Kaldorian Approach to Greek Economic Growth

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ABSTRACT

In the last 30 years, Greece has experienced a rapid rate of economic growth which has transformed the economy and enabled it to become a member of the EEC. Specifically, Greece transformed itself from an agricultural economy with virtually no industrial base to an economy with a significant industrial sector and consequently a relatively high income per capita. One can explain this on the lines of a Kaldorian framework. In this paper we provide an outline of Kaldor's growth model and test its relevance to the economic experience of Greece during the 1967-1988 period. The empirical results suggest that the model can adequately explain the developments in the economy to a considerable degree.

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I. INTRODUCTION

Before World War I1 Greece was basically an agricultural economy with a virtually non-existent industrial sector. However, the post-war picture is diametrically opposite. In particular, the Greek economy has experienced such a rapid rate of growth that it has transformed itself from an agricultural economy into a market economy with a significant industrial base and a high income per capita. One can examine this rapid transformation of the Greek economy in terms of a Kaldorian growth framework. Although other OECD and non-OECD economies have been investigated in terms of this model, no such investigation has been made for the Greek economy (see for instance Rowthorn, 1975; Chatterji and Wickens, 1983). In this paper we will first give an outline of the Kaldorian model and then we will examine its relevance to the growth of the Greek economy.

An indication of this rapid change of the Greek economy is that the share of agricultural production in the GDP has fallen substantially in the last four decades whereas the share of industrial production has increased considerably, as shown in Table 1 which reports the share of each sector as the percentage of GDP.

(Table 1 about here)

The rates of growth of the Greek economy in the same period have been some of the highest of the OECD countries. As an indication, the average rate of growth between 1960 and 1970 was 7.6% and between 1970 and 1980,4.7%. There are years when Greece's rate of growth was the highest in the OECD excluding Japan (Kamouzis, 1981, P.80). In addition, the average growth rate in the last three decades is still the second highest in the EC, despite the relative fall of the last decade (World Bank, 1989). Furthermore, in the period 1950-1980, the average rate of growth of the industrial sector was higher than the GDP rate of growth (7.6% and 5.9% respectively) (Agapitos, 1989, p. 76). The percentage rates of GDP growth of the period 1967-1988 are given by Table 2.

(Table 2 about here)

However, attention should be drawn to the following structural peculiarities of Greek economic development. Since the 1950s Greek manufacturing industry exhibited a remarkable growth. The average annual growth of manufacturing output during the period 1953-1973 was 9.6% and the share of the manufacturing output in the GDP increased from 1 1.5% in 1951 to 21% in 1973. Although this is still low in comparison to other EC countries its increase is substantial. During the same period the structure of the manufacturing industry has also changed. The manufacturing of basic metal, chemical, electrical and transportation equipment expanded with an annual increase in production of between 11% and 23%, whereas food, textile clothing and footwear manufacturing showed an annual increase at the rate of 6%-9%. Employment in the former industries exhibited an increase from 60% to 100% over the period 1953-1973, whereas employment in the latter industries showed an almost equivalent decrease. A similar trend was observed until the 1980s. This is mainly because food, textile, clothing and footwear industries experienced a considerable improvement in the organization and updating of the production process which resulted in an increase in the marginal productivity of labour. This increase in productivity of labour seems to explain the decrease in employment in this sector although there was a moderate increase in output production (Pavlidis, 1989 and Negreponti-Delivani, 1981).

Furthermore, a substantial number of textile and especially finished clothing and footwear manufacturing firms are traditional businesses where members of the family are employed. As a result increases in output in these firms may not be correlated with an increase of paid employment. In 1977, for instance, 18.4% of the labour force in Greece was found to be non-paid family members employed in a family business or small factory. The corresponding figure in other EC countries was 3.4% (ILO, 1978). The above points might lead us to expect a low correlation between output and employment in the manufacturing sector.

II. OUTLINE OF THE MODEL

Kaldor's first formulation of his model which was presented in 1966, attempted to explain the slow rate of economic growth of the UK (Kaldor, 1966, 1978). Since then, the model has received considerable attention by theorists and also has been modified to a certain extent. The extensive literature on the subject has also provoked different interpretations of Kaldor's points. However, in spite of this controversy one can distinguish the main thrust of the model which can be expressed by three laws (Parikh, 1978; Thirlwall1983; McCombie and de Ridder, 1983; McCombie, 1983; Mizuno and Ghosh, 1984; Lee, 1990).

The first law simply states that there exists a positive relationship between the growth of Gross Domestic Product and the growth of manufacturing (or industrial) output:

$$q = f(q_m) \qquad (1)$$

where q is the GDP rate of growth and q_m, is the rate of growth of manufacturing output. (Some researchers have used industrial output instead of manufacturing output (McCombie and de Ridder (1983).) The empirical result should give a high correlation and a correlation coefficient different from zero. The basic idea of the first law, namely that the manufacturing sector is important for economic growth, is not new. Many growth theorists have also emphasized its significance (Solow, 1970). Kaldor placed fundamental importance on the manufacturing sector, maintaining that the relationship is not merely due to the fact that manufacturing output comprises a large part of total output in developed economies.

The implication of this law is that there must be a positive association between q and the excess of the rate of growth of manufacturing output over the rate of growth of non-manufacturing (q_{nm}) (Thirwall, 1983).

$$q = a_0 + b_0 (q_m - q_{nm}) \qquad (2)$$

In addition, there must not be a correlation between q and the growth of agricultural output because growth in the model is industry led. (The coefficient of regression should be equal to zero.) Finally, there must be a strong correlation between q and the growth of services' output with a regression coefficient not statistically different from unity. This is because the demand for services is a by-product of the demand for manufacturing output itself.

The great importance placed on the role of q_m , for economic growth is not difficult to explain. First, if one accepts that differences in various growth rates are due to productivity, one can maintain that the expansion of manufacturing sector will result in increased overall productivity. The manufacturing sector is more likely to exhibit increasing returns while agriculture exhibits diminishing returns. Kaldor's emphasis on the increasing returns is unique given the established approach of the neoclassical theorists that production processes are subject to diminishing or constant returns (Mizuno and Ghosh, 1984). One can trace Kaldor's attention to increasing returns in his influence from the American economist A. Young, who paid particular attention to the concept of increasing returns as applied to the whole industrial sector (Young, 1928; Blitch, 1983).

The above discussion brings us to the second law which is sometimes known as the Verdoorn law (Verdoorn, 1949, 1980; Thirlwall, 1983). Defining productivity as

$$p = q - e$$

where p is productivity growth and e is employment growth, the Verdoorn's law is expressed as:

$$p = a_1 + b_1 q \quad \text{with } b_1 > 0 \qquad (3)$$

In the manufacturing sector this relation implies that there is a positive relation between the rate of growth of labour productivity in the manufacturing sector and the rate of growth of manufacturing output. Since increasing returns are associated with the industrial sector, productivity increases in this sector, consequently:

$$p_m = a_2 + b_2 q_m \qquad (4)$$

where p_m is labour productivity in the manufacturing sector.

According to Kaldor, p_m and e_m (employment in manufacturing) are endogenous to the manufacturing sector, but q_m is exogenous since this is a Keynesian demand determined model (Kaldor, 1975). The exogeneity of q_m can be partially explained by the growth of export demand, and by the non-existence of supply constraints on q_m since manufacturing can attract labour from agriculture which is supported by the third law (Stoneman, 1979; Mizuno and Ghosh, 1984).

In the agricultural sector the employment is exogenous because of the surplus labour pull from the manufacturing sector. The existence of unemployed and underemployed labour in agriculture means that there is no relationship between the growth of agricultural output (q_a) and the growth of agricultural employment (e_a) (Stoneman, 1979). In addition, given the definition of productivity and the independence of e_a and q_a the testing of Equation 3 with respect to the agricultural sector should give a coefficient on q_a equal to unity (Stoneman, 1979).

Kaldor's second law can be explained by considering that the expansion of the manufacturing sector will result in increasing productivity. As was mentioned in the first law, the expansion of the manufacturing sector with its increasing returns to scale will result in lower costs of production. In turn this implies increasing surplus for reinvestment in the manufacturing sector. Reinvestment implies that better and bigger capital stock is brought into the sector with consequent increases in labour productivity in the manufacturing industry.

The above bring us to the third law of the model which relates the manufacturing or industrial sector to the overall productivity of the economy. As q_m increases, there is a transfer of labour from other sectors (where no relation exists between employment growth and output growth). This transfer of labour will raise productivity outside manufacturing. As a consequence of this and because of the increasing returns in manufacturing, there will be a correlation of overall productivity with manufacturing output. A simple formulation of the above is to state:

$p = a_3 + b_3 q_m$ (5)

A more usual formulation which is found in the literature is to state:

$q = a_4 + b_4 e_m$ (6)

There is a strong relation between the rate of growth of GDP and the rate of growth of employment in the manufacturing sector. This strong correlation is support for the hypothesis unless e_m is closely correlated with total employment growth. Thus, there should be no relation between q and total employment. Also there should be no relation between q and e_m and e_s (growth of employment in the service sector). In general, there is no relation between q and employment in the non-manufacturing sector (e_{nm}) because growth can be accelerated by diverting labour to manufacturing where there is a correlation (Thirlwall, 1983).

Cripps and Tarling (1973) and Lee (1990) have proposed the following formulations of the third law

$$q = a_5 + b_5 e_m - c_0 e_{nm} \quad (7)$$

$$p = a_6 + b_6 q_m - c_1 e_{nm} \quad (8)$$

The third law is tightly connected with the previous analysis. Since the manufacturing sector is the most important for the growth of an economy, there has to be a correlation between output growth and the transfer of workers from diminishing or constant returns activities to the manufacturing sector.

III. EMPIRICAL RESULTS

The above points are empirically examined by using the Greek historical record between 1967 and 1988. The data series are collected from the appropriate volumes of OECD (Historical Data). The time period is particularly interesting since it begins at a period which is generally considered to mark the end of the transformation process of the Greek economy to a modern market economy. The time span is also long enough to include both troughs and peaks of the trade cycle.

First law

Table 3 reports the estimated equations concerning the basic formulations of the first Law. In column 1, GDP growth is regressed on the growth of manufacturing output. The results are satisfactory. q_m explains 81% of the total variation of the GDP growth and it is highly significant. DW also indicates the non-existence of first order autocorrelation. The size of the coefficient of q_m is comparable with other time series studies. Stoneman found a coefficient of 0.39 for the UK economy and Mizuno and Ghosh one of 0.41 for the Japanese economy (Stoneman, 1979; Mizuno and Ghosh,1984).

(Table 3 about here)

As additional evidence that the strong relationship between q and q_m is not merely due to q_m constituting a large part of q, we took the difference in the growth rates in the manufacturing and the non-manufacturing sectors (q_{dmn}). The growth of q was regressed against q_{dmn} and this estimation yielded the following results:

$$q = \underset{(3.916)}{2.117} + \underset{(6.275)}{0.3036}\, q_{dmn}$$

R^2 =0.66 DW =2.075 S.E. = 2.075

Once again this reinforces the validity of the first Law.

Column 2 examines a variation of the first Law by using the growth of industrial production (q_i) as the right-hand side variable. Such a formulation has been used by other authors (McCombie and de Ridder, 1983), but also it is particularly useful in the case of Greece because it reflects the important effect of the self-employed. Although R^2, the t-ratio and the standard error of regression indicate a better fit, the DW lies in the inconclusive area. The use of Cochrane-Orcutt method improved the fit substantially and yielded the following results:

$$q = 1.564 + 0.523\, q_i$$
$$\quad (6.422) \quad (15.586)$$

$R^2 = 0.90$ DW = 1.659 S.E. = 1.172

q_i is highly significant and explains 90% of the total variation of GDP. The SE of the regression was substantially lower than the original formulation.

The regression results reported in columns 3 and 4 indicate the validity of Kaldor's predictions with respect to the behaviour of the agricultural and service sectors. When GDP growth is regressed against the agricultural output growth (q_a) the results are very poor. The R^2 is only 4% and the q_a is insignificant, in spite of the still relatively large agricultural sector in Greece. When the service sector production growth q_s replaces q_a as the right-hand variable, it is highly significant which explains 92% of the total variation of GDP growth. In addition the hypothesis that the coefficient of q_s is not significantly different from 1 could not be rejected.

Second law

Turning to the second law, the relationship between the growth of the manufacturing output (q_m) and manufacturing productivity (p_m) was examined. The regression results presented below are satisfactory and in accordance with the theoretical predictions.

$$p_m = -1.015 + 0.804\, q_m$$
$$\quad (1.551) \quad (9.850)$$

$R^2 = 0.82$ S.E. = 2.318 DW = 1.781

The coefficient of q_m is positive and highly significant as required by the theory. Also, it explains 82% of the total variation of the p_m. The size of the coefficient is comparable with Stoneman's (1979) estimate (0.66) for the UK economy, and Mizuno and Ghosh's (1984) estimate (0.712) for the Japanese case.

However, McCombie and de Ridder (1983) and McCombie (1983) have pointed out that when using time series to test Verdoorn's law some adjustment may be needed to take into account the cyclicality of ouput growth since otherwise Verdoorn's law and Okun's law get mixed up.' In an attempt to disentangle the short-run cyclical (Okun) effect from the long-run (Verdoorn) relationship, the method suggested by McCombie and de Ridder (1983), involving the use of potential output, was used. Potential output was estimated by following the standard trend-through-peaks method (Klein and Preston, 1967; Taylor, 1974). The subsequent two regressions were run.

Initially, the growth of manufacturing productivity was regressed on growth of manufacturing output and capacity utilization. (Capacity utilization is defined as

$CU_t = Q_t/Q'_t$

where Q_t, is the index of actual output at time t and Q'_t is the level of full capacity output.) The idea here is that CU will take up the short-run cyclical trend. The results of the regression were:

$$p_m = \underset{(1.14)}{-16.170} + \underset{(9.943)}{0.814}\, q_m + \underset{(1.070)}{15.696}CU$$

$R^2 = 0.839$ S.E. = 2.310   DW = 1.910

The introduction of capacity utilization was insignificant and its introduction did not affect either the size or the significance of the coefficient of the growth of manufacturing output. This result can be interpreted as supportive of the second law.

McCombie and de Ridder (1983) have also suggested that the growth of full-capacity output (Qm) rather than the actual output should be used in the regressions. Implementing this, the following results were obtained:

$$p_m = \underset{(1.159)}{-1.281} + \underset{(5.349)}{89.965}\, Qm$$

$R^2 = 0.601$ S.E. = 3.542   DW = 2.434

The growth of full-capacity output in manufacturing turned out to be significant with the correct sign. The standard error of the regression has been increased and R^2 is lower than the original regression (when using the growth of manufacturing output as a regressor). Overall, it can be maintained that the last two regressions provide support for the validity of Verdoorn's relation in the case of the Greek economy.

It has been argued, that the growth of manufacturing output is possibly partially influenced by export demand (Stoneman, 1979; Mizuno and Ghosh, 1984). In considering this proposition, manufacturing output was regressed against the growth of the volume of exports (X). Given that DW was in the inconclusive region, the Cochrane-Orcutt method was used. The yielded results are as follows:

$$q_m = \underset{(0.893)}{2.133} + \underset{(2.470)}{0.302}\,X$$

$R^2 = 0.41$ S.E. = 5.095   DW = 2.216

Thus the volume of exports was a significant determinant of manufacturing output. When industrial output was regressed on exports, the Cochrane-Orcutt estimation gave the following results:

$$q_i = \underset{(0.751)}{1.750} + \underset{(2.104)}{0.32}\,X$$

$R^2 = 0.30$ S.E. = 5.876   DW = 1.838

As has been already pointed out, the application of the second law to agriculture should give a regression coefficient not significantly different from unity, something which was confirmed by using the appropriate regression. A further regression was also carried out: the growth of agricultural output was regressed on the employment in the agricultural sector (e_a). The results are:

$$q_a = \underset{(0.773)}{1.186} - \underset{(0.775)}{0.323}\,e_a$$

$R^2= 0.03$ $DW = 2.677$ $S.E. = 2.677$

and indicate a very poor fit as is predicted by the theoretical discussion.

Third law

The regression results concerning the third law are presented in Tables 4 and 5. In Table 4, Equation 1, the results of the regression of p against q_m are reported. The results are very satisfactory. q_m is highly significant, explaining 73% of the total variation of p. When q_i replaces q_m in the above regression, the fit in the equation improves only marginally.

(Table 4 about here)

In Equation 1, Table 5, GDP growth is regressed with employment in the manufacturing sector (e_m) as an explanatory variable. The results are poor since R^2 is very low and DW statistics are inconclusive. The use of the Cochrane-Orcutt method did not improve the fit of the regression. However, when industrial employment replaces manufacturing employment, the fit improves considerably as is indicated in Equation 2. Even in this version of the equation R^2 still remains at a low level. This can be interpreted as an illustration of the particular features in the pattern of restructuring of the employment in the Greek economy as discussed in the introduction (Fakiolas, 1969;Andrikopoulos and Carvalho, 1986).

(Table 5 about here)

In regression 3, q is regressed on total employment (e). Total employment is insignificant as an explanatory variable in this regression and this is in accordance with the theoretical predictions. Similarly when e is replaced by either employment in the agricultural sector (e_a) or by employment in the service sector (e_s), very poor results are created as is again predicted by the theoretical discussion (Equations 4 and 5)

Equation 6 reports the results of the regression of GDP growth on non-manufacturing employment (e_{nm}), which are in accordance with the theoretical propositions. Similar results were obtained when non-industrial employment (e_{ni}) replaced e_{nm} .

All in all, apart from the relatively low R^2 in Equation 2 the investigation seems to justify the predictions of the Kaldorian model. To justify this conclusion further other alternative versions of the third law were tested (Cripps and Tarling, 1973 and Lee, 1990).

The results are reported in Table 4, Equations 2 and 3. In Equation 2, the productivity of the economy (p) was regressed on both manufacturing output (q_{m},) and non-manufacturing employment (e_{nm}). The results are satisfactory ($F_{2,19}$, =26.284) and both variables are jointly significant. Manufacturing output is strongly significant but e_{nm} has a low t-ratio and a negative coefficient. Furthermore when p was regressed on manufacturing output, employment in the agricultural sector and employment in services (column 3), q_m is highly significant whereas both e_m and e_s exhibit a negative sign.

IV. CONCLUSION AND POLICY IMPLICATIONS

In general, it can be maintained that the interpretation of the growth of the Greek economy in terms of a Kaldorian growth model is satisfactory, and can give an adequate explanation for its growth in the period under investigation. As was observed, the regression results of the first and the second growth laws in terms of the size and signs of the coefficients and R^2 were satisfactory and in line with the findings of other researchers concerning the UK and Japanese economies. As far as the main formulation of the third law is concerned, although the relevant coefficient of manufacturing employment found to be significant with the correct sign, R^2 was low. This, however, might be due to the structural peculiarities of the Greek labour market. In addition, the coefficient of other formulations of the third law were in accordance with the Kaldorian framework.

The main implication for economic policy which emerges from our discussion is the extreme importance of the manufacturing sector for economic growth. The Greek economy started to transform itself from an agricultural economy to a market economy only when the relative share of manufacturing output became significant. Moreover, as the first law indicates the recent slow rate of growth of the economy (Table 2) is the result of the declining share of the manufacturing sector. Clearly, the main thrust of economic policy as far as economic growth is concerned, should be geared towards encouraging and supporting investment in the manufacturing sector even at the cost of the agricultural sector which is still relatively large in comparison to other EC economies.

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Table 1. GDP share by sectors (percentages)

Year	Agriculture	Industry	Services
1953	31.9	19.7	48.4
1960	25.0	26.7	48.3
1970	19.5	30.0	50.0
1980	14.4	32.4	53.0
1986	13.9	30.7	55.1

Source: Statistical Bulletin of the Bank of Greece

Table 2. Percentage growth of GDP during 1967-1988

Year	GDP Growth	Year	GDP Growth	Year	GDP Growth
1967	5.5	1976	6.4	1985	3.1
1968	6.7	1977	3.4	1986	0.8
1969	9.9	1978	6.7	1987	−0.1
1970	8.0	1979	3.7	1988	4.0
1971	7.1	1980	1.8		
1972	8.9	1981	0.1		
1973	7.3	1982	0.4		
1974	−3.6	1983	0.4		
1975	6.1	1984	2.8		

Table 3. Dependent variable q

Independent variable	(1)	(2)	(3)	(4)
Constant	1.410 (3.179)	1.686 (5.247)	3.843 (4.951)	−1.026 (2.644)
q_m	0.506 (9.138)			
q_i		0.503 (12.427)		
q_a			0.124 (1.001)	
q_s				1.149 (15.600)
R^2	0.81	0.89	0.04	0.92
DW	2.292	2.618	1.176	1.723

Table 4. Dependent variable q

Independent variables	(1)	(2)	(3)
Constant	0.553	0.544	1.432
	(0.921)	(0.883)	(1.552)
q_m	0.555	0.544	0.490
	(7.419)	(6.247)	(7.008)
e_{nm}		−0.054	
		(0.266)	
e_a			−0.288
			(2.075)
e_s			−0.424
			(1.574)
R^2	0.73	0.74	0.82
DW	2.440	2.402	2.469

Table 5. Dependent variable q

Independent variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.387	2.580	4.490	3.430	4.970	3.396
	(3.786)	(3.216)	(5.545)	(4.075)	(3.408)	(4.409)
e_m	0.369					
	(1.369)					
e_i		0.940				
		(3.006)				
e			−0.728			
			(1.249)			
e_a				−0.346		
				(1.475)		
e_s					−0.362	
					(0.725)	
e_{nm}						−0.534
						(2.013)
R^2	0.08	0.31	0.07	0.10	0.03	0.16
DW	1.279	1.816	1.451	1.635	1.273	1.523