervention in addition to the three mentioned above.

[5] For a general appraisal of the reasons for government intervention see Afxentiou [1972].

There are no data that exactly correspond to the four themes under examination. Therefore, some assumptions had to be made to facilitate the causality tests undertaken. Due to lack of data on industrialization itself, the Summers and Heston information on investment has been used as a proxy for it. The assumption here is that investment in industry constitutes a relatively constant proportion of total investment,[6] which also represents the theme of rapid capital accumulation. The theme of mobilization of unemployed manpower can only be covered descriptively, rather than quantitatively, and in the absence of appropriate data it is assumed that all countries exhibit the same degree of concern and put the same effort in improving the allocation of labour resources. With repect to planning, it is assumed that it goes hand in hand with state activism which is represented by government expenditure.

In the Summers-Heston time series, government spending stands for exhaustive expenditures on goods and services, and consequently excludes transfer payments. From the point of development, these are the kinds of expenditures which are directly related to economic activity in contrast to transfer payments which incorporate the moral values of income distribution and are one step removed from impacting directly on economic activity. As a rule, transfer payments do not qualify as development expenditure, and for this reason, their exclusion in statistical tests is fully justified. All exhaustive expenditures do not naturally qualify as development expenditures. In actuality their major proportion falls under government consumption expenditures. But the expectation and assumption is that development spending grows *pari passu* with the overall increase in exhaustive expenditures, which can therefore be taken as a good proxy for government development spending.

With these classifications and assumptions in mind, we proceeded to test for causality, in the Granger (1969)–Sims (1972) sense, that runs from either investment or government expenditure or both to *GDP*. The premise of these tests is that the relevant information is entirely contained in the present and past values of the variables under consideration.

III. THE FORMAL MODEL AND TESTS

To test the hypothesis that government expenditure and investment causes real *GDP*, we assume that real *GDP* is governed by the following trivariate autoregressive time series model (with the variables denoting log transforms):

$$GDP_t = \alpha_o + \sum_{i=1}^{r} \alpha_i GDP_{t-i} + \sum_{j=1}^{s} \beta_j G_{t-j} + \sum_{h=1}^{k} \delta_h I_{t-h} + \varepsilon_t \qquad (1)$$

[6] It is common for governments in developing countries to concentrate initially their investment in infrastructure, rather than in industrial projects. However, because such investment as in communication and power generation is directly linked to industrialization, the assumption of a relatively constant share of investment in industry does not appear to deviate significantly from reality.

where G is government expenditure, I is investment and α_o, α_i, β_j, and δ_h are parameters; ε_t is a mean zero error term.

Causal relationships would appear to enter this model in a very natural way. If $\beta_j=0$ for all j, then it is clear from equation (1) that government expenditure has no effect on future GDP; that is, G_t does not cause GDP_t. Similarly, if $\delta_h=0$ for all h, I_t does not cause GDP_t. Thus, one could determine the causal relationships between G_t and I_t and GDP_t by simply carrying out standard F-tests.

The disturbance ε_t in equation (1) must be a white noise to make the said statistic an asymptotic F-distribution. A white noise is a serially uncorrelated process. However, since many economic time series are nonstationary, in the sense that they tend to depart from any given value as time goes on, it is unlikely that the disturbance ε_t in equation (1) will result in a white noise series.

To remove apparent nonstationarity in economic time series, the series are frequently detrended in empirical investigations by regressing the series on time or a function of time. With a linear time trend equation (1) becomes

$$GDP_t=\alpha_o+\sum_{i=1}^{r}\alpha_i GDP_{t-i}+\sum_{j=1}^{s}\beta_j G_{t-j}+\sum_{h=1}^{k}\delta_h I_{t-h}+\delta t+\varepsilon_t \tag{2}$$

Many researchers have instead transformed the series through prefilters, to satisfy the condition of a white noise for ε_t. For instance, most have used first differencing of the natural logarithms of the data series to reduce the serial correlation in the residuals. In particular, the $(1-L)$ filter was used to transform the raw data, where L is the backward shift operator. Of course, once variables are transformed using logarithms, a further transformation through the filter $(1-L)$ yields the growth rate of the series. With the $(1-L)$ filter, equation (1) becomes

$$\Delta GDP_t=\alpha_o+\sum_{i=1}^{r}\alpha_i \Delta GDP_{t-i}+\sum_{j=1}^{s}\beta_j \Delta G_{t-j}+\sum_{h=1}^{k}\delta_h \Delta I_{t-h}+\varepsilon_t \tag{3}$$

where $\Delta=(1-L)$.

There is obviously an unlimited number of possibilities that can account for nonstationary behaviour and, of course, failure to account for nonstationarities or choice of the wrong transformation has far-reaching consequences in econometric work. Under these circumstances it becomes important to evaluate empirically what type of nonstationarity is present in the data. This is done using the augmented Dickey-Fuller (ADF) test. The test is obtained as the t statistic of ρ in the following regression $[\Delta=(1-L)]$:

$$\Delta z_t=\rho z_{t-1}+\sum_{i=1}^{N}\beta_i \Delta z_{t-i}+e_t$$

where z_t is the series under consideration and N is large enough to ensure that e_t is a white noise series. N was set equal to 4 to obtain correct standard errors. The

distribution of the ADF statistic is not standard. We use the critical values tabulated by Fuller (1976, Table 8.5.2).

The results are presented in the first three columns of Table 1. It is quite obvious that the ADF test statistics cannot reject the hypothesis that these series are stationary in first differences. In fact, most of the ADF statistics are positive, which is even the wrong sign for the series to be stationary in levels. Differencing, therefore, seems to be the appropriate transformation to achieve stationarity.

One preliminary matter had also to be dealt with before we could proceed to perform Granger-causality tests. It concerns the lengths of lags, r, s, and k. In the literature r, s, and k are frequently chosen to have the same value, and lag lengths of 1, 2, or 3 are used most often with annual data. Although we explored the sensitivity of the results to the lag length chosen, we only report results (in Table 1) based on $r=s=k=3$ in equations (2) and (3).

IV. STATISTICAL RESULTS

The results of causality tests are displayed in Table 1, using equation (3) as well as equation (2). The statistic F_1 is the asymptotic F-test statistic for the null hypothesis that G does not Granger cause GDP, in a regression of GDP on lagged values of itself and G. The F-test denoted F_2 is the test of the hypothesis that in a regression of GDP on lagged values of itself and I, the coefficients of I are zero. The F-test denoted F_3 is the test of the hypothesis that in a regression of GDP on lagged values of itself and G and I, the coefficients on G are zero. The F-test denoted F_4 is the test of the hypothesis that in a regression of GDP on lagged values of itself and G and I, the coefficients of I are zero. The F-test denoted F_5 is the test of the joint hypothesis that in a regression of GDP on lagged values of itself and G and I, the coefficients of G and I are zero.

A rearrangement of the information in Table 1 is provided in Table 2 and Table 3 in which those countries that satisfy the Granger causality F_1, F_2, F_3, F_4 and F_5 tests, at three different levels of significance, based on equation (3) and equation (2) respectively, are displayed. The same information is further condensed in Tables 4 and 5.

From the point of hypothesis testing the 5% level of significance is the most relevant and acceptable. But for comparative purposes the 10% and 15% levels are given as well. At the 5% level the proportion of countries that satisfy Granger-causality more than doubles when equation (2) is used instead of equation (3), but in both cases the proportions remain low. Clearly, the international evidence for a causal link between either government expenditure or investment or both and GDP is very weak.

To check the sensitivity of results to changes in the sample, and more importantly to test the validity of the major themes of development economics, the industrial countries were eliminated from the sample and only the experience of 42 developing countries was recorded in Tables 6 and 7. Again, for comparative purposes, the

TABLE 1. TAIL AREAS OF TESTS OF GRANGER CAUSALITY

	ADF Test			Based on equation (3)					Based on equation (2)				
	GDP	I	G	F_1	F_2	F_3	F_4	F_5	F_1	F_2	F_3	F_4	F_5
Egypt, Arab	1.28	−1.27	−1.90	0.897	0.859	0.783	0.749	0.932	0.436	0.256	0.758	0.512	0.545
Ethiopia	−1.27	−1.89	0.25	0.900	0.844	0.968	0.927	0.984	0.692	0.054	0.625	0.072	0.180
Kenya	−1.03	−2.12	−0.93	0.013*	0.140	0.039*	0.273	0.029*	0.001*	0.029*	0.010*	0.096	0.002*
Mauritius	−1.86	−1.59	−1.88	0.025*	0.671	0.052	0.780	0.135	0.021*	0.962	0.034*	0.874	0.142
Morocco	0.22	−1.61	−0.59	0.307	0.191	0.197	0.130	0.151	0.347	0.514	0.295	0.416	0.410
Nigeria	0.27	−0.10	0.55	0.760	0.119	0.822	0.179	0.383	0.101	0.047*	0.775	0.460	0.240
S. Africa	−1.13	−1.43	−0.43	0.287	0.171	0.193	0.123	0.138	0.601	0.050*	0.166	0.017*	0.049*
Uganda	−1.62	−1.58	0.01	0.728	0.048*	0.784	0.082	0.209	0.325	0.000*	0.761	0.003*	0.006*
Zaire	−1.65	−0.91	−1.44	0.871	0.854	0.621	0.607	0.852	0.039*	0.335	0.165	0.822	0.196
Burma	−1.27	−1.88	−5.75*	0.593	0.901	0.705	0.965	0.915	0.304	0.672	0.261	0.524	0.451
India	−0.93	−2.23	−2.45	0.243	0.602	0.300	0.640	0.462	0.194	0.275	0.129	0.175	0.138
Israel	−1.80	−1.75	−0.97	0.294	0.277	0.430	0.409	0.366	0.373	0.122	0.403	0.159	0.205
Japan	−1.75	−2.50	−2.24	0.515	0.992	0.378	0.747	0.753	0.529	0.489	0.202	0.187	0.300
Pakistan	−0.72	−2.07	0.63	0.466	0.361	0.424	0.340	0.427	0.469	0.014*	0.187	0.009*	0.021*
Philippines	−0.38	−0.12	−2.82	0.487	0.019*	0.032*	0.001*	0.005*	0.216	0.176	0.001*	0.001*	0.001*
Sri Lanka	−3.35	1.25	0.50	0.743	0.569	0.471	0.364	0.598	0.393	0.546	0.313	0.418	0.445
Taiwan	2.07	−0.66	−1.10	0.552	0.849	0.687	0.945	0.886	0.605	0.869	0.676	0.903	0.888
Thailand	−0.82	−1.57	−0.22	0.219	0.801	0.323	0.906	0.585	0.027*	0.592	0.057	0.717	0.130
Austria	−1.77	−2.76	−4.98*	0.934	0.097	0.449	0.053	0.193	0.894	0.565	0.699	0.452	0.755
Belgium	−0.26	−1.57	−0.10	0.199	0.134	0.119	0.084	0.076	0.043*	0.060	0.033*	0.044*	0.013*
Cyprus	−0.70	−1.98	−1.01	0.674	0.235	0.678	0.279	0.473	0.715	0.483	0.916	0.697	0.832
Denmark	−1.31	−1.35	1.06	0.687	0.724	0.782	0.815	0.881	0.030*	0.055	0.503	0.749	0.148
Finland	−0.65	−0.91	−0.39	0.439	0.448	0.270	0.275	0.352	0.594	0.460	0.235	0.184	0.322
France	−1.69	−3.10	−2.63	0.186	0.547	0.192	0.487	0.315	0.066	0.085	0.086	0.106	0.040*
Germany, Fed.	−2.12	−2.03	−3.49	0.716	0.046*	0.725	0.072	0.186	0.686	0.223	0.655	0.254	0.449
Greece	−1.20	−3.66*	−2.51	0.757	0.862	0.896	0.973	0.969	0.385	0.305	0.879	0.762	0.669
Iceland	−0.43	−2.77	−1.41	0.924	0.113	0.331	0.043*	0.163	0.897	0.334	0.245	0.088	0.267
Ireland	−0.48	−0.74	−1.59	0.774	0.391	0.895	0.529	0.754	0.374	0.793	0.389	0.739	0.646
Italy	−2.01	−2.84	−2.07	0.014*	0.180	0.095	0.665	0.078	0.021*	0.029*	0.114	0.150	0.023*
Luxembourg	−1.00	−1.72	−0.89	0.454	0.122	0.624	0.215	0.300	0.622	0.534	0.887	0.802	0.844

Netherlands	−1.19	−1.38	−1.59	0.835	0.362	0.936	0.491	0.757	0.114	0.061	0.654	0.422	0.204
Norway	1.47	−1.41	0.77	0.701	0.134	0.969	0.284	0.492	0.214	0.076	0.297	0.127	0.113
Portugal	−0.45	−1.35	0.04	0.517	0.138	0.736	0.258	0.375	0.793	0.057	0.759	0.084	0.228
Spain	−0.93	−1.85	−1.30	0.814	0.021*	0.822	0.039*	0.130	0.185	0.020*	0.494	0.085	0.072
Sweden	−1.52	−1.77	0.56	0.411	0.179	0.652	0.339	0.393	0.559	0.063	0.594	0.097	0.190
Switzerland	−1.92	−2.12	−1.03	0.861	0.866	0.848	0.853	0.956	0.950	0.547	0.872	0.531	0.844
Turkey	1.27	−1.85	1.89	0.041*	0.631	0.052	0.543	0.129	0.000*	0.607	0.000*	0.777	0.000*
United Kingdom	−1.07	−2.02	−3.31	0.684	0.774	0.562	0.631	0.778	0.702	0.159	0.841	0.260	0.463
Barbados	−0.86	−1.97	−1.25	0.186	0.502	0.154	0.369	0.251	0.140	0.347	0.133	0.288	0.169
Canada	−0.41	−2.11	−2.61	0.383	0.066	0.734	0.188	0.239	0.017*	0.033*	0.503	0.756	0.104
Costa Rica	0.47	0.47	−2.61	0.724	0.555	0.791	0.638	0.802	0.463	0.375	0.440	0.368	0.448
Dominican Re	−0.32	−0.66	−0.82	0.773	0.339	0.802	0.405	0.652	0.228	0.121	0.287	0.170	0.152
El Salvador	−1.57	−1.84	−0.94	0.400	0.432	0.208	0.223	0.282	0.021*	0.577	0.094	0.928	0.189
Guatemala	1.19	−3.66*	−1.54	0.258	0.258	0.739	0.738	0.534	0.765	0.341	0.989	0.576	0.783
Honduras	0.12	−0.30	−0.09	0.565	0.742	0.553	0.701	0.756	0.193	0.038*	0.803	0.251	0.187
Mexico	−0.65	−0.99	0.24	0.707	0.422	0.841	0.564	0.745	0.911	0.146	0.187	0.031*	0.120
Nicaragua	−1.07	0.85	−1.25	0.659	0.565	0.438	0.905	0.990	0.215	0.459	0.477	0.563	0.658
Panama	−1.31	−1.99	−2.52	0.547	0.969	0.478	0.829	0.819	0.406	0.932	0.427	0.876	0.755
Trinidad	−2.56	−1.13	−0.05	0.971	0.347	0.907	0.366	0.725	0.971	0.447	0.727	0.339	0.695
United States	−0.08	−0.33	−0.76	0.878	0.819	0.431	0.397	0.700	0.266	0.640	0.494	0.924	0.657
Argentina	−0.94	−0.47	−1.94	0.269	0.904	0.223	0.680	0.512	0.060	0.847	0.089	0.812	0.252
Bolivia	−3.22	−2.05	−2.04	0.300	0.522	0.452	0.699	0.554	0.022*	0.265	0.049*	0.379	0.059
Brazil	1.22	−0.12	−0.51	0.251	0.089	0.648	0.294	0.255	0.052	0.029*	0.457	0.297	0.087
Chile	−1.00	−1.53	−1.60	0.126	0.906	0.135	0.767	0.369	0.050*	0.439	0.197	0.943	0.273
Columbia	1.81	−1.49	−2.18	0.338	0.368	0.534	0.571	0.509	0.416	0.335	0.431	0.359	0.412
Ecuador	1.67	−0.88	−0.84	0.041*	0.190	0.020*	0.077	0.021*	0.080	0.295	0.058	0.180	0.075
Guyana	−0.97	−2.95	0.45	0.601	0.208	0.361	0.139	0.265	0.153	0.644	0.255	0.796	0.430
Paraguay	3.32	1.01	−1.34	0.571	0.627	0.656	0.707	0.763	0.413	0.622	0.467	0.689	0.647
Peru	−1.08	−1.32	0.06	0.738	0.837	0.654	0.736	0.864	0.333	0.201	0.414	0.273	0.290
Uruguay	0.81	−1.59	−0.50	0.886	0.074	0.968	0.132	0.353	0.786	0.021*	0.293	0.011*	0.045*
Venezuela	−3.66*	−2.26	0.56	0.254	0.817	0.299	0.801	0.565	0.153	0.033*	0.173	0.048*	0.038*
Australia	−0.83	−0.36	−1.02	0.301	0.661	0.478	0.867	0.656	0.966	0.492	0.564	0.278	0.619
New Zealand	−1.00	−1.79	−0.91	0.217	0.532	0.104	0.237	0.194	0.048*	0.834	0.024*	0.329	0.090

Notes: i. Sample period, annual data: 1950–1980.

ii. The asymptotic critical value for the ADF test statistic at a 1% significance level and 50 observations is −3.58—see Fuller (1976, Table 8.5.2)

iii. * indicates significance at the 5% levels.

TABLE 2. COUNTRIES SATISFYING GRANGER CAUSALITY F_1, F_2, F_3, F_4, AND F_5 TESTS AT 5%, 10%, AND 15% SIGNIFICANCE LEVELS BASED ON EQUATION (3) AND THE FULL SAMPLE OF 63 COUNTRIES.

Significance Level	Hypotheses Tests				
	F_1	F_2	F_3	F_4	F_5
0.05	Ecuador Kenya Mauritius Turkey Italy*	Philippines Uganda Germany Fed.* Spain*	Ecuador Kenya Philippines	Iceland Philippines Spain*	Ecuador Kenya Philippines
0.10		Uruguay Canada*	Mauritius Turkey Italy*	Ecuador Uganda Austria* Belgium* Germany Fed.*	Belgium* Italy*
0.15	Chile	Kenya Nigeria Portugal Belgium* Iceland* Luxemburg* Norway*	Chile Belgium* New Zealand*	Guayana Morocco S. Africa Uruguay	Mauritius S. Africa Turkey Spain*

Note: * indicates the countries defined as industrial by the International Monetary Fund.

same three levels of significance are retained.

These tables show that the evidence for causality from developing countries is practically the same as that from the full sample, and by inference the same as that from industrial countries. Again, at the 5% level, the proportion of developing countries that satisfy Granger-causality more than doubles when equation (2) is used instead of the statistically more rigorous equation (3). According to equation (2), fewer than 1 out of 5 countries satisfy tests F_1–F_5 with causality from investment to *GDP* and from government expenditure to *GDP* being the most pronounced. This is the strongest case that can be made for development economics, but it is most assuredly not strong enough, especially when viewed through equation (3), which more or less reduces it to complete insignificance.

V. CONCLUSIONS

The statistical evidence indicates that there is a very high similarity in patterns of behaviour in both industrial and developing countries. Accepting the proposition that growth or development is universally desirable, it appears from our causality tests that neither in the industrial nor in the developing world can this objective be successfully pursued exclusively through investment stimulation and

TABLE 3. COUNTRIES SATISFYING GRANGER CAUSALITY F_1, F_2, F_3, F_4, AND F_5 TESTS AT 5%, 10% AND 15% SIGNIFICANCE LEVELS BASED ON EQUATION (3) AND THE FULL SAMPLE OF 63 COUNTRIES.

Significance Level	Hypotheses Tests				
	F_1	F_2	F_3	F_4	F_5
0.05	Bolivia Chile El Salvador Kenya Mauritius Thailand Turkey Zaire Belgium* Canada* Denmark* Italy* N. Zealand*	Brazil Honduras Kenya Nigeria Pakistan S. Africa Uganda Uruguay Venezuela Canada* Italy* Spain*	Bolivia Kenya Mauritius Philippines Turkey Belgium* N. Zealand*	Mexico Pakistan Philippines S. Africa Uganda Uruguay Venezuela Belgium*	Kenya Pakistan Philippines S. Africa Turkey Uganda Uruguay Venezuela Belgium* France* Italy*
0.10	Argentina Brazil Ecuador France*	Ethiopia Portugal Belgium* Denmark* France* Netherlands* Norway* Sweden*	Argentina Ecuador El Salvador Thailand France*	Ethiopia Kenya Porturgal Iceland* Spain* Sweden*	Bolivia Brazil Ecuador N. Zealand* Spain*
0.15	Barbados Nigeria Netherlands*	Domicican Republic Israel Mexico	Barbados India Italy*	France* Italy* Norway*	India Mexico Thailand Canada* Denmark* Norway*

Note: * indicates the countries defined as industrial by the International Monetary Fund.

government expenditure policies. It is evident, from our analysis, that over the period studied the art of governing is more or less uniform world-wide. One might venture to speculate on how high or low government efficiency or standards are, but the evidence suggests that bureaucrats or politicians in charge of economic affairs all over the world learn from each other whatever is to be learned and run their respective economies along relatively similar lines.

Our results can also be viewed as an indictment against government stabilization policies which are embodied in the Keynesian paradigm. In this context, our findings are in agreement with the conclusions reached by Ram [1986] although his model was different from ours, his formulation was in per capita terms, and his main preoccupation was the test of Wagner's law.

TABLE 4. NUMBER (AND PERCENTAGE) OF COUNTRIES SATISFYING GRANGER CAUSALITY BASED ON EQUATION (3) AND THE FULL SAMPLE OF 63 COUNTRIES.

Significance Level	Hypotheses Tests				
	F_1	F_2	F_3	F_4	F_5
0.05	5 (7.9)	4 (6.3)	3 (4.8)	3 (4.8)	3 (4.8)
0.10	5 (7.9)	6 (9.5)	6 (9.5)	8 (12.7)	5 (7.9)
0.15	6 (9.5)	13 (20.6)	9 (14.3)	12 (19.0)	9 (14.3)

TABLE 5. NUMBERS (AND PERCENTAGE) OF COUNTRIES SATISFYING GRANGER CAUSALITY BASED ON EQUATION (2) AND THE FULL SAMPLE OF 63 COUNTRIES.

Significance Level	Hypotheses Tests				
	F_1	F_2	F_3	F_4	F_5
0.05	13 (20.6)	12 (19.0)	7 (11.1)	8 (12.7)	11 (17.5)
0.10	17 (27.0)	20 (31.7)	12 (19.0)	14 (22.2)	16 (25.4)
0.15	20 (31.7)	23 (36.5)	15 (23.8)	17 (27.0)	23 (36.5)

The rejection of the major themes of development economics may seem surprising in view of the various persuasive arguments which consider an active government involvement and capital accumulation as the sine qua non for economic development. The minor significance of investment may be considered as another manifestation of the fact that growth is not automatically generated through increments of production factors alone, and another indication that the ghost of the residual is still around haunting econometricians and growth theorists. As for the lack of evidence regarding the impact of government spending on *GDP*, it is likely that more often than not the resources used by government for growth or development are not enough to make a real difference, and that expanded budgets mainly finance consumption rather than development expenditures.[7] Under such conditions, the impact of the public sector on economic development

[7] The tendency of government consumption expenditure to grow concomitantly with government revenue has been christened by some as the weak version of the "Please effect," compared to the strong version of the effect according to which increased taxation may lead to a reduction in national saving. In this connection, see Please [1967; 1970].

TABLE 6. NUMBER (AND PERCENTAGE) OF COUNTRIES SATISFYING GRANGER CAUSALITY BASED ON EQUATION (3) AND A SAMPLE OF 42 DEVELOPING COUNTRIES.

Significance Level	Hypotheses Tests				
	F_1	F_2	F_3	F_4	F_5
0.05	4 (9.5)	2 (4.8)	3 (7.1)	2 (4.8)	3 (7.1)
0.10	4 (9.5)	3 (7.1)	5 (11.9)	4 (9.5)	3 (7.1)
0.15	5 (11.9)	6 (14.3)	6 (14.3)	8 (19.0)	6 (14.3)

TABLE 7. NUMBER (AND PERCENTAGE) OF COUNTRIES SATISFYING GRANGER CAUSALITY BASED ON EQUATION (2) AND A SAMPLE OF 42 DEVELOPING COUNTRIES.

Significance Level	Hypotheses Tests				
	F_1	F_2	F_3	F_4	F_5
0.05	8 (19.0)	9 (21.4)	5 (11.9)	7 (16.7)	8 (19.0)
0.10	11 (26.2)	11 (26.2)	9 (21.4)	10 (23.8)	11 (26.2)
0.15	13 (31.0)	14 (33.3)	11 (26.2)	10 (23.8)	15 (35.7)

is naturally destined to fade away in the midst of the other numerous and diverse day-to-day government functions.

Finally, the lack of causality between government expenditure and *GDP* may be attributed to the service orientation of the public sector and the known fact that productivity in the service sector has historically fallen behind the rest of the economy. Only when government extends its duties beyond the traditional services and into direct production in the form of expanded socialism would such causality be expected to evolve. Clearly, the productivity lag theory which has been proposed among others by Baumol [1967] as a theory of growth of government spending has another hitherto unsuspected dimension, namely, it explains why a causal relationship should not be expected between government expenditure and gross domestic product.

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