CENTRE OF PLANNING AND ECONOMIC RESEARCH

No 45

Dynamic Effects in Greek Manufacturing: The Changing Shares of SMEs, 1983-1990

by

ST. THOMADAKIS
V. DROUCOPOULOS

February 1995

Stavros Thomadakis
University of Athens,
Centre of Planning and Economic Research and
Baruch College, CUNY

Vassilis Droucopoulos
University of Athens and
Centre of Planning and Economic Research

Dynamic Effects in Greek Manufacturing: The Changing Shares of SMEs, 1983-1990

CENTRE OF PLANNING AND ECONOMIC RESEARCH

The Centre of Planning and Economic Research (KEPE) was established as a research unit, under the title "Centre of Economic Research", in 1959. Its primary aims were the scientific study of the problems of the Greek economy, encouragement of economic research and cooperation with other scientific institutions.

In 1964, the Centre acquired its present name and organizational structure, with the following additional objectives: (a) The preparation of short, medium and long-term development plans, including plans for regional and territorial development and also public investment plans, in accordance with guidelines laid down by the Government. (b) The analysis of current developments in the Greek economy along with appropriate short-term and medium-term forecasts; also, the formulation of proposals for appropriate stabilization and development measures. (c) The further education of young economists, particularly in the fields of planning and economic development.

The Centre has been and is very active in all of the above fields, and carries out systematic basic research in the problems of the Greek economy, formulates draft development plans, analyses and forecasts short-term and medium-term developments, grants scholarships for post-graduate studies in economics and planning and organizes lectures and seminars.

In the context of these activities KEPE produces series of publications under the title of "Studies" and "Statistical Series" which are the result of research by its staff as well as "Reports" which in the majority of cases are the outcome of collective work by working parties set up for the elaboration of development programmes. "Discussion Papers" by invited speakers or by KEPE staff are also published.

The Centre is in continuous contact with similar scientific institutions abroad and exchanges publications, views and information on current economic topics and methods of economic research, thus further contributing to the advancement of the science of economics in the country.

DISCUSSION PAPER SERIES

This series of Discussion Papers is designed to speed up the dissemination of research work prepared by the staff of KEPE and by its external collaborators with a view to subsequent publication. Timely comment and criticism for its improvement is appreciated.

CONTENTS

A. INTRODUCTION*

The purpose of this paper is to investigate the changes in SME sales shares in Greek manufacturing over the period 1983-1990. Aggregate data show that an increase in the role of SMEs on manufacturing employment has taken place in the 1980s.[1] The factors underlying this change, and the change of sales shares across sectors of manufacturing, have not been assessed empirically.

An earlier study (Droucopoulos and Thomadakis, 1993), using data from 1983, sought to explain intersectoral differences of SME sales shares. SMEs were divided into four size strata: establishments employing 10 to 19, 20 to 29, 30 to 49, 50 to 99 persons. Cross-sectional regression for each stratum was used to discover significant determinants of shares. The following conclusions were formed. First, capital intensity appeared to act as a barrier to the presence of SMEs in a sector. Second, product differentiation (measured by advertising intensity) showed no consistent significant effect on sales shares of SMEs. Third, SME shares were positively responsive to SME performance variables, e.g. their relative efficiency within their sector.

The existence of a tractable model of determinants of SME sales shares in 1983 encourages several lines of inquiry with respect to how, and by what process, these shares change overtime. The purpose of this paper is to investigate the process of change in SME shares.

The broader context of the paper is furnished by the major institutional change in the Greek economy in the 1980. This was Greece's accession to full EC membership in 1981. Rapidly thereafter, Greece dismantled its traditional trade protection (tariffs and subsidies) on manufacturing products. A large increase in manufactured import penetration followed.[2] Besides this direct effect, the Greek economy as a whole has experienced very low growth since 1981. As a result, domestic industry has faced stagnant demand. Manufacturing

---

* An earlier version of this paper was presented at the 21st Annual EARIE Conference, Chania, Greece. Please do not quote without permission from the authors.

[1]. The share of manufacturing employment attributed to establishments of 0-49 employees was 60.1 percent in 1978 and rose to 64.2 percent in 1988. See Droucopoulos and Thomadakis (1994), p.12.

[2]. Import penetration as measured by the ratio of value of manufacturing imports into gross production value of Greek manufacturing changed from 30.5 in 1983 to 57 percent in 1991. See Droucopoulos and Thomadakis, ibid., p. 27.

production has also virtually stagnated. Taking 1980 as a base year, the index of manufacturing production stood at 102.6 in 1990.[1] Possibly, the direct and indirect effects of Greek EC entry constitute a driving force for structural change in the size distribution of firms in manufacturing.

The impact of the radical changes in the institutional and market environments of manufacturing firms upon the size structure of industry has not been studied. The present paper seeks to fill this gap, at least partially, by studying the evolution of SME sales shares over the interval 1983-1990. These two years lend themselves to testing of hypotheses about the impact of Greece's entry in a large competitive market, composed of more advanced economies and manufacturing sectors. It is presumed that if EC entry has indeed created dynamic effects on industrial size structure in Greece, the interval 1983-1990 is adequate for the discovery of these effects; whereas 1983 was very close to the time of EC entry (1981) and adjustment to the external shock may have been unavailable or incomplete, by 1990 the impact must have permeated the structure of the industrial sector, and the effects must have become more apparent. Thus, the analysis of this paper is based on the presumption that observed changes over the interval 1983-1990 can elucidate the nature of the adjustment process unleashed by EC entry upon industrial structure in Greece.

The fundamental empirical questions to be pursued are: If we accept EC entry in 1981 as an "external shock", how did this shock affect equilibrium industry structure? A "shock" is usually an event condensed in time. Consistent with a "shock" the new equilibrium structure should be well defined by 1983, although adjustment to it could be partial. In that case, all observed subsequent change would simply be a form of gradual adjustment to the new equilbrium. Or did changes in the period 1983-1990 become determined by a deeper process whereby, the equilibrium level of size structure was itself gradually changing overtime? There is an important difference in the two outcomes since the first verifies that entry acted as a "shock" and characterises changes after this shock as "adjustment effects"; whereas the second implies that the impact of entry came not as a "shock" but as a drawn-out process of structural changes which may still be taking place.

In Part B, we discuss the outline of alternative hypotheses. In Part C, measurement of variables and data are presented. Part D includes empirical test results and Part E presents conclusions. The fundamental result of the analysis is that dynamic structural effects are in evidence, implying permanent changes in Greek industry structures as a result of the country's participation in the European Community.

---

[1]. Bank of Greece, Monthly Statistical Bulletin, Nov.-Dec. 1993, p. 88.

B. HYPOTHESES ON CHANGING SME SHARES

A historic event such as Greek entry into the EC and the elimination of all direct and indirect protections which were provided to manufacturing in the pre-entry regime could theoretically have no effect on the shares of firms in various size classes. This would be the case if existing structure were efficient, in the sense that it could produce internationally competitive outputs, and that no part of it found itself under differential pressure due to the opening of the economy to foreign competition. If some category of firms however, say large ones, were inefficient and were harder hit than smaller ones by international competitive pressure, we would observe changes in structure whereby the shares of small firms would rise while those of large ones would fall. However, the effect of an initial shock upon a particular category of firms would not be necessarily the "equilibrium outcome". To continue our previous example, it could happen that although initially large firms were harder hit by an international competitive shock, they could also adjust to new conditions with time, improve their efficiency and regain their shares over the medium term. After all, the paradigm of efficiency - inducing competitive pressure is based precisely on such a story of initial shock which may eliminate some firms but leads others to subsequent recovery. On the other hand, the effect of entry could come not in the form of a clean cut shock, but in a form of gradual movement to a new equilibrium which would be divulged only with the passage of time and the accumulation of market experience by firms in the new environment. In whichever fashion these effects work out, there is clearly need to distinguish between temporary effects which represent adjustment to a defined equilibrium, from long-term changes which operate in a gradualist fashion and which lead to eventual emergence of a new equilibrium.

Pursuing the analysis of the change in SME sales shares in this vein, we start from a typical partial adjustment model.[1] The development of the model, its econometric specification, and the general interpretation of its variants follow the important work of Levy (1985), on the explanation of the dynamics of industry concentration. Letting S_{jt} be the observed sales share of firms in size stratum j in year t, and defining the corresponding change in share as $\Delta S_{jt} = S_{jt} - S_{jt-1}$, we start from the model:

$$\Delta S_{jt} = \lambda (S^*_{jt} - S_{jt-1}) + u_{jt} \qquad (1)$$

---

[1]. This type of model assumes that market adjustment is non-instantaneous and has been used in a variety of contexts in empirical economics. See in this regard the discussion in Levy (1985), pp. 58-59.

S^* is defined as the optimal share, and λ is an adjustment parameter which will take the value of 1 if shares have adjusted fully to their equilibrium level, but will normally take a value less than 1, if adjustment is only partial. Whereas lagged shares (S_{jt-1}) are observable, optimal shares S^* are not, but must be estimated from factors that we theoretically believe to be determinants of optimal share. Letting these factors be denoted by X_{it}, (where i denotes the ith factor) and their respective changes by ΔX_{it}, we may formulate several possible hypotheses about the determination of optimal shares. The first is:

$$S^*_{jt} = b_0 + \Sigma_i b_i X_{it-1} \qquad (2)$$

This specification has two specific implications. The first is that the equilibrium structure is implicit in factors realized in (t-1), and is exclusively defined by these factors, so that for example, firms in (t-1) could predict the equilibrium structure that would eventually arise and act accordingly. This description of the process is the one that is most consistent with the occurence of a well-defined "shock". The second necessary implication of this type of process is that all observed subsequent change in shares, i.e. shifts between (t-1) and t, is due exclusively to adjustment towards the pre - defined equilibrium level which was implicit in the "shock". In the case of Greek accession to the EC and observations of structure in 1983 and 1990, this model implies specifically the following: Entry created a "shock" whose effects were well defined by 1983, but not wholly realised. Changes between 1983 and 1990 represent the adjustment to equilibrium after the displacement that occured in 1981 (year of entry) and was still embedded in the 1983 observations.

The second specification is the more general one:

$$S^*_{jt} = b_0 + \Sigma_i (b_i X_{it-1} + \beta_i \Delta X_{it}) \qquad (3)$$

This specification allows for long-run effects upon the equilibrium structure, depending on the changes in determining factors over the interval [t-1,t]. Thus, it provides for gradual change in long-term equilibrium.

It is clear that equation (2) is a special case of (3), if all $\beta_i = 0$. In its general form, equation (3) expands the possible causes of observed changes in shares by a new set of factors. Thus, the changes ΔX_i lead to a redefinition of equilibrium structure over the period of observation, so that observed changes are a mixture of "adjustment" effects and long - term effects of a shifting equilibrium. In the specific context of Greek entry to the EC, this expanded model would imply that the long-term equilibrium of structure was neither well -

defined nor predictable in 1983. Subsequent changes were significant in the determination of new equilibrium structure. This is a fully dynamic model of change, which is also more realistic since it allows both for the existence of uncertainty and for more permanent structural effects taking place over time.

A special case of (3) occurs when $b_i = \beta_i$. Equation (3) reduces in that case to:

$$S^*_{jt} = b_0 + \Sigma_i b_i (X_{it-1} + \Delta X_{it}) = b_0 + \Sigma_i b_i X_{it} \quad (4)$$

This is a restricted form of equation (3) which implies that equilibrium shares in period t are fully defined by contemporaneous factors. This is the equation used by Schwalbach (1990) in his stimulating study on dynamic effects on the shares of SMEs in German manufacturing. The restriction imposed on (3) in order to obtain (4) is indicative of the latter's implications. The condition that $b_i = \beta_i$ means that lagged factors (X_{it-1}), and their changes (ΔXit), over the interval (t-1, t) exert identical influences upon the determination of the equilibrium level. If this restriction does not hold however, the implication is that deeper change is occuring: The model of determination of equilibrium shares is itself under revision. This is a description of gradual change towards a new regime of operation of SMEs, in which the determinants of SME shares are themselves different at the end of the process, compared to what they were at the beginning.

The substitution of equations (2)-(4) into (1) gives three alternative empirical equations which can be used for testing:

$$\Delta S_{jt} = c_0 + \Sigma_i c_i X_{it-1} - \lambda S_{jt-1} + u_{jt} \quad (5)$$

$$\Delta S_{jt} = c_0 + \Sigma_i (c_i X_{it-1} + \gamma_i \Delta X_{it}) - \lambda S_{jt-1} + u_{jt} \quad (6)$$

$$\Delta S_{jt} = c_0 + \Sigma_i c_i X_{it} - \lambda S_{jt-1} + u_{jt} \quad (7)$$

The coefficients in (5) - (7) are defined respectively as:

$$c_i = \lambda b_i \quad \text{and} \quad \gamma_i = \lambda \beta_i$$

In the empirical work undertaken below we estimate the three equations for the sales shares of each size class of firms. We then conduct two tests. The first is a test of the joint hypothesis that $\gamma_i = 0$ for all i, so that (6) in fact reduces to (5). The second is a test to be performed, provided that the first hypothesis is rejected. This is a test of the joint

hypothesis that $c_i = \gamma_i$ for all i, so that in fact (6) reduces to (7). Thus, we will be testing the general form against two restricted forms of the specification of change in sales shares of SMEs. The acceptance of the hypothesis implied by one or the other of these restricted equations leads to quite different implications.

The three specifications described refer to the process by which SME sales shares have been changing in Greece after EC entry. Naturally, the hypotheses to be tested also include predictions about the role and effects of specific variables. These are discussed in the following section.

C. MODEL VARIABLES: SPECIFICATION AND MEASUREMENT

The methodology to be followed in this analysis is an extension of earlier work on SME shares (Droucopoulos and Thomadakis, 1993). The dependent variable is the change in sales share of SMEs belonging to a specific size stratum. This is computed as specified before by,

$$\Delta S_{jkt} = S_{jkt} - S_{jkt-1},$$

where j is the size stratum, k is the industrial sector, t-1 is 1983 and t is 1990.

As in our earlier study, we define SMEs in Greece as firms which are equivalent to establishments employing up to 99 persons. This is a reasonable limit for Greek manufacturing: if we adopted the common European definition of SMEs as those firms which employ less than 500 persons, we would end up classifying as SMEs practically all Greek manufacturing firms. Moreover, four size strata are distinguished, on the basis of employment as measured in 1983:

Stratum 1 is composed of firms employing 10-19 persons.
Stratum 2 is composed of firms employing 20-29 persons.
Stratum 3 is composed of firms employing 30-49 persons.
Stratum 4 is composed of firms employing 50-99 persons.

Notably, there is no data coverage for firms (establishments) employing less than 10 persons. This is a lacuna of statistical coverage in Greece which unfortunately prevents the examination of the smallest but most populous subgroup of Greek firms.

The independent variables which are used are selected on the basis of SME literature,[1] of our previous study on SME sales shares in 1983 (which is the starting year for the present investigation), and on the intrinsic significance of some variables linked to the main event which presumably shaped the changes studied: EC entry of Greece.

The first independent variable is determined by the specification of the model in equations (5) - (7). It is the lagged sales share ($S_{jk,1983}$). Its coefficient will represent the estimate of the adjustment parameter (λ), whose value is expected to be between 0 and 1, if partial adjustment is indicated.

---

[1]. We mainly draw from Acs and Audretsch (1989), (1990), and Schwalbach (1990).

The next two independent variables are sector specific variables ("industry variables") which indicate the possible operation of entry barriers against SMEs. The ratio of fuel and energy consumption over the number of employees (FE) is used as proxy for capital intensity. In earlier work this was found to exert a negative influence on SME sales shares, for at least some strata. The change in this ratio is correspondingly denoted (ΔFE). The next industry variable formed is the sum of advertising, research/development, and trademark expenditures over sales, for each sector (ARDT). This is a variable which attempts to measure the intensity of product differentiation across sectors. In earlier work, and due to data limitations, advertising intensity alone was used but was found to have no significant effects. The utilisation of a broader measure is selected here for two reasons. First, each of the component expenditures represented a very small percentage of sales, indicating the low degree of utilisation of product differentiation strategies by Greek firms. Hence, it was decided to sum them together.[1] This decision was reinforced by the fact that the true differentiation between those expenditures is not guaranteed from the way the questionnaires to firms have been formulated by the National Statistical Service of Greece. For example, under the rubric of "research" firms may have included both product research and marketing research, and those in turn may have been related to their choice to select the promotion of a foreign trade-mark. Secondly, in a possible context of change in regime, the change in this variable (ΔARDT) could prove significant as new market attitudes, habits, and strategies emerge in the Greek manufacturing sector after EC entry. Inasmuch as such developments prove to be easier for larger firms to follow, they are expected to operate as barriers to entry for smaller firms.

Two additional independent variables relate to market size and the composition of local market sales. Thus, by the logarithm of total domestic sales of each subsector (LSZ), we measure market size, and correspondingly, the change in market size by the difference of these logarithms (ΔLSZ). The effect of market size is expected to be negative on SME shares. Earlier evidence by Schwalbach (1990) indicates such a relationship in the case of German manufacturing, and it is justified by the existence of economies of scale which are an impediment to the developed presence of SMEs. As market size changes, in a small country as Greece, it will probably strengthen the possibility of economies of scale, since it is presumed that precisely in small countries few industries are able to reach minimum efficient size when they operate primarily in the domestic market. Thus, it is also expected that the change in market size will act as a negative influence on the change in SME shares.

---

[1]. A similar choice has been made by Conyon (1994), who aggregated into one variable all costs of non-industrial services which go towards increasing sales effort.

The composition of local market sales is measured by the ratio of imports to total domestic consumption of each class of manufacturing product (IP). This is conceptually a very important variable since, it has been observed that import penetration of manufacturing products has increased very substantially, as one of the main economic effects of Greek EC entry. The available data here allow a cross-sectional differentiation of this variable only for 2-digit ISIC classifications, so that the measurement is not as refined, and this can dampen the estimated effect, as compared to the true effect, of this variable. Import penetration could affect SME sales shares in ambiguous ways, since it may primarily affect large firms, which for example work on a national market basis, rather than small firms which are dependent on localised clienteles. In that case, import penetration will have a positive effect on SME shares. On the other hand, SME shares could decline, if imports bypass the market effectiveness of large entrenched firms and substitute for SME supply. Moreover, this is also a variable whose significance may arise from its change overtime (ΔIP). It is possible that as penetration increases, it may start affecting negatively SME shares even if initially, it affected them positively due to its original impact on large firms. Thus, there may exist a negative "trickle down" import effect which starts from large and extends to small firms as imports continue penetrating the domestic market.

Three remaining independent variables are "performance variables" of SMEs. By this we mean measures of magnitudes that depend on the SMEs' own efforts and economic decisions. First among them is a measure of relative efficiency (RE). This has been used in earlier work with considerable success.[1] We measure this as follows. The ratio of sales to employment for a particular stratum is divided by the same ratio for the whole sector. Since this sales - to - employment relative may reflect both relative efficiency and factor mix however, we decompose it into two parts. For each stratum we estimate a regression,

$$RE_{jk} = f_0 + f_1 RFE_{jk} + V_{jk},$$

where RFE is the relative of the fuel/energy to employees ratio for the stratum to the same ratio for the sector, i.e.

$$RFE_{jk} = FE_{jk} / FE_k.$$

Since FE is used as a measure of capital intensity, RFE measures relative capital intensity for each stratum. Estimation of the regression enables the formation of two

---

[1]. See Droucopoulos and Thomadakis (1993) for discussion of estimation results regarding this variable, pp. 193-195. The main interpretation is that relative efficiency captures SMEs' own effort at increasing their market share.

variables therefore. The first is RFE, which is itself the outcome of choice of technique in a particular stratum as compared to the whole sector; the second is the estimated residual from the regression, V_{jk}, which proxies for the "pure" efficiency differential, once difference in technique has been controlled. The changes of the two variables that come from the separation of RE, are depicted respectively, ΔRFE and ΔV. Based on both simple theory and earlier findings on the level of SME shares in 1983, we expect that both the levels and the changes in these performance variables will have a positive effect on the shares of SMEs and their change. Relative capital intensity should have a positive role if capital intensity in general acts as an entry barrier for smaller firms. Inasmuch as small firms can overcome this barrier their position would improve. As to relative efficiency, the hypothesis of a positive effect on SME share and its change is self evident. The final performance variable to be used is the relative of a stratum's investment - to - sales ratio to the same ratio for the sector (INV). This variable is used as the only available proxy for firms' modernization efforts. Although it was not successfully employed in our earlier work on the level of sales shares in 1983, it is included here because its change is conceptually a strong contender for significant effect on the change of shares. Specifically, it is possible that change in the level of investment activity is specifically driven by new calculations of market conditions, new competitive pressures felt, and may therefore capture firm strategies towards a changing share in a sector's business. The change in the investment ratio is depicted as (ΔINV). We expect a positive effect of (INV) and (ΔINV) upon changes in SME shares. The importance of including performance variables should be underlined. It is these variables which will capture the response of firms themselves to new conditions; and it is the effect of these variables that will finally indicate whether SMEs can, by their own efforts, affect their standing in their industry and the economy.

The specifications employed correspond to the equations (5)-(7), and are linear specifications in which the seven independent variables described are the representations of the variables (X) in the abstract models.

D. ESTIMATION RESULTS

The results of tests are shown, and commented on separately for each stratum, starting from the smallest firms of 10-19 employees. After all results are presented we undertake a comparison of conclusions for all the strata.[1],[2]

In Table 1, we show estimation results for stratum 1.

Turning first to the specification of equations we see that equation (5) has very little explanatory power, whereas equation (6) has considerable explanatory power. The test of the joint hypothesis that all $\gamma_i = 0$ is rejected at the 1 percent level of significance. Thus, equation (6) is the primary specification, implying that equilibrium structure kept changing gradually over the interval of observation. Since (6) is found to be significantly different from (5), we can proceed with the test of the second joint hypothesis, which compares (6) to (7); this is the hypothesis that $c_i = \gamma_i$ for all i.[3] As seen from the F-statistic on the bottom right side of Table 1, this hypothesis is also rejected, but more weakly than the previous one, at the 5 percent level of significance.

Thus, (6) is the acceptable specification, and it does not reduce to (7). The implication of this finding is that changes in determinants have a different impact on the emerging equilibrium than lagged levels of the independent variables did. Observing the coefficients of equation (6) in Table 1, we note that among significant variables, ΔV obtain a much larger coefficient than V_{83}, and that ΔLSZ obtains an insignificant coefficient compared to LSZ_{83} whose coefficient is negative and significant at the 5 percent level. The effects of the other significant variables, relative capital intensity (RFE) and its change (ΔRFE) are positive and appear to be similar to each other. This indicates that a moderation

---

[1]. We have considered the use of the GLS procedure of SUR for estimation. However, we opted for simple OLS estimation since virtually half the independent variables are common in each specification, and since we found virtually no correlation of residuals across the estimated equations for different strata. Thus, as suggested by econometric theory the gain in efficiency from switching to GLS would be practically nil. Consequently, when we did run the SUR procedure, results were almost exactly the same as those of the OLS specification shown here.

[2]. All equations were tested and found free of heteroscedasticity in residuals. Hence no correction for heteroscedasticity was warranted.

[3]. The two joint hypotheses have been tested by appropriate ratios which have F-distributions. See respectively, Gujarati (1988), pp. 233-234, and Ramanathan (1992), pp. 176-177.

TABLE 1

Estimation Results for Stratum 1 (10-19 Employees)

Variable	Equation 5		Equation 6		Equation 7	
	Coeff.	T-Stat.	Coeff.	T-Stat.	Coeff.	T-Stat.
Constant	0.410	1.822[c]	0.391	1.866[c]	0.417	2.001[b]
S_{83}	-0.290	-2.727[a]	-0.352	-3.691[a]	-0.327	-3.911[a]
FE_{83}	$2X10^{-5}$	0.404	$-1X10^{-4}$	-0.488		
$ARDT_{83}$	-1.010	-1.500	-0.068	-0.107		
LSZ_{83}	-0.024	-1.799[c]	-0.029	-2.435[b]		
IP_{83}	0.025	0.351	0.033	0.543		
RFE_{83}	0.087	2.009[b]	0.184	4.325[a]		
V_{83}	-0.0006	-0.013	0.131	2.587[b]		
INV_{83}	0.005	0.471	-0.006	-0.615		
ΔFE			0.0001	1.187		
$\Delta ARDT$			-0.040	-0.054		
ΔLSZ			0.002	0.055		
ΔIP			0.097	0.723		
ΔRFE			0.117	3.108[a]		
ΔV			0.267	5.686[a]		
ΔINV			-0.001	-0.663		
FE_{90}					$3X10^{-5}$	1.919[c]
$ARDT_{90}$					-0.021	-0.058
LSZ_{90}					-0.026	-2.354[b]
IP_{90}					0.030	0.486
RFE_{90}					0.127	3.763[a]
V_{90}					0.189	4.405[a]
INV_{90}					0.0002	0.114
Adj.R^2	0.054		0.381		0.285	
No.Obs.	76		76		76	
		F(7,60) = 6.25[a]			F(7,60) = 2.49[b]	

Note: a,b,c, indicate respectively significance levels of 1,5 and 10 percent.

of the effect of market size, but a strengthening of the effect of differential efficiency were in operation in the interval 1983-1990 with respect to the smallest size stratum of firms. Relative capital intensity maintained a uniformly positive effect on the change in SME shares. It is finally also noted from Table 1 that the adjustment parameter (λ), which is estimated as the coefficient of the lagged share (S_{83}), is highly significant but obtains a value closer to zero than to 1 (0.352). This implies that adjustment to equilibrium structure was highly incomplete for this very small firm stratum.

In Table 2, we proceed with estimation results from stratum 2.

The specification of equations, through the comparison of results for equations (5) and (6), leads again in this case to rejection of the joint hypothesis that $\gamma i = 0$, for all i, as the F-test indicates significant difference at the 1 percent level. It should be noted however that, in contrast to what was seen in stratum 1, equation (5) commands explanatory power, although (6) is the clearly superior specification. The test of the joint hypothesis, that $\gamma_i = c_i$, can therefore be conducted, and as seen from the F-statistic, this hypothesis cannot be rejected. The F-test does not indicate a significant difference in equations (6) and (7). Therefore in this case, the specification of the determinants of share changes as contemporaneous factors observed in 1990 is valid. We can therefore proceed to interpret the results of equation (7). Market size and import penetration exerted negative effects on changes in sales shares for this stratum, significant at the 5 and 10 percent level respectively. On the other hand, the residuals proxying for relative efficiency exerted strong positive influence on the changes of shares. Lastly, the lagged level of stratum shares is a significant variable, and the adjustment parameter estimated by its coefficient has a value of 0.531, indicating partial adjustment to the new equilibrium structure for this stratum.

It is now the turn of the third size stratum, covering establishments of 30-49 employees. Estimation results are shown in Table 3.

The first joint hypothesis, that $\gamma_i = 0$ for all i, is rejected at the 5 percent level of significance. Thus, equation (6) is the preferred specification again, and we can proceed with the test of the second hypothesis that jointly $c_i = \gamma_i$ for all i. This is in fact accepted, so that (7) is an equivalent specification to (6), and we can base our empirical conclusions for this stratum on (7). The change of sales share for this stratum has been strongly positively affected both by the relative capital intensity of firms, and by their relative efficiency. Thus, clearly, performance measures are the primary determinant that emerges. Also significant, but with a negative effect on share changes, is the variable measuring market size. No other variables appear significant except of course the lagged share variable (S_{83}) whose coefficient, (λ) obtains a value of (0.783), indicating almost complete adjustment of this stratum's shares to their equilibrium structure.

TABLE 2

Estimation Results for Stratum 2 (20-29 Employees)

Variable	Equation 5		Equation 6		Equation 7	
	Coeff.	T-Stat.	Coeff.	T-Stat.	Coeff.	T-Stat.
Constant	0.212	1.535	0.260	2.120[b]	0.295	2.703[a]
S_{83}	-0.381	-3.092[a]	-0.424	-4.060[a]	-0.531	-7.382[a]
FE_{83}	$-3X10^{-5}$	-0.859	-0.0001	-0.722		
$ARDT_{83}$	-0.791	-2.299[b]	-0.521	-1.572		
LSZ_{83}	-0.010	-1.170	-0.014	-1.938[c]		
IP_{83}	-0.056	-1.339	0.053	-1.456		
RFE_{83}	0.001	0.052	0.005	0.225		
V_{83}	-0.030	-0.895	0.050	1.600		
INV_{83}	0.006	1.862[c]	0.004	0.625		
ΔFE			$5X10^{-5}$	0.539		
$\Delta ARDT$			0.058	0.147		
ΔLSZ			0.015	0.655		
ΔIP			-0.049	-0.669		
ΔRFE			0.006	0.270		
ΔV			0.097	5.742[a]		
ΔINV			0.0003	0.046		
FE_{90}					0.014	0.812
$ARDT_{90}$					-0.228	-1.293
LSZ_{90}					-0.013	-2.227[b]
IP_{90}					-0.055	-1.690[c]
RFE_{90}					0.014	0.812
V_{90}					0.095	5.857[a]
INV_{90}					-0.002	-0.435
Adj.R^2	0.407		0.614		0.609	
No.Obs.	60		60		60	
		F(7,44) = 4.60[a]			F(7,44) = 1.10	

Note: a,b,c, indicate respectively significance levels of 1,5 and 10 percent.

TABLE 3

Estimation Results for Stratum 3 (30-49 Employees)

Variable	Equation 5		Equation 6		Equation 7	
	Coeff.	T-Stat.	Coeff.	T-Stat.	Coeff.	T-Stat.
Constant	0.620	3.324[a]	0.544	2.736[a]	0.536	3.088[a]
S_{83}	-0.612	-3.936[a]	-0.739	-4.742[a]	-0.783	-6.186[a]
FE_{83}	$-1X10^{-5}$	-0.139	$-2X10^{-5}$	-0.052		
$ARDT_{83}$	-0.392	-0.754	0.107	0.197		
LSZ_{83}	-0.034	-3.127[a]	-0.028	-2.564[b]		
IP_{83}	0.046	0.718	0.005	0.083		
RFE_{83}	-0.016	-0.597	0.079	2.232[b]		
V_{83}	0.031	0.699	0.059	1.182		
INV_{83}	-0.003	-0.360	0.002	0.206		
ΔFE			0.000	0.021		
$\Delta ARDT$			0.364	0.477		
ΔLSZ			-0.060	-1.651[c]		
ΔIP			-0.038	-0.294		
ΔRFE			0.097	3.429[a]		
ΔV			0.074	2.740[a]		
ΔINV			-0.001	-0.141		
FE_{90}					0.000	0.221
$ARDT_{90}$					0.176	0.542
LSZ_{90}					-0.031	-3.310[a]
IP_{90}					0.002	0.029
RFE_{90}					0.089	3.635[a]
V_{90}					0.074	3.203[a]
INV_{90}					-0.002	-0.501
Adj.R^2	0.267		0.381		0.445	
No.Obs.	58		58		58	
		F(7,42) = 2.28[b]			F(7,42) = 0.28	

Note: a,b,c, indicate respectively significance levels of 1,5 and 10 percent.

Finally, the estimation for the fourth stratum, covering firms of 50-99 employees, is shown in Table 4.

Once again, the joint hypothesis that $\gamma_i = 0$, for all i, is rejected by an F-statistic that indicates significant difference at the 1 percent level, as seen at the bottom left side of the table. The second joint hypothesis, $c_i = \gamma_i$ for all i, is also rejected however, though more weakly, at the 5 percent level of significance. Thus, specification (6) is the best one, and is different from both the restricted forms of the other equations tested.

Looking more specifically at the results of estimation of equation (6) for the fourth stratum, we note the following: The most highly significant variables are relative efficiency and its change (V_{83} and ΔV). The two variables have a similar positive effect on the change in shares for this stratum. Once again, this underlines the importance of SMEs own efforts to improve their position in the market, and the strong and continued effect of these efforts. The remaining significant variables indicate unstable behaviors, in the sense that the effect of their 1983 level differs from the effect of their change over the interval 1983-1990. Thus, (FE_{83}), which is our proxy for capital intensity, obtains a positive significant coefficient whereas its change (ΔFE) obtains a negative and significant coefficient. This indicates that whereas in the initial position a sector's capital intensity favored the position of firms of this stratum, the increase in capital intensity of the sector overtime, disfavored these firms. A similar but weaker finding is seen with respect to relative investment activity and market size. In the case of relative investment (INV_{83}) a negative significant effect obtains, which is somewhat surprising since we would expect that early investment initiatives would strengthen the position of the relevant firms. The change in relative investment (ΔINV) also obtains a negative coefficient, but is not statistically significant. Market size on the other hand, exhibits a significant negative effect in its change variable (ΔLSZ), but an insignificant one in its lagged level (LSZ_{83}). In short, it appears that the role of both relative investment and market size, as determinants of changes in shares, shifted over time in the period of observation. Finally, the lagged shares level (S_{83}) was found again to be a significant negative factor, with an estimate of the coefficient (λ) at 0.703, indicating almost complete adjustment to the new equilibrium structure for this stratum.

TABLE 4

Estimation Results for Stratum 4 (50-99 Employees)

Variable	Equation 5		Equation 6		Equation 7	
	Coeff.	T-Stat.	Coeff.	T-Stat.	Coeff.	T-Stat.
Constant	0.439	1.132	0.432	1.404	0.435	1.410
S_{83}	-0.951	-4.682[a]	-0.703	-4.252[a]	-0.787	-5.636[a]
FE_{83}	-0.000	-0.014	0.0007	2.279[b]		
$ARDT_{83}$	0.190	0.201	0.646	0.770		
LSZ_{83}	-0.020	-0.921	-0.012	-0.738		
IP_{83}	-0.073	-0.654	0.030	0.341		
RFE_{83}	0.084	1.520	0.049	1.122		
V_{83}	0.065	1.083	0.171	3.032[a]		
INV_{83}	-0.022	-0.686	-0.051	-1.858[c]		
ΔFE			-0.0004	-2.323[b]		
$\Delta ARDT$			-0.579	-0.588		
ΔLSZ			-0.113	-1.783[c]		
ΔIP			0.034	0.181		
ΔRFE			-0.043	-1.280		
ΔV			0.213	5.173[a]		
ΔINV			-0.0004	-1.161		
FE_{90}					-0.00001	-0.282
$ARDT_{90}$					0.0005	0.001
LSZ_{90}					-0.020	-1.191
IP_{90}					0.034	0.411
RFE_{90}					0.023	0.829
V_{90}					0.209	5.082[a]
INV_{90}					-0.0002	-0.706
Adj.R^2	0.250		0.587		0.509	
No.Obs.	61		61		61	
		F(7,45) = 7.05[a]			F(7,45) = 2.54[b]	

Note: a,b,c, indicate respectively significance levels of 1,5 and 10 percent.

E. COMPARISONS OF RESULTS ACROSS SIZE STRATA

It is now possible to collect together the most relevant findings of the analysis and compare them across the four strata. Let it first be noted that the separation of Greek SMEs into four size strata appears to have been productive. Different behaviors, and different processes of change appear for different strata, and these would not be discernible if all SMEs had been lumped together into a single category.

Comparing across strata then, three findings seem primary and relevant. The first is that for all strata the hypothesis of a "shock" that produced a well-defined equilibrium by 1983 is rejected. The findings indicate that changes in sales shares of all strata over the interval 1983-1990 comprised not only "adjustment" but also long-run equilibrium shifts. The basic implication of this finding is that the new equilibrium structure has emerged slowly, and has been consequently intertwined with the firms' own actions and strategies, as opposed to an exogenously imposed new equilibrium that remained immobile from 1983 on. The second finding is that for two extreme strata, namely stratum 1 (very small firms employing 10-19 persons) and stratum 4 (medium-sized firms employing 50-99 persons), the change in shares involved structural shifts, in the sense that the model itself of structural determination appears to have evolved. On the other hand, for the two intermediate strata of firms (employment of 20-49 persons), the evidence indicates a shifting equilibrium but not a significanlty changed model of structural determination. It would thus seem that more structural upheaval from the event of Greek EC entry arose for very small and very large SMEs. The third important comparative finding among strata is that as we move to higher size classes, the adjustment to new equilibria appears to be closer to completion. The estimates for the adjustment parameter (λ) were 0.352, 0.424, 0.783, 0.703 for strata 1, 2, 3, 4 respectively. Hence, among SMEs, the larger firms have adjusted more quickly. This is not an unexpected finding for two reasons. First, larger firms may feel more readily the impact of changing overall market conditions. Secondly, larger firms may have higher capability of strategic response.

Looking at the effects of specific variables, we note the uniform significance of two variables on all strata and across relevant specifications. These are the measures of relative efficiency, which in every case come through as significant positive determinants of share changes, and market size which affects SMEs in a uniformly negative direction. Neither of these results is surprising, since they are both theoretically explicable and in line with international experience. The effects of other variables, such as capital intensity and relative capital intensity are more sporadic, but generally appear in the expected direction when they are significant.

It is also notable that some variables are almost completely ineffective in the determination of shares. One is the measure of product differentiation expenditure intensity (ARDT). Its ineffectiveness indicates that product differentiation strategies have acquired no role in the determination of size structure within Greek manufacturing, despite the internationalisation of the market and despite the substantial penetration of manufacturing imports which feature (presumably) high differentiation content. The second variable that appears ineffective, contrary to expectation, is the measure of import penetration (IP). The absence of effect for this variable would imply that import penetration, which has been noted as a major factor in domestic manufacturing developments, has had a uniform effect across the board so that the size composition of firms remained impervious to it. This conclusion must be moderated however by an earlier consideration: as was pointed out in the previous section, the measurement of this variable is too broad, covering 2-digit ISIC sectors rather than the 3-digit sectors in which our remaining observations are classified. Thus, there may be an "error - in - variables" problem in this instance which biases downward the coefficient of the variable and its significance. The last variable that shows absence of effect, except in one case where its effect was noted to be perverse, is relative investment intensity. This variable was introduced to proxy for possible modernisation efforts among firms of a particular stratum, and it was particularly expected that its change overtime would exert significant influence on emerging equilibrium structures. The apparent absence of positive effect is a sign that investment effort among SMEs has been misdirected, since it has not contributed to the expected amelioration in their market position.

Finally, with respect to the two strata of very small and medium-sized firms for which we found evidence of "structural upheaval", it should be noted that the shifts in determinants of changes in shares are in opposite directions for the two groups. Indeed, in the very small firms and in the medium-sized ones, the evidence of a shift in the determinants of share changes is located with two variables, primarily: capital intensity and market size. The negative roles of capital intensity as entry barrier, and of market size as index of scale economies, appear to have been fortified over time for medium sized firms. On the other hand, the negative impact of both factors appears to have moderated over time for very small firms. This is an interesting finding because it suggests that very small firms, perhaps because of their access to special niche markets or because of their ability to employ extra cheap labor[1] bypass the inherent disadvantages of small size in capital

---

[1]. Some statistical and much anecdotal evidence suggest that small firms employ with higher frequency unpaid family members and non-unionized labor, thereby reaping a low wage advantage.

intensive sectors, or in sectors with large available scale economies. This finding requires further elaboration and research.

F. CONCLUDING REMARKS

The results of this paper indicate that industrial structure in Greece was changing in various ways over the 1980s. Measuring change in structure by the change in sales shares of various size classes of SMEs appears to be an effective technique capable of yielding substantial insights. We find that both long-term effects of shifting equilibria, and adjustment effects, have been present in Greek manufacturing. Moreover, for the smallest and the largest classes of SMEs, we also find that the determinants of shares have themselves been shifting, indicating movement towards a new regime of market operation and structural determination.

Inasmuch as these changes were spurred on by Greece's entry in the European Community, their analysis furnishes insight into the depth of the effects of entry, and the fact that the process of emergence of new equilibria has been a long drawn one. The findings do not support the view of a well-defined and time-contained "shock" in the Greek industrial sector; rather they suggest the view of gradual change, not simply in adjustment to equilibrium, but in shifting equilibrium structures which are followed by renewed waves of adjustment. The evidence that among the strongest determinants of structure we encounter measures of firms' own exertions such as their relative efficiency holds an important implication: small firms can respond to external competitive pressure and define their presence in their sector by specific actions at their disposal.

An important indication, that should not be missed from the findings of this study is that among SMEs larger ones (the medium-sized firms) appear to have been much closer to complete adjustment than the small ones by 1990. This holds the possible implication that the structural effects of internationalisation and competition do not reach all firms at the same time, nor do they meet their resolution simultaneously. Rather, a "trickle down" type phenomenon is suggested, whereby smallest firms feel the impact and adjust to it more slowly. If smaller firms are in greater flux than larger ones, we could surmise that the future holds more structural uncertainty for them than for their larger counterparts. In any case, the differential size and timing of impact of external disturbances upon firms of different size class appears to be an important subject of future research.

Lastly, another important subject for research is the question of the extent to which restrictive macroeconomic policies, as opposed to import penetration, have been the proximate force behind the structural turbulence in Greek manufacturing. This paper has examined a time span in which both import penetration and macropolicy restrictions were growing. A data set and test design that would separate one influence from the other would hold considerable interest and, we think, important policy implications.

REFERENCES

Acs, Zoltan and David Audretsch, "Small Firms in US Manufacturing: A First Report", Economics Letters, 1989, pp. 399-402.

_____, Innovation and Small Firms, MIT Press, Cambridge 1990.

Bank of Greece, Monthly Statistical Bulletin, November-December 1993.

Conyon, Martin J., "Labour's Share, Market Structure and Trade Unionism", International Journal of Industrial Organization, 1994, pp. 117-131.

Droucopoulos, Vassilis and Stavros B. Thomadakis, "The Share of Small and Medium-Sized Entreprise in Greek Manufacturing", Small Business Economics, 1993, pp. 187-196.

_____, Globalization of Economic Activities and Small and Medium-Sized Entreprises' Development: Country Study - Greece (with the collaboration of Dimitris Seremetis), report to the OECD, 1994.

Gujarati, Damodar, Basic Econometrics (2nd edition), McGraw Hill, N.Y., 1988.

Levy, David, "Specifying the Dynamics of Industry Concentration", The Journal of Industrial Economics, 1985, pp. 55-68.

Ramanathan, Ramu, Introductory Econometrics with Applications (2nd edition), Harcourt, Brace Jovanovich, Fort Worth, 1992.

Schwalbach, Joachim, "Small Business in German Manufacturing", in Zoltan, Acs and David Audretsch (eds.), The Economics of Small Firms: A European Challenge, Kluwer Academic Publishers, Dordrecht, 1990, pp. 63-73.

IN THE SAME SERIES

No 1 G. Alogoskoufis, Competitiveness, Wage Rate Adjustment and Macroeconomic Policy in Greece. Athens, 1990 (in Greek).

No 2 L. Athanassiou, Adjustments to the Gini Coefficient for Measuring Economic Inequality. Athens, 1990.

No 3 J. Dutta and H. Polemarchakis, Credit Constraints and Investment Finance: Evidence from Greece. Athens, 1990.

No 4 C. Kanellopoulos, The Underground Economy in Greece: What Official Data Show. Athens (in Greek 1990 - in English 1992).

No 5 N. Antonakis and D. Karavidas, Defense Expenditure and Growth in LDCs - The Case of Greece, 1950-1985. Athens, 1990.

No 6 J. Geanakoplos and H. Polemarchakis, Observability and Constrained Optima. Athens, 1992.

No 7 L. Athanassiou, Distribution Output Prices and Expenditure. Athens, 1992.

No 8 N. Christodoulakis, Certain Macroeconomic Consequences of the European Integration. Athens, 1992.

No 9 V. Rapanos, Technological Progress - Income Distribution and Unemployment in the less Developed Countries. Athens, 1992.

No 10 V. Rapanos, Joint Production and Taxation. Athens, 1992.

No 11 D. Maroulis, Economic Analysis of the Macroeconomic Policy of Greece during the Period 1960-1990. Athens, 1992 (in Greek).

No 12 C. Kanellopoulos, Incomes and Poverty of the Greek Elderly. Athens, 1992.

No 13 G. Agapitos and P. Koutsouvelis, The Harmonization within EEC: Single Market and its Impacts on Greece's Private Consumption and Vat Revenue. Athens, 1992.

No 14 C. Carabatsou-Pachaki, Elaboration Principles/Evaluation Criteria for Programmes. Athens, 1992 (in Greek).

No 15 C. Carabatsou-Pachaki, Reforming Common Agricultural Policy and Prospects for Greece. Athens, 1992 (in Greek).

No 16 P. Paraskevaides, Effective Protection, Domestic Resource Cost and Capital Structure of the Cattle Breeding Industry. Athens, 1992 (in Greek).

No 17 Kl. Efstratoglou, Export Trading Companies: International Experience and the Case of Greece. Athens, 1992 (in Greek).

No 18 C. Carabatsou-Pachaki, Rural Problems and Policy in Greece. Athens, 1993.

No 19 St. Balfoussias, Ordering Equilibria by Output or Technology in a Non-linear Pricing Context. Athens, 1993.

No 20 St. Balfoussias, Demand for Electric Energy in the Presence of a two-block Declining Price Schedule. Athens, 1993.

No 21 P. Paraskevaides, Regional Typology of Farms. Athens, 1993 (in Greek).

No 22 P. Paraskevaides, Evaluation of Regional Development Plans in the East Macedonia-Thrace's and Crete's Agricultural Sector. Athens, 1993 (in Greek).

No 23 C. Eberwein and Tr. Kollintzas, A Dynamic Model of Bargaining in a Unionized Firm with Irreversible Investment. Athens, 1993.

No 24 P. Paraskevaides, Income Inequalities and Regional Distribution of the Labour Force Age Group 20-29. Athens, 1993 (in Greek).

No 25 A. Gana, Th. Zervou and A. Kotsi, Poverty in the Regions of Greece in the late 80's. Athens, 1993 (in Greek).

No 26 G. Georganta, The Effect of a Free Market Price Mechanism on Total Factor Productivity: The Case of the Agricultural Crop Industry in Greece. Athens, 1993.

No 27 H. Dellas, Recessions and Ability Discrimination. Athens, 1993.

No 28 Z. Georganta. Accession in the EC and Its Effect on Total Factor Productivity Growth of Greek Agriculture. Athens, 1993.

No 29 H. Dellas, Stabilization Policy and Long Term Growth: Are they Related? Athens, 1993.

No 30 Z. Georganta. Technical (In)Efficiency in the U.S. Manufacturing Sector 1977-1982. Athens, 1993.

No 31 P. Paraskevaidis, The Economic Performanve of the Agricultural Cooperative Organisations. Athens, 1993 (in Greek).

No 32 Measurement Errors and the Indirect Effects of R & D on Productivity Growth: The U.S. Manufacturing Sector. Athens, 1993.

No 33 C. Carabatsou-Pachaki. The Quality Strategy A Viable Alternative for Small Mediterranean Agricultures. Athens, 1994.

No 34 E. Petrakis and A. Xepapadeas. Environmental Consciousness and Moral Hazard in International Agreements to Protect the Environment. Athens, 1994.

No 35 Z. Georganta, K. Kotsis and Emm. Kounaris, Measurement of Total Factor Productivity in the Manufacturing Sector of Greece 1980-1991. Athens, 1994.

No 36 C. Kanellopoulos, Public-Private Wage Differentials in Greece. Athens, 1994.

No 37 C. Vergopoulos, Public Debt and its Effects. Athens, 1994 (in Greek).

No 38 M. Panopoulou, Greek Merchant Navy, Technological Change and Domestic Shipbuilding Industry from 1850 to 1914. Athens, 1995.

No 39 V. Rapanos, Technical Change in a Model with Fair Wages and Unemployment. Athens, 1995.

No 40 V. Rapanos, The Effects of Environmental Taxes on Income Distribution. Athens, 1995.

No 41 St. Balfoussias, Cost and Productivity in Electricity Generation in Greece. Athens, 1995.

No 42 V. Rapanos, Trade Unions and the Incidence of the Corporation Income Tax. Athens, 1995.

No 43 V. Rapanos, Economies of Scale and the Incidence of the Minimun Wage in the less Developed Countries. Athens, 1995.

No 44 P. Mourdoukoutas, Japanese Investment in Greece. Athens, 1995 (in Greek).