Accounting for Net Entry into Greek Manufacturing by Establishments of Varying Size

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ABSTRACT. Adopting the view that size matters in understanding entry (exit) patterns, this research explores the nature and causes of net entry patterns of various size-defined groups of establishments in the case of a less industrialised country – Greece. The hypothesis to be tested is that the determinants of entry are not independent of firm size. Throughout this paper the analysis has had to confront difficulties arising from the use of net entry rates defined at the size class level. The degree of size disaggregation used in this paper is considerably finer than used before. Five employment-defined size classes have been used instead of sliding cut-off points discriminating between small and large firms. Unlike other research using pooled models to explain variation in entry (exit) rates across industries, the data used here are characterised by the absence of significant industry-specific systematic variation. Overall, the results obtained in this paper indicate that there is a gradation in the responses of different size classes to stimuli defined at the industry level. Evidence is offered that small firms are different in that they manage to overcome entry barriers, perhaps adopting different survival strategies, and that large firms are well aware of market conditions and are in an advantageous position to overcome many of the problems imposed by entry barriers. Size classes in the middle of the size class distribution offer a rather mixed result due to size-related advantages and disadvantages.

1. Introduction

There has been increasing recent interest in understanding the determinants of entry and exit of firms according to their size. However, the empirical evidence so far is confined mainly to the advanced industrial world, Mata's (1991) study of Portuguese manufacturing industries the notable exception. This research does not offer an unequivocal understanding of the determinants of entry (exit) of firms of various sizes. It seems that dealing with size-defined groups of firms within industries often makes the experience gained from studies of size-indifferent entry not particularly helpful.

Conventional modelling of firm entry based on 'limit profits' approaches define the magnitude of barriers to entry using size-indifferent entry measures. It may well be, however, that the perceived height of entry barriers is a notion related to the special characteristics of those who perceive it. Not all types of firms perceive entry barriers in the same way, and firm size may be an important distinguishing trait.

Adopting the view that 'size matters' in understanding entry (exit) patterns, the aim of this paper is to discover the determinants of net entry patterns of various size-defined groups of establishments in the case of a less industrialised country – Greece. The hypothesis to be tested is that proposed by Acs and Audretsch (1989a) that "the determinants of entry are not independent of firm size".

In this research, data availability constraints force the use of net entry rates which inevitably increases the degree of difficulty in interpretation. However, an effort is made to deal with net entry as a variable worthy of investigation in its own right, and one which is not treated simply as gross entry (Fotopoulos and Spence, 1997a).

The next section reviews the empirical evidence from studies concerned with entrants' size.

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Definitional issues and descriptive statistics along with analysis of variance results are given in sections three and four respectively. In section five, hypotheses concerning potential determinants of net entry rates are stated. The sixth section contains the results of the econometric analysis.

2. Current understanding of entry and exit of firms according to size

New firms in an economy have been often treated as homogeneous (Gorecki, 1975).This is certainly an erroneous assumption in that an entry by a large firm can offset the entry of many smaller (Acs and Audretsch, 1989a). However, in the years after Orr's (1974) seminal work considering entry into Canadian manufacturing industries there have been but only a handful of empirical studies seeking to distinguish between the determinants of firms' entry and exit by size.

Research in industrial economics makes it clear that firms of different size, and especially small firms, should be regarded as a behaviourally distinct group within industries and not as 'scaled down' versions of their larger counterparts (Storey, 1990). Moreover the existence of firms operating at sub-optimal size can be attributed, amongst other things, to superior responsiveness to cyclical fluctuations (Mills and Schumman 1985), to production technologies that are more flexible (Piore and Sabel, 1984; Dosi, 1988; Acs, Audretsch and Carlsson, 1990), to persuasion of product innovation strategies (Caves and Pugel, 1980), and to a tendency to occupy product niches different from those occupied by larger firms (Pratten, 1991). Additionally, Brown and Medoff (1989) and Brown, Hamilton and Medoff (1990) point out that small firms can be partially compensated for their inherent size disadvantages by paying lower wages.

White (1982) analyses the question why small firms flourish in some sectors and not in others. His results indicate that small businesses appear to be more important in less capital intensive industries, those less vertically integrated, and those in fast growing industries serving local markets. Interestingly, advertising intensity was not found to be source of particular disadvantage for small firms, indicating that smaller firms may have found alternative survival strategies. Acs and Audretsch (1990) find that high entry barriers exert a significant and negative influence on small-firm shares, but that small firm innovation as a strategy can be positive. Droucopoulos and Thomadakis (1993) discover that capital intensity appears to be a significant barrier to the presence of small and medium size firms, whereas the relative operating efficiency of small firms is strongly positive and advertising intensity possibly so.

An obvious link between the former studies of entry and exit determinants of different sized firms and the latter considering the presence of firms of different sizes can be established. Since entry and exit to or from an industry can affect the shares of firms of particular size classes within industries, then it is possible to compare, amongst other factors, the performance of barriers to entry in determining entry rates in different size classes with their role determining the relative size classes' performance.

MacDonald (1986) was interested in gross entry and exit determinants in the 'competitive fringe' of some 46 American food industries. The evidence produced reveals that capital intensity presents a significant barrier to the entry of small firms, but where the disadvantage of operating at a smaller scale (in labour productivity terms) is moderated, then entry is encouraged. On the other hand, profitability appears to be an insignificant determinant and even presents a negative sign. Product differentiation also is not a significant entry barrier. But industry growth was found to be a significant inducement of entry. For exit, capital requirements proved a significant exit barrier and industry growth a negative but insignificant influence.

Acs and Audretsch (1989b) considered net entry rates of small firms in 247 U.S. manufacturing industries. Cross-sectional evidence seems to indicate that past industry profits induce entry only in firms employing at least 250 employees and not in the case of the smallest enterprises. Similarly capital intensity deters only when the smallest firms are concerned. Industry growth remains by far the most important inducement to entry. This study also demonstrates that higher industry concentration and R&D intensity strongly deters entry for small firms, but the same is not evident for advertising intensity. What seems, however, to compensate small firms for their inherent size-related disadvantages is the adoption of product innovation strategies. Interestingly, a higher degree of unionisation was found to favour small firm entry. The authors, recognising deficiencies of using net entry rates, later utilised gross entry data in a similar study (1989a). Confirming the net entry results, lagged industry growth appears to be a greater inducement to entry than is lagged profits. Innovation seems again to deter smaller firms, but as before, where smaller firms contribute a relatively high share of innovation, the relationship with small firm entry becomes positive. As opposed to the earlier results, however, product differentiation proves a significant entry barrier when considering gross entry. The same is true for concentration, but only for small firms. However, neither capital intensity nor the small-firm cost disadvantage was found to exert much influence.

Mata's (1991) results for some 73 Portuguese manufacturing sectors do not support the view that strategic deterrence or aggressive behaviour, proxied by the concentration ratio, comprise an important determinant of entry. Most of the 'conventional' barriers to entry proved to be significant in deterring entry, but only in the case of small firms. Sunk costs' proxies, however, prove a significant barrier only for large scale entry, which is unsurprising as they were measured by second hand markets for machinery and equipment. Storey and Jones (1987) point out that small scale entrepreneurs usually enter the market by buying cheap, second-hand equipment. To the extent that past profitability is important, Mata's evidence supports the view that entrants' perception of industry profits does differ by size. This, proxied by lagged profits, appears to matter only when small firm entry was concerned. Exactly the opposite was the case when industry growth was examined and found to be a significant inducement only for large firms. Industry size, on the other hand, had a uniform positive effect in both the size classes and suggests itself as the only common determinant of entry.

The analyses above all deal with entry using cross sectional analysis but Wagner (1994) uses a panel of 29 manufacturing industries for the regions of Lower Saxony. He addresses questions about industry-specific effects by adopting a least squares with dummy variables technique to allow for time-invariant industry characteristics which may be not captured by the variables employed and could also be collectively important in determining gross entry rates. The results, from ordinary least squares estimation, reveal that small firm entry occurs in industries which are characterised by higher degrees of growth, past profits and concentration in times of higher unemployment and higher interest rates. Both the capital intensity and R&D variables were negative, but the latter was not significant at any conventional level. The introduction of industry-specific dummies to account for time-invariant sectoral effects alters the magnitude of the coefficients, their significance levels but not the signs. Thus profits, capital intensity and concentration become insignificant while industry growth becomes significant. These results, however, did not hold when alternative robust estimation techniques were used in order to detect and delete the influence extreme cases. Moreover, these results seem also to be affected by the introduction of industry dummies, when both R&D and capital appeared negative and insignificant, industry profits significant and negative, and concentration significant and positive. Wagner favoured the robust estimation techniques even at the expense of fewer observations leaving the pooled design unbalanced and susceptible to selectivity bias. He argues that it is the basic pattern that is important in the estimations, leaving 'special cases' or 'idiosyncratic events' to case studies.

The evidence so far does not offer a totally clear picture. Past industry profits do not have unequivocal effects on small firms, entry barriers are hardly significant and when they become significant this applies to small rather than larger entrants. Industry growth, on the other hand, plays a significant role in determining entry rates, but again it is not universally accepted whether this role is more significant for smaller rather than larger firms. However, with the Portuguese exception, research to date indicates that smaller firms develop different strategies attempting to enter and survive within markets.

By far the most interesting observation is that inference is mainly driven by the insignificance of traditional variables and the focus is more about what does not explain variation in firm entry by size than what does.

3. Defining entry by size of entrants

Greek manufacturing data makes available net entry of firms by size, defined by the National Statistical Service of Greece (NSSG) in terms of the number of employees employed as follows:

- Size class 1 composed of establishments employing between 10 and 19 persons;
- Size class 2 composed of establishments employing between 20 and 29 persons;
- Size class 3 composed of establishments employing between 30 and 49 persons;
- Size class 4 composed of establishments employing between 50 and 99 persons;
- Size class 5 composed of establishments employing over 100 persons.

No data exists for establishments employing less than 10 employees. This deprives the analysis from using a size class which is likely to present considerable turbulence (entry plus exit). The data refer to establishments and not firms. This could be somewhat problematic since multi-plant firms may not behave in the same way as single-plant firms, but most Greek firms are in fact single-plant (Droucopoulos and Thomadakis, 1993).

Since the data refer to the number of establishments in each year only a net entry measure defined for each size class is feasible. However, these size classes do permit a more disaggregated approach since previous studies have either used a sliding cut-off point between small and large firms or just a single one. Of course, it goes without saying that a net entry measure lacks the detail of gross entry and exit. Clearly, net entry near zero may result either from near zero entry and near zero exit or from equally large numbers of entries and exits. Nevertheless, net entry should be treated as a variable in its own right as it is the combined product of both entry and exit actions. It may be useful in studies explaining the impact of firm turnover on industry output and performance (McGuckin, 1972) but only if the key processes involved relate mainly to the number of survivors and not to the total number of participants as reflected by gross entry (Geroski, 1991a). Evans and Siegfried (1992) point out that the use of net entry necessarily forces the determinants of entry and exit to be the same. If the durability and specificity of capital result in sunk costs (Eaton and Lipsey, 1980) then this may deter both the entry of new competitors as well as the exit of heavily committed incumbents. To the extent that barriers to entry are also barriers to exit (Caves and Porter, 1976) this establishes the core of the symmetry hypothesis through the dependence of both entry and exit on entry barriers. Shapiro and Khemani (1987) offer support for the validity of the symmetry hypothesis in Canadian manufacturing industries. In Greece, Anagnostaki and Louri (1995) also offer qualified support, whereas in Fotopoulos and Spence (1997b) symmetry was found to apply to other factors beyond the traditional core of proxies often employed to capture entry barriers. The most striking finding in the latter study was that both entry and exit were positively related with industry price cost margins.

When net entry is used the two different assumptions of symmetry and asymmetry about factors determining firm entry and exit may lead to seemingly identical results when a net entry measure is used, but there may be still cases when the sign obtained can identify the correct underlying hypothesis (Fotopoulos and Spence, 1997a).

Dealing with net entry defined for different size classes imposes certain additional problems. The first is the need to account for different 'industry sizes' as the purpose is to explain differences in net entry rates between industrial sectors. The second is to account for different 'sectoral size-structures' as it is accepted that firms are not uniformly distributed between size classes across industries. Both relate to the choice of appropriate denominator when computing net entry rates. One solution is to divide by the number of firms in existence for the sector as a whole in the base year. Here different sectoral size structures on the right hand side of the equation need to be accounted for. Thus, an indicator of the 'strength' of firm presence in the particular size class should be developed. This is the procedure adopted by Acs and Audretsch (1989b, p. 264) who make the self-critical point that "dividing net change in the number of firms for each size class by the number of firms in that size class, rather than the entire industry, would provide a better measure of the impact that entry has had on the existing stock of small firms". However, they justify their choice by arguing that "standardising the amount of entry in each size class by the total number of firms in the industry reveals more about the subsequent price and output effects, or the overall industry effects, as a result of entry".

Both arguments are attractive. In the present study, however, a size-class-specific denominator is preferred for two reasons: first, that when dealing with very small amounts of net entry more observations tend to be closer to zero when a sectoral than a size-class-specific denominator is used, second, when five different size classes use the same industry specific denominator, net entry rates are artificially increased for those classes presenting higher differences in the numerator.

Here the net entry rate (*ER*) is:

$$ER_{jit} = \frac{N_{jit} - N_{jit-1}}{N_{ij,\,t-1}}$$

for every $j = 1, \ldots, 5$ size classes, where $i = 1, \ldots, 20$ 2-digit industrial sectors, and $t = 1, \ldots, 9$ time periods, (the period 1982–1991 defines only nine net entry rates) and N stands for the number of firms in existence.[1]

The third and probably most important problem associated this definition is that it cannot be seen if changes in the number of establishments in an industry's size class over time are solely due to net entry into an industry size class or due to inter-size class mobility of already operating establishments. The movement of an establishment from one size class to another will reduce the number in the originating industry size class, and generate an increase in the destination size class. But both the exit from the origin-size class and the entry in the destination-size class are sustained within an industry and do not relate to entry and exit from an industry. If instead of panel data, a cross-section on a number of industries is used to deal with changes in the number of firms in a size class by industry between two points in time (Acs and Audretsch, 1989a), the problem of unaccounted inter-size class mobility within industry is not avoided. Unless information is used to exclude from the sample those firms moving size class, a cross-sectional analysis of net entry by size class might be even more contaminated by inter-size class mobility within industry, the larger the time span between the two points in time and the finer the classification in size classes is.

Therefore, the number of establishments in an industry's size class can change as the result of a) entry and exit of establishments from an industry that coincides with entry and exit from a size class in that industry, b) intra-industry but inter-size class mobility and c) a combination of the first two reasons. If the change in the number of establishments in an industry's size class was to be entirely described by the first of the causes then the term net entry might suffice. However, given the nature of the data here the term 'growth' might more accurately describe changes in the number of establishments operating in an industry's size class. Thus, the question really posed in the present research on net entry relates to the determinants of the growth in number of establishments in an industry/size class. In what follows, the term net entry is used for convenience in place of the perhaps more appropriate growth rate.

The consequences of unaccounted inter-size class mobility depend much on whether or not the traditional Orr-type model of entry is sufficient. If it is, then the question becomes whether or not entry (exit) barriers can serve as inter-size class mobility barriers as well. Caves and Porter (1977) argue that entry barriers might possibly be incorporated in a more general theory of inter-scale mobility of firms, but they do believe that firms in an industry are likely to differ in traits other than size. It is due to these specific traits that firms resemble each other in shaping groups within an industry. Barriers to entry can then be defined at the group level, not only in terms of protection from potential entry from outside the industry, but also from potential within-industry movers coming from other groups. If size is not over-emphasised at the expense of other firm characteristics then it could be a useful classification tool. Caves and Porter use other than firm size characteristics to define groups within an industry and then assign to these groups differential degrees of entry barriers. Given this it can be argued that the review of evidence in the second section of this study is helpful in asserting that to the extent that different size classes differently experience entry barriers then ex post size classes can be treated as industry-groups. This is recognised in the literature of strategic groups as far as "scale-economy barriers themselves suffice to define groups because they explain why entrants could rationally choose sub-optimal scales when larger firms and lower-cost sellers are present" (Caves and Porter, 1977, p. 253). To the extent that scale economies are size-related, this offers enough justification for size as a classification key and for entry barriers to be treated as mobility barriers. Porter (1979) examines the theory of strategic groups by using a size-related measure (size classes accounted for 30% of an industry's sales) to define leaders and followers in an industry and accounting for the differential impact of entry barriers in determining profitability. In Greece, Droucopoulos and Thomadakis (1993) find considerable differences in the effect of entry barriers when size-class market shares are examined.

Another strand of fast-growing literature – industry demographics – views entry barriers as barriers to survival and growth. This theorisation of entry barriers might be of great assistance to help resolve the empirical puzzle where high entry rates coincide with high entry barriers (Geroski, 1995). Furthermore, it can be combined with the notion of entry paths (Caves and Porter, 1977) in explaining not only why many entrants fail shortly after entry, but also why entry at a sub-optimal scale occurs at all.

In short, despite the constraints imposed by the data, it is worthwhile examining the determinants of growth in the number of firms operating in an industry by size class in time across industries.

4. Net entry patterns in Greek manufacturing industries by size class

Geroski (1995) maintains that the driving force of variation of entry across industries and time lies in the 'within' rather than 'between' industries variation. This implies that inter-industry structure of entry measures may not be as stable in time as for structural variables often employed to assist inference on the determinants of entry (profitability along with entry barriers).

Fairly unstable inter-industry variation over time on entry has been reported in previous work for the U.K. (Geroski, 1991b) and Germany (Wagner, 1994). Geroski compares inter-industry correlation coefficients of entry measures, namely gross entry, gross penetration, gross entry rate, net penetration, net entry rate, net penetration across years to conclude that industries do not persistently show high or low entry rates over time. Furthermore, decomposing the variance for each of these variables over 79 3-digit U.K. industries for the 1975–79 period he finds that the proportion of total variation accounted by industry-driven variation (between industries) was as high as 49% for gross entry penetration and as low as 21% in the case of net entry rates. He concluded that inter-temporal variations in entry may exceed cross-sectional variation. Unfortunately the author does not provide the relative figures for between-year variation and no direct test as to how significant both the systematic sources of variation (industry, time) are. However, in all cases, even though inter-temporal variation is said to be the driving force in this study, between-industry variation was always significant when allowance was given for industry fixed effects in entry autoregressive models. As a consequence, the effect of time-invariant, inter-industry-variable factors is collectively significant in explaining variation in net entry rates Between-industry variation is probably smaller than inter-temporal variation, but it remains a significant source of variation.

Wagner (1994, p. 215), on the other hand, drawing on inter-temporal correlation of various measures of entry intensity concludes that ". . . inter-industry structure of total entry, small firm entry, and entry by small firms is not constant over time because "Often the coefficient of correlation between the same entry intensity measure for two years is either about zero or negative." The coefficients themselves do not support this view and later the research successfully utilises a least squares with dummy variables model to account for time-invariant industry-fixed factors. The successful utilisation of industry-fixed effects model seems to require that, conditional on other covariates, there should be a sufficient fairly-permanent between-industries component in entry flows observed across time. This seems to imply that although the inter-industry structure of various entry measures in Lower-Saxony is not constant over time, it is at least stable enough.

The foregoing provides the context for examining patterns in net entry rates, (more accurately growth patterns) in the number of establishments by size class and sector across time for Greek manufacturing.

Table I provides sectoral averages for the

TABLE I
Sectoral means for net entry rates into Greek manufacturing, 1982–1991

SIC	Industrial sectors	Size class 1	Size class 2	Size class 3	Size class 4	Size class 5
20	Food preparation except beverages	0.27	–0.72	–2.60	–1.27	–0.94
21	Beverages	–0.51	–1.83	–1.69	2.74	0.02
22	Tobacco manufactures	5.91	2.13	–3.79	–8.54	–0.24
23	Manufacture of textiles	–1.96	–2.11	–1.70	–0.66	–5.75
24	Manufacture of footwear and sewing of fabric	0.36	3.28	2.70	3.09	–2.28
25	Wood and cork	–1.11	–5.41	–5.64	2.38	–8.68
26	Furniture and fixtures	1.96	4.27	–1.29	–4.80	–6.18
27	Manufacture of paper	2.37	2.85	1.23	3.31	–4.00
28	Printing and publishing	–0.39	–3.95	–2.03	0.06	–2.97
29	Leather and fur products	1.42	–0.77	–1.10	–5.26	3.70
30	Rubber and plastic products	1.53	–0.44	–2.81	–0.79	–3.50
31	Chemical Industries	2.13	–3.09	–0.92	3.28	–1.08
32	Petroleum and coal refining	4.72	–2.22	–1.39	27.51	–4.81
33	Non metallic mineral products	1.03	–0.28	–1.99	–5.85	–1.90
34	Basic metal products	10.4	1.48	5.16	–1.57	1.64
35	Fabricated metal products except machinery	–0.26	–2.07	–3.95	–2.22	–5.24
36	Machinery and appliances except electrical	1.22	–0.51	–3.92	–7.48	1.34
37	Electrical machinery apparatus, appliances and supply	1.36	–1.45	–4.78	–5.01	–4.24
38	Transport equipment	0.66	–0.52	–2.51	–2.31	–4.94
39	Miscellaneous manufacturing industries	1.38	–2.76	–4.04	–2.22	4.26

Figures have been multiplied by 100 and pertain to percentage points.

1982–1991 period for all 2-digit industrial sectors and size classes.

In one fifth of the industrial sectors the only gains recorded stem from the smallest size class (SIC: 30, 33, 37, 38). Interestingly, none of these sectors can be classified into the light-industry group that is supposed to enjoy lower entry barriers. About a quarter of the sectors (SIC: 20, 21, 29, 34, 39) exhibit some gain in the largest of the size classes. In all cases the same sectors also presented gains in the smallest size class, apart from beverages. Two sectors stand out having gains in all size classes except the largest one, namely the footwear-clothing industry and manufacture of paper and two that present losses in all size classes are fabricated metal products except machinery and manufactures of textiles. The fourth of the size classes considered presents distinctive behaviour in two industry cases where it is the only size class that enjoys some increase in the number of operating establishments over the period. These cases concern wood and cork industries and printing and publishing. In two other industries both the fourth and smallest size classes are the only cases with gains. These industries are chemicals and petroleum and coal refining, the latter having the maximum mean value in the sample (27.5% increase in size class 4). Both industries are considered as having quite high entry barriers.

Since the data used in this research are pooled, it would be useful to examine also what happens in the other dimension involved – that of time, and Table II gives the single-year interval averages for all manufacturing industries in each of the size classes.

The first size class always exhibits percentage growth in the number of establishments operating. Almost the opposite is the case for all other size classes. In particular, the number of establishments has declined in size class two except for 1986–1987 and 1989–1990. For the third size class the only positive figures relate to 1983–1984 and 1988–1989 and these coincide with the periods that relate also to the positive values of the largest size class. On the other hand, size class 4 presents large gains for 1986–1987. Within the size classes there is some degree of year to year variation. What stands out is that in all but one size class manufacturing averages for net entry rates peak

TABLE II
Annual means for net rates in Greek manufacturing, 1982–1991

Time period	Size class 1	Size class 2	Size class 3	Size class 4	Size class 5
1982–1983	1.28	–1.36	–4.20	–4.60	–1.87
1983–1984	0.86	–1.60	0.91	–1.53	0.42
1984–1985	0.63	–1.70	–3.48	–4.10	–2.14
1985–1986	0.10	–3.47	–4.11	–1.97	–1.38
1986–1987	10.48	7.24	–1.36	12.29	–9.48
1987–1988	0.37	–0.70	–0.10	0.59	–0.74
1988–1989	0.07	–0.19	0.02	–1.95	0.70
1989–1990	0.70	0.50	–0.19	–0.21	–4.25
1990–1991	0.12	–5.08	–4.19	–1.05	–1.88

Figures pertain to percentage points.

in absolute terms in the 1986–1987 period. Interestingly, this coincides with the lowest rate of growth of real GDP in the study period (–0.8%). Figure 1 helps to draw the picture of time-fluctuation in all size classes along with wider movement in the economy – real GDP growth.

Thus, for both the first two size classes the peak is positive and the same is also evident for the fourth size class. In contrast, the largest size class follows closely the economy-wide fluctuations presenting a negative peak in the 1986–87 period, whereas at the same time size class 3 does not seem to peak at all. The reduction of real GDP growth follows the introduction of an austerity program in 1985 aiming to control inflation and bound fiscal and trade deficits. Two years after its implementation inflation was down to 15.7% (from 25%), the fiscal deficit was reduced but not so the trade deficit. This was achieved at the expense of both agricultural and manufacturing production, the latter resulting from decreasing demand due to the effect of reductions of real

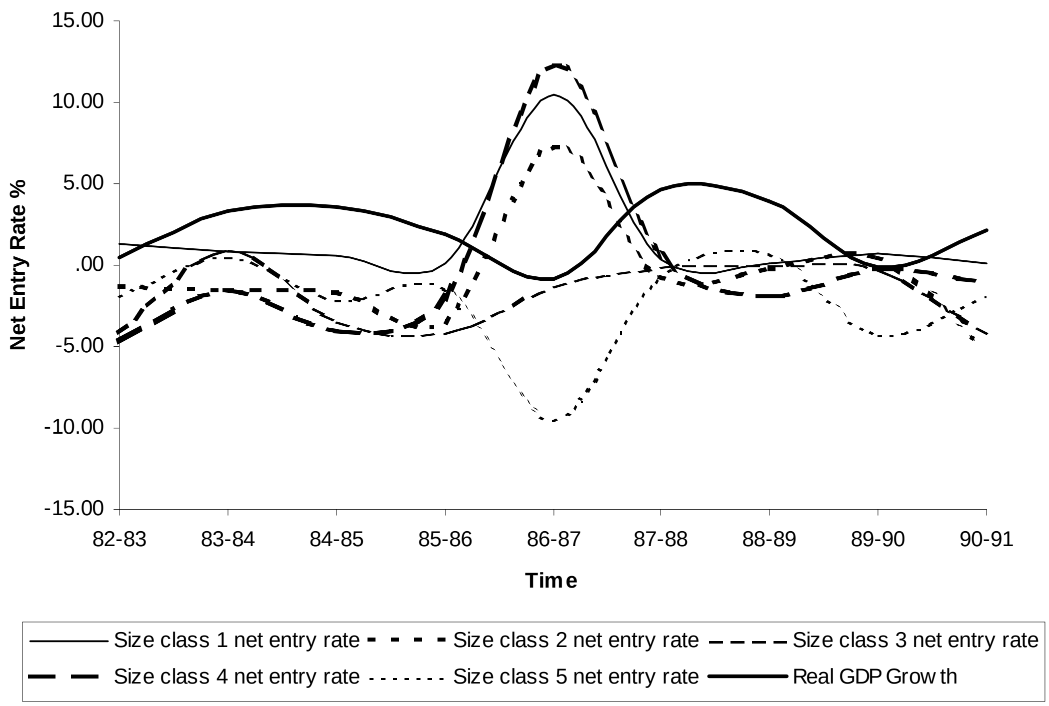

Figure 1. Annual net entry rate averages for Greek manufacturing industries and growth rate of real GDP over time.

disposable income on private consumption.[2] There is certainly a suggestion that wider movements in the economy relate to net entry rates, but the picture is somewhat confusing as there is no clear-cut dichotomy established between the response of smaller and larger size classes. Thus, although the smallest size classes seem to exhibit a superior performance during the economy's downturn the same is also evident for the second largest size class considered. What seems to be a crucial impediment precluding clearer inference of these patterns is not knowing the extent to which gains in the fourth size class are the result of inter-size class mobility originating from the fifth size class. It is quite plausible that, moving from smaller to larger size classes, entry and exit becomes less entry and exit from an industry and more within-industry entry and exit from size classes.

It could be argued that there is some degree of within-size-class, across-industries variation, but more important average total manufacturing net entry rates by size class seem to fluctuate considerably in time. Variation in time seems to have been influenced by the inclusion of two recession-years. An explicit account for the statistical significance of potential sources of variation is required to determine whether or not the industry-means in Table I are statistically different to conclude if, unconditionally on other regressors, industry fixed effects are significant. The same also applies in terms of time-fixed effects to the time-means presented in Table II.

Tables III and IV present the results of a variance decomposition exercise for each of the size classes. The total sample variation and the between-industry and between-year variation are presented. The last two sources of variation are systematic in the sense that they are controlled for by industry-fixed and time-fixed effects. The highest proportion of between-industry variation is exhibited by the first size class followed by the fourth and fifth. The highest proportion of between-time variation expresses itself again in the first size class, but it is followed by the second and to a lesser extent by the largest size class.

It is evident that both the systematic sources

TABLE III

Net entry rates into Greek manufacturing 1982–1988: variance decomposition accounting total sample variation and its systematic sources

Size class employment range	Grand mean	Total sample variation $\sigma^2 = \frac{1}{NT}\sum_i \sum_t (x_{it} - \bar{x})^2$	Between-industry variation $B_n = \frac{1}{N}\sum_i (x_i - \bar{x})^2$	Between-year variation $B_t = \frac{1}{T}\sum_t (x_t - \bar{x})^2$	$\frac{B_n}{\sigma^2}$	$\frac{B_t}{\sigma^2}$
10–19	1.624	64.641	7.166	9.949	0.110	0.153
20–29	0.705	113.259	5.846	10.418	0.051	0.091
30–49	1.853	75.227	6.173	3.994	0.082	0.053
50–99	0.280	500.922	52.947	22.213	0.105	0.044
Over 100	2.289	108.332	10.955	8.371	0.101	0.077

TABLE IV

Unsystematic sample variation and 2-way analysis of variance related tests for industry and time fixed effects

Size class	Unsystematic variation $\sigma^2 - B_n - B_t$	$\frac{\sigma^2 - B_n - B_t}{\sigma^2}$	$\frac{B_n}{\sigma^2 - B_n}$	$\frac{B_t}{\sigma^2 - B_n}$	Industry fixed effects $F_{(19, 152)}$	Time fixed-effects $F_{(8, 152)}$	Non additivity	Tukey's $F_{(1, 151)}$
1	47.524	0.735	0.150	0.209	1.206	3.977***	41.048	957.094***
2	96.994	0.856	0.060	0.107	0.482	2.040**	31.969	74.237***
3	65.059	0.864	0.094	0.061	0.759	1.167	1.320	3.128*
4	425.761	0.849	0.124	0.052	0.994	0.991	301.761	365.758***
5	89.005	0.821	0.123	0.094	0.984	1.787*	12.198	23.981***

*** Significant at 1%; ** Significant at 5%; * Significant at 10 %.

of variation present just a small fraction of total variation in all cases. This can be visualised in column three of Table IV where the amount of total variation unaccounted for by industry and time effects is all cases over 70%. The minimum amount of unsystematic variation is exhibited by the first size class (73%) and to some lesser extent by the fifth (82%) and fourth (84%) size classes respectively. Comparing the shares of both systematic sources of variation to total variation in Table III reveals that in only the two smallest size classes the proportion of time driven variation is higher than that from inter-industry differences of net entry rate means over time. The same relationships hold when both sources of systematic variation are expressed as proportions of the overall unsystematic variation as opposed to total variation (columns 4 and 5 of Table IV). This does not necessarily imply that, whenever the proportion of between-time industry variation to total variation (or to total unsystematic variation) exceeds that of between-industry variation, the former is statistically more significant than the latter. What crucially determines the statistical significance of each of the systematic sources of variation, apart form the magnitude of the effect itself as compared to the total unsystematic variation, is the degrees-of-freedom correction. Multiplying each of the figures appearing column 4 of Table IV by 152/19 yields the relevant F test for between-industry variation for each size class. Multiplying the fifth column by 152/8 yields the relevant F-test for between-time variation. Both F-tests relate to two-way fixed effects analysis of variance procedures. In all but two cases both the industry and time effects as hypotheses were rejected. Time-driven variation was found to be significant in the case of the first two size classes and to a lesser extent for the largest. The implications are that net entry rates indeed fluctuate more in time rather than across industries and that given the statistical insignificance of industry fixed-effects it may be concluded that inter-industry structure of net entry rates is quite unstable over time.[3]

However, before concluding a further refinement is needed. Data on a dependent variable of a pooled nature are rarely experimental in economics. As a practical consequence, no replications are available for observations that are assigned to, say, an industrial sector and time period. That is there is only one observation for each sector and year for the variable under study. This in turn implies that no direct account can be given for possible interaction effects i.e. the combined effect of double-participation of an observation to an industrial sector and point in time. In the absence of replications what would otherwise have been the interaction effect is labelled as unsystematic variation (or residual, or chance variation). To the extent that interaction, if present, exhibits itself a source of systematic variation this results in an overestimation of the residual term making a Type I error possible. In case of no replications, the assumption of no interaction is called additivity. Testing for non-additivity in the present research is facilitated by the means of Tukey's test. Even the lowest values of the test, that for size class 3, provides confidence (90%) that the additivity assumption is rejected, the other cases being much clearer. A Type I error remains possible in case of insignificant ANOVA F-tests. The extreme situation, where neither factor is statistically significant, but the non-additivity assumption holds, has been described by Scheffé (1959) as one where a factor (sector) can be averaged over the other (year). The absence of significant industry-driven variation is a peculiarity of Greek net entry data encountered before (Fotopoulos and Spence, 1997a). This is not evident in other net entry studies, such as Yamawaki's (1991) study for Japan, where industry effects were found to be collectively significant in determining net entry rates.

5. Consideration of some model specification issues

The inclusion of the variables employed in this research follows the tradition established in the years after Bain's (1956) definition of entry barriers and Orr's (1974) applied work. The interpretation of results on these variables becomes troublesome however when it comes to the investigation of net entry rates. Unless only positive net entry figures are considered, it should be recognised that net entry is neither gross entry, as often interpreted, nor gross exit, but the product of the two actions. Interpretation can often be speculative in that the econometric analysis of net entry rates can yield at first glance counterintuitive signs for the regressors employed. Matters are even more complicated here since growth in the number of establishments operating in size classes between two points in time may not entirely due to net entry *per se* but also do to inter-size class mobility within industries. A more detailed discussion on interpretation difficulties when using net entry rates can be found elsewhere (Fotopoulos and Spence, 1997a). The nature of the variables are briefly considered next and they are offered with no strong preconception about the sign of the regressors employed, given a net entry context.

It is assumed that entry is positively related to expectations of higher profits in that the latter are not protected by high entry barriers. As a profitability proxy, price-cost margins (PCM) for each sector were constructed. Duetsch (1975) recognises the possibility of obtaining a negative PCM sign when net entry rates are used due to effectively blockaded entry.

As far the 'timing' of the PCM when net entry is used, this has often been taken as 'in phase' with net entry rates (Yamawaki, 1991; Orr, 1974 and Duetsch, 1975). In studies having both entry and exit equations recognition has been given to the situation that exit might be more highly responsive to industry profitability than entry, so profits were taken with zero lags in the exit equation (Shapiro and Khemani, 1987; Rosenbaum and Lamort, 1992). Since a net entry figure results from both entry and exit, it is not necessary that net entry rates are led by lagged profits (Geroski, 1991c). In the present study, however, PCM was taken both 'in phase' with net entry rates and with one year lag. Where the adoption of lags delivered better results, these were then preferred for presentation.

Industry growth from the preceding period is expressed in employment terms (EMPLGR). This is expected to have a positive impact on net entry rates, unless the opportunities created by industry expansion are being exploited by expansion of already established firms, rather than new entrants and/or when industry growth prospects result in an overreaction of potential entrants which leads to higher firm turnover and thus eventually to lower net entry rates.

An industry size proxy is also employed to account for different sectoral sizes. The latter is important to the extent that industry size is related to displacement effects within industries (Baldwin and Gorecki, 1983; Shapiro and Khemani, 1987). Industry size is proxied here as the relative share of industry value-added to total manufacturing (SI).[4]

Product differentiation as an entry barrier was proxied by the sum of advertising, research and trademark-related expenditures over sales (ARDT). Since the NSSG provides a research expenditure figure for each sector that includes both product research and market research, this was preferred as it summarises different aspects of product differentiation effort (Thomadakis and Droucopoulos, 1994). A high ratio is usually expected to create a disadvantage for potential entrants unless higher advertising outlays serve more as a means of informing buyers about the entry of new products in the market rather than as an entry barrier due to sunk costs that they involve and/or consumers' loyalty in favour of incumbents that they create (Kessides, 1986, 1991). Net entry studies provide empirical evidence which supports the ambiguity of the advertising effect. It has often been found that advertising intensity does not result in lower net entry rates (Duetsch, 1984; Geroski and Masson, 1987). Sometimes it is said to lower net entry rates (Duetsch, 1975; Jeong and Mason, 1991; Rosenbaum, 1993). Other times it has been found to be beneficial to net entry rates (Gorecki, 1975; Kessides, 1986, 1991). Siegfried and Evans (1994) when comparing advertising results between gross and net entry studies, suggest that if in gross entry studies advertising appears to deter entry, then this can be reconciled with ambiguous net entry results in that advertising can deter also exit.

Capital requirements for entry were proxied as the ratio of sectoral fuel and energy consumption in monetary values to industry employment over the ratio of the fuel and energy consumption of the total manufacturing to total manufacturing employment (KR). This imperfect measure of capital intensity have been used with some success elsewhere (Shapiro and Khemani, 1987; Droucopoulos and Thomadakis, 1993; Thomadakis and Droucopoulos, 1994) based on the rationale that higher consumption of fuel and energy implies a higher degree of mechanisation and hence higher use of capital. Capital requirements are thought to present a barrier to entry and under the symmetry hypothesis also an exit barrier.

An index of relative efficiency is required to capture productivity differences and indicate the advantages or disadvantages of operating in a particular size class. Entry can be seen as a twofold decision. First, comes the question of the industry to be entered, and second, the concern about the size of entry. The index of relative efficiency (RE) should be seen as related to the latter. It is defined here as the ratio of size class specific value-added to employment ratio over the industry's value-added to employment ratio.[5]

The higher the value of this index, the lower the disadvantage of establishments entering the particular size class within an industry. Since the index gives the relative productivity of labour for each size class, it should be recognised that it is not free of ambiguity given that all firms do not use the same technology within an industry. Those more capital intensive firms will achieve higher labour productivity. The index of relative efficiency reflects then both the factor mix and labour efficiency. A way to disentangle the index of relative efficiency in a more meaningful manner was suggested by Droucopoulos and Thomadakis (1993). They regressed the index of each size class on an index of class-specific relative capital requirements (RKR_{jit}). This idea of auxiliary regression was also used here. The relative index of capital requirements is defined as the size class' fuel and energy consumption to employment ratio over the relevant sectoral ratio.

The relation thus becomes:

$$RE_{jit} = b_0 + b_1\, RKR_{ijt} + U_{jit}$$

for every $j = 1, \ldots, 5$ size classes, where $i = 1, \ldots, 20$ 2-digit sectors, $t = 1, \ldots, 9$ time periods. The residual of the regression (U) can be then used to proxy relative efficiency after the effect of different technology has been removed.

Labour market characteristics (Storey and Jones, 1987; Shapiro and Khemani, 1987; Acs and Audretsch, 1989b, 1989b; Anagnostaki and Louri, 1995) and their effect on net entry rates by entrants' size are also considered. A measure of relative labour costs for each of the 20-digit industrial sectors is constructed as the average wage of the industry over the average wage for the total manufacturing (LA).

Prospects for differentiated effects of macroeconomic conditions on different size classes are also explored. In particular, the growth rate of real GDP (RGDPGR) from the preceding year and the growth rate of the price index of investment goods (PINVR) were used.

All industry variable definitions utilise published and unpublished data resulting from the annual industrial surveys conducted by the NSSG for the years 1982–1991. For the RGDPGR and PINVR the data sources were the statistical annex of European Economy and Macro-economic Series published by the Bank of Greece respectively.

6. Estimation and results

Geroski (1995, p. 430) points out that "entry rates are hard to explain using conventional measure of profitability". He explains that while both the profitability and entry barriers proxies present very little variation in time and most of their variation is between-industry variation, the variable whose variation they seek to explain – entry rates – has as a main source of variation fluctuations over time. Geroski recognises that although panel data are more advantageous than cross-sections in that they incorporate the time dimension, they usually provide a low overall fit.

Despite this argument, the vast majority of empirical studies that use panel data have successfully employed industry-fixed effects. In almost all justification is provided by means of some statistical test for their collective significance. This, in turn, implies that there should be a quite important time-invariant element in entry rates conditional on other regressors. However, if the between-industry variation is only a modest fraction of the fluctuation over time that entry rates are claimed primarily to present, then industry fixed-effects cannot deal with the latter, as they are only capable of purging the model of between-industry variation.

Here previous statistical analysis cast no doubt that a) time is unconditionally the most significant source of variation in the present research, b) unless a serious Type-I error was committed in the analysis of variance, industry-fixed effects are not statistically significant, implying that inter-industry structure of net entry rates is quite unstable in time, and c) unsystematic or chance variation retains the biggest share of total variation in all size classes.

This necessarily means that the model employed here should deal to a great extent with unsystematic variation, on the one hand, and time variation, on the other. Both the real GDP growth (RGDPGR) and the price index of investment goods (PINVR) are deployed to capture the effect of time through the notions of firstly, macroeconomic conditions and secondly, the cost of capital. In the presence of these industry-invariant variables time dummies were not introduced to avoid perfect-multicollinearity. Other right hand side variables, although characterised mainly by sectoral variation, are by no means time-invariant and are included to explain some of the unsystematic variation especially in a situation where the interactive effect of cross-sections and time series seem to be important (see the non-additivity test in section 4).

The econometric technique employed is generalised least squares estimation (GLS) described by Kmenta[6] (1986) and the results are reported in Table V.

TABLE V

Results of regressions accounting for net entry rates into Greek manufacturing 1983–1991 by size class

Variable name	Size class 1	Size class 2	Size class 3	Size class 4	Size class 5
PCM	–0.62044E-01***	–0.45081E-01	–0.58106E-02	0.13072***	–0.11205***
	(0.4004E-01)	(0.5114E-01)	(0.4947E-02)	(0.8313E-01)	(0.6224E-01)
SI	–0.17347**	–0.28002*	–0.27178E-01*	0.10871	–0.82828E-01
	(0.8928E-01)	(0.9335E-01)	(0.1004E-01)	(0.1371)	(0.1127)
EMPLGR	0.86161E-01*	0.17446E-01	–0.68080E-03	–0.29320E-01	0.66983E-01
	(0.3585E-01)	(0.3764E-01)	(0.5548E-02)	(0.6599E-01)	(0.5494E-01)
RKR	–0.72277E-02	0.89739E-02	0.49080E-03	–0.75248E-01*	–0.40952E-02
	(0.9571E-02)	(0.1362E-01)	(0.9602E-03)	(0.2310E-01)	(0.6633E-02)
U	–0.48817E-01***	0.35940E-01	0.70142E-03	0.11031E-01	0.11642E-02
	(0.2899E-01)	(0.2866E-01)	(0.2450E-02)	(0.3424E-01)	(0.2933E-01)
ARDT	–0.31311E-01	–0.15114	–0.18053E-01***	0.19800	0.10538
	(0.1129)	(0.2877)	(0.1008E-01)	(0.3450)	(0.2134)
LA	0.33551E-02	0.22117E-01*	–0.24676E-02***	–0.27378E-01	0.17380E-01
	(0.8009E-02)	(0.9420E-02)	(0.1375E-02)	(0.1917E-01)	(0.1406E-01)
RGDPGR	–0.60287E-02*	–0.79542E-02*	–0.49460E-04	–0.11891E-01*	0.11005E-01*
	(0.1226E-02)	(0.1718E-02)	(0.2474E-03)	(0.3024E-02)	(0.2381E-02)
PINVR	–0.18611*	–0.31589*	–0.39024E-01*	–0.56957*	0.52323*
	(0.6495E-01)	(0.7686E-01)	(0.1036E-01)	(0.1308)	(0.1006)
CONSTANT	0.81593E-01*	0.51622E-01**	0.86351E-02*	0.17159*	–0.11930*
	(0.1938E-01)	(0.2257E-01)	0.2736E-02	(0.3674E-01)	(0.2361E-01)
Buse R^2	0.3089	0.2247	0.0621	0.1957	0.1853
R^2 between observed and predicted	0.3590	0.2800	0.1711	0.2874	0.3041
Number of obs.	180	180	180	180	180
Determinant	0.5584	0.6516	0.6168	0.5033	0.4689
VIF	1.2759	1.2682	1.2486	1.5205	1.5101
Condition index	16.291	16.167	16.145	15.266	14.760
$F_{(19, 151)}$ for industry fixed effects	0.84	0.86	1.02	0.55	1.33

Notes: Standard errors in parentheses.
* Significant at the 1%; ** Significant at 5%; *** Significant at 10% (2-tailed tests).
In the size class equations 4 and 5 one year lag applies to PCM.

Not all the variables discussed earlier appear because their inclusion increased multicollinearity problems.[7] The results presented in Table V reflect estimation in the presence of moderate multicollinearity. However, carrying out variance decomposition analysis, suggested for such cases by Belsley et al. (1980), revealed that variance proportions did not lead to significant loss of accuracy in estimating regression coefficients. All the condition indices were lower than the cut-off point of 30, usually used to identify severe situations. The highest condition indices for each of the five size class equations are cited in Table V along with the highest of the variance inflation factors (VIF) and the determinant of the variable correlation matrix in order to support the argument. Additional testing for the collective significance of omitted time-invariant industry specific characteristics was facilitated by the means of an F-test. The evidence once more offers no support for industry-fixed effects.

The sign and the magnitude of the estimated variable coefficients appears to be considerably different across different size classes.

First, consider the smallest size class. The PCM variable has a negative, moderately significant, effect on the net entry rates. This indicates that both entry and exit are symmetrical in their response to higher profit margins. Moreover, if both entry and exit are positively related to PCM then the negative sign of net entry rates clearly depends on the relative entry and exit elasticity. That is, exit might be steeper than entry in its response to higher margins. The height of entry barriers is important as a determinant of such a result, in both that it deters entry, and post-entry survival and mobility. In the presence of entry barriers entry is less discouraged than exit is forced, probably due to subsequent exit of less qualified recent entrants or less efficient incumbents. Dunne and Roberts (1991) find that high profits attract entry but also high profits are associated with frequent exit in the U.S. manufacturing industries. Fotopoulos and Spence (1997b) using size-independent measures of gross entry and exit discover the same for Greek manufacturing.

Industry size is found to be negative and significant, which seems at the first glance rather odd. However, it has been pointed out in other studies (Schwalbach, 1990; Thomadakis and Droucopoulos, 1994) that industry size can be associated with the existence of scale economies thus leaving less scope for smaller firms. If this is the case, to the extent that the industry size proxy reflects an industry's share of value added, then the negative sign obtained here can be seen as the outcome of a process where entry of smaller firms is more elastic than exit, both being negatively related to size.

Industry growth, in contrast to industry size, seems to exert a significant and positive effect on net entry rates. Given the hypothesis that newer, and hence smaller, industries grow faster (White, 1982), the above findings seem important in supporting the notion that small faster growing industries offer better grounds for smaller new participants. This may imply that industry growth may be associated with higher industry profitability (Bradburd and Caves, 1982), which is not necessarily accessible by entrants at the expense of existing firms. Thus, industry growth might have attracted more entry to the extent that small entrants assume that the aggressive reaction is less likely than otherwise would have been the case.

In contrast, the index of relative capital intensity was found to be negative but not significant, whereas the index of relative efficiency (for reasons other than differences in capital utilisation) is also negative but of moderate significance. This seems to indicate, where small firms are not at a great disadvantage vis a vis their larger counterparts, that net entry rates become lower possibly because of higher turnover in the smallest size class. That is to say that where small firms can find their way in competing in industry segments both entry and exit are positively related to higher efficiency but exit is more elastic than entry. Higher efficiency provides a welcoming signal to small entrants but not all of them can be accommodated.

Labour costs are not found to present a significant effect on net entry rates (while there is trace of a positive effect). Small firms may well be more efficient in finding cheaper ways of labour compensation (part-time and seasonal workers, family participation) or they may prefer to substitute labour for capital to improve factor-mix utilisation.

Finally, an ameliorating macro-economic environment does not seem to favour small firm net entry rates. The coefficient of the growth rate of real GDP is negative and highly significant. Put it the other way around it seems that smaller size classes seem to perform better during the economy's downturns The higher costs of capital also exert a significant negative effect. Since these last results are of great importance in understanding movement of firms of different sizes into industries the discussion will be returned to.

The majority of signs discussed above hold in the case of the two next larger size classes. However, important gradations concerning the magnitude of the effects can be traced. For PCM, the effects remain negative but not significant at any conventional level. Industry size, as a negative influence on net entry rates, increases its significance as size class increases, and the opposite is the case for the positive effect of industry growth. The industry-size-industry-growth effect trajectory may be because as size increases there is less scope for alternative small firm strategies to confront competition, this becoming more direct and the presence of firms becomes better noticed. Industry growth becomes an unimportant factor offsetting entry barriers and indeed turns into a negative effect for the middle size class.

The variables RKR and U remain insignificant but change their signs leaving the implication that, as small establishment size increases across industries, firms tend to approach an industry norm. The index of relative efficiency allows for more surviving firms and higher relative capital intensity might also facilitate increased survival. For higher values of U, entry is more elastic than exit both being positively related to U, and exit more elastic than entry both being negatively related to RKR. Interestingly, ARDT becomes moderately significant for the middle size class. The negative effect of product differentiation may indicate that middle-sized firms suffer most from this barrier since their product aims at broader markets than the more protected specialised niches served by smaller firms. Relative labour costs remain a positive influence for the second size class but become highly significant. This might point to a better exploitation of labour here, either through lower wages or higher productivity. This tendency is reversed, however, when the analysis reaches the middle size class. Here, the effect of higher relative labour costs is of moderate significance but negative. This raises the question of the 'formalisation' of the middle size class establishments. These results certainly highlight distinctive behaviour of net entry rates for the third size class where tendencies observed in the smallest size classes are reversed. But the overall state of the economy remains a negative force affecting net entry rates in size classes two and three.

The most striking finding concerning the econometric results for the largest size classes (four and five) is that hardly any variable other than the price cost margins are found to be significant at any conventional level. The relative capital intensity of size class four is the only exception.

Here the use of one year lags in PCM provides more significant results. This contrasts with the results obtained for smaller size classes, particularly the smallest, where 'in-phase' PCM presented a negative, moderately significant effect. The signs for size classes four and five are different, however, being positive for the medium size establishments and negative for the large ones. The positive sign obtained the second largest size class seems to imply that more firm enter the this size class than exit from it for higher margins. The opposite is the case for the largest size class. Duetsch (1975) uses the term 'blockaded entry' to characterise situations where the negative relation between net entry rates and PCM is determined by the height of entry (exit) barriers. Duetsch's view necessarily assumes that, if entry is to be blockaded, the relationship between entry and PCM should be negative and far more negative and significant than the relationship between entry and barriers to entry proxies. However, results for other variables like RKR, SI and ARDT do not appear to strongly support this argument. On the other hand, the relative capital intensity (RKR) is found to exert a significant negative influence on the growth rate in the number of operating establishments in the second largest size class.

Given the caveats associated with the nature of the dependent variable in use, it might be wiser to treat the patterns of the growth in the number of establishments operating in the two largest size classes as the result of entry and exit from the size class (within-industry movements) rather than entry and exit from the industry. In this case entrants and exiting firms share at least one important feature, that of size. Barriers to entry (exit) defined at the industry level do not seem particularly important since both firm residing in the size class as well as movers can attain minimum efficient size of production. More interesting are individual firm effects (Amato and Wilder, 1990). Firm characteristics are more likely to determine the competitive conditions at the top of the firm size pyramid, rather than the overall entry condition at the industry level.

A most interesting finding when comparing the empirical results across the five size-class equations is that only large firms present a positive sign for both RGDPGR and PINVR. The econometric results for these two variables across size classes closely resemble Figure 1 previously discussed. The combination of both the diagrammatic presentation of the patterns and the econometric results rise two issues: a) intra-industry inter-size class mobility might have some contribution in explaining these patterns and b) macro-economic shocks seem to have a disproportionate effect on different size classes.

The first point relates to the idea that facing decreasing demand large firms, given their irrecoverable capital commitments (sunk costs), may decide to terminate a number of employees in order to bound overheads, instead of exit from an industry. This might offer an explanation for both the negative impact of the demand shock in 1986–1987 period on the largest size class and the positive impact on the immediately smaller size class 4, to the extent that size classes are employment defined. As a counter-argument, however, it could be claimed that downsizing itself might be limited by the way the production lines of mass producers are organised. If rigid enough mass production lines might not be easy to restructure and terminating jobs might not salvage the situation depending on the length of the shock, how unexpected it was, the level of inventories etc. The second point relates to the increase in the number of establishments in all other size classes. This far more than offsets the decrease in the largest size class even if a trickle down downsizing effect is assumed. It seems thus that size classes relating to smaller firms have a net increase beyond what could have been attributed to inter-size class mobility. This points to superior responsiveness of smaller firms to demand fluctuations (Mills and Schumann, 1985), probably through their inherited flexibility in shifting or rearranging production (Carlsson, 1989). Moreover the applied literature points out that in a related context new firm formation might be facilitated during downturns because prospective firm proprietors would otherwise have faced serious hazards of being unemployed, and because of greater supply of cheaper labour (Storey, 1991) and cheaper second-hand equipment released due to demand shortages leading to closure of many firms (Binks and Jennings, 1986). This reasoning which might be applicable in the present research appears to conform more with what Highfield and Smiley (1987) have described as an ‘opportunistic’ scenario. Their time series analysis for U.S. manufacturing suggested that sluggish macro-economic conditions (lower growth rates of GNP), lower inflation rates and growth in the unemployment rate relate to higher rates of new firm formation. In the present context, however, it is worth noting that even if the ‘opportunistic’ scenario is to serve as an explanation this certainly does not apply to all size classes, since the largest firms seem to be anything but ‘opportunistic’.

Apart from the Highfield and Smiley study there have been just of handful other studies the employ macro-economic factors as explanatory variables in entry regressions. From these only one uses a size related measure of entry (Wagner, 1994), whereas the others (Yamawaki, 1991 and Audretsch and Acs, 1994) used either size invariant net entry or gross entry measures. The results of this research, although in similar vein with that of Highfield and Smiley, contradict the results of all others to the extent that the latter point out that higher growth rates of GNP are associated with higher entry rates (Yamawaki, 1991 and Audretsch and Acs, 1994). What seems, however, to have been a more uniform result across all studies is that unemployment, where applied, has been found to be a negative influence on entry activity (Highfield and Smiley, 1987; Wagner, 1994; Audretsch and Acs, 1994). The same also holds for the cost of capital proxies which was everywhere negative (Highfield and Smiley, 1987; Yamawaki, 1991; Wagner, 1994; Audretsch and Acs, 1994). The results in the present study support this finding to the extent that

PINVR as a proxy of capital cost was found to be negative for all but the last size class.The present research augments the empirical literature by providing evidence that wider movements in the economy have a disproportionate effect on the growth in the number of establishments of various size classes. Future research might benefit from use of gross instead of net entry, longer time series available for each cross section so as to encompass more of the economy's cycles, and probably from some effort to account for differential effect of wider-economy conditions on industrial sectors.

7. Conclusion

The analysis here has had to confront basic difficulties arising from the use of net entry rates defined at the size class level. The fundamental difficulty is that net entry cannot be distinguished from inter-size class mobility of establishments within an industry. In fact, this research is really more properly labelled as dealing with growth in the number of establishments in individual industry size classes. As regards the literature on entry (exit) by size, this is only the second example where a pooled model has been used. Furthermore, the degree of size disaggregation here is considerably finer than used before. However, unlike previous research, the data used here were characterised by the absence of significant industry-specific systematic variation. This is clearly a peculiarity of the Greek data for this time.

In the absence of systematic variation, the models have revealed that there are likely to be considerable differences among the mechanisms governing net entry rates for different size classes. In particular the results for the smallest firms indicate that price cost margins were only fractionally significant in determining net entry rates. Conversely, industry growth appeared to be by far the most significant inducement for net entry rates – confirming previous research. Barriers to entry proxies (ARDT, RKR) were not found to be particularly significant for small firms. An exception was industry size, which implies significant economies of scale to be operating in larger industries. This result holds for the three smallest firm size classes and supports the view that smaller firms perceive different rules of competition compared to their larger counterparts.

There is evidence suggesting that entrants' (leavers') perception of industry profitability differs according to firm size. However, the observed pattern here is not directly analogous to that for previous research in Portugal where past industry profitability was significant only in the case of small firms. Here, the significance of PCM re-emerges in the case of the medium-sized and largest establishments. What is also of interest is that only in these last cases does lagged profitability perform better in the models than the in-phase' values.

The index of relative efficiency was found to be of moderate significance only for the two smallest size classes but the relationship does not have the same sign in both classes. The index of relative capital requirements was found to be negative and significant only in the case of medium-sized establishments and product differentiation was just negative and significant when the largest of small firms were concerned.

The labour costs proxy was shown to be significant in three of the classes, but again the sign of the relationship varies. The interpretation may be that for small firms there might be alternative ways of cheaper labour remuneration, and the largest firms may provide higher compensation for the labour inputs employed. For the size classes in between higher relative labour costs have a negative effect on net entry rates.

Finally, the results for the wider economic conditions proxies make evident that large firms are different in respect of their net entry patterns in response such conditions. The reasons behind this different behaviour are difficult to explain. It is certainly the case that, unlike large firms, small and medium firms exhibit a positive response to macro-economic downturns.

Overall, the results obtained seem to indicate that there is a gradation in the responses of different size classes to stimuli defined at the industry level. Some limited evidence is offered that small firms are different in that they manage to overcome entry barriers, perhaps adopting different survival strategies, and that large firms are well aware of market conditions and are in an advantageous position to overcome many of the problems. Size classes in the middle of the distribution offer rather mixed results due to size-related advantages and disadvantages.

The nature of the analysis here has, necessarily, often been speculative. There have been occasions where alternative accounts have had the same potential in explaining the outcomes of the econometric analysis. Difficulties have arisen due to the nature of the data, the use of the net entry concept and the size class disaggregation. However, an effort has been made to treat net entry as a distinct and proper variable, and to analyse possible scenarios behind the observed net entry figures.

Almost inevitably these results call for additional work using gross entry and exit data which might facilitate a better explanation of the determinants of firm entry and exit across the size distribution spectrum. Unfortunately this will not be possible for Greece. Perhaps more important is the conclusion that research to date seems to have discovered what does not explain entry by industry size class rather than what does. New explanatory variables, perhaps those defined at the industry or firm level, are much needed.

Notes

[1] Alternative definitions of net entry rates have been suggested by an anonymous referee. In particular $ER_{jit} = N_{jit} - N_{ijt-1}/[(N_{ijt} + N_{ijt-1})/2]$ (bounded by +2 and –2) and $ER_{ijt} = \ln(N_{ijt}/N_{ijt-1})$, being symmetrical around zero were thought advantageous. The latter, being asymmetrical around zero, was thought may lead to unusual regression results. In neither the statistical nor the econometric analysis used here did these definitions lead to significantly different results.

[2] The situation described in Figure 1 was compared with the fluctuation of average net entry rates constructed by gross entry and exit data provided by the Federation of Greek industries (FGI). The federation keeps record of all establishments that publish accounts in all 2-digit manufacturing sectors. Although there is no direct employment-size correspondence the FGI record pertains to somewhat larger firms that account for about 90% of total assets in Greek manufacturing. For these firms the relevant plot presents also an important downward shift in the 1986–1987 period. Unfortunately the FGI does not disclose data for a size breakdown of the firms in their records.

[3] This can be further pursued by taking inter-temporal Spearman rank-correlation coefficients of net entry rates by size class, rather than simple correlations. It was found that hardly any rank correlations between consecutive time periods were significant and this supports the argument for unstable inter-industry patterns of net entry over time.

[4] Alternative empirical definitions of the industry size variable, such the logarithm of sector sales, the number of firms in existence (independent of size class) and the logarithm of total sectoral employment, could potentially give similar results but would significantly have contributed to multicollinearity problems.

[5] When the sales to employment ratio of each size class over the relevant sectoral ratio was used as a proxy of relative size class efficiency, the results suffered from a higher degree of multicollinearity.

[6] The model applied here deviates from the cross-sectionally heteroskedastic and time-autoregressive model described by Kmenta (1986) in that when calculating the components of the diagonals of the variance covariance matrix, instead of using the formulation in equation 12.37 (Kmenta, 1986), the formulation proposed by Fomby et al. (1984) equation 15.2.7 was preferred. See also Greene (1993) equation 16-8 (for $i = j$).

In addition it should be mentioned that the model described by Kmenta (1986) as cross sectionally correlated and timewise autoregressive was not feasible when estimating each size class equation separately since the number of cross sectional units was always larger than the number of years of observation inevitably resulting in a singular variance-covariance matrix (Baltagi, 1986). Testing for group-wise heteroscedasticity was served by the means of Bartlett's homogeneity of variance test (Baltagi, 1986). In all the size class equations the hypothesis of homoscedasticity was rejected. When estimating each size class equation separately, a different autocorrelation coefficient was estimated for each cross sectional unit (industrial sector) and used to transform the model variables. Although the use of different autocorrelation coefficients when the time series available are sort has been criticised (Judge et al., 1988) it was preferred to an average due to considerable differences among autocorrelation coefficients for different industrial sectors. The pooled OLS residuals for each separate size class equation were used for the estimation of the autocorrelation parameters.

[7] The unemployment rate for the total economy was found to significantly correlated with both PINR (0.52) and RGDPGR (0.32) and thus was excluded from the analysis to avoid multicollinearity problems.

[8] It has been stated that net entry rates when defined at the size class level are vulnerable to the possibility of unaccounted intra-industry inter-size class mobility. In order to alleviate this problem a minimal degree of simultaneity was allowed by using seemingly unrelated regressions estimation (SURE), which treats all the five classes equations as a system. In particular the method allows for correlation between the residuals of the same industry, the same study year but different size classes. Each of the separate equation variables were initially subjected to a double transformation to remove the effects of group-wise heteroskedasticity and autocorrelation (where applicable) prior to SURE estimation. The existence of significant correlation between size class residuals in the fashion described above was tested by the means of a Breusch-Pagan Lagrange multiplier test (Breusch and Pagan, 1980). The value of the test was 57.672 pointing to significant cross-equation residual correlation. Overall the results of SURE estimation confirm those of the GLS estimates presented in Table V, providing limited efficiency gains. The use of SURE can be criticised on the grounds that the majority of the variables are common between the size classes. Only U and RKR

differ across all the size classes and the lags taken in PCM distinguish profitability conceptions between the last two size classes and the rest. Nevertheless, the use of transformations to remove heteroskedasticity and autocorrelation induces the values of the same variable to be different across the equations. What then facilitates the reasoning for the marginal gains in efficiency in the present case is that ". . . efficiency gain tends to be higher when the explanatory variables in different equations are not highly correlated but the disturbance terms corresponding to different equations are highly correlated" (Judge et al., 1985). This implies that in the present case even after the transformations prior to SURE estimation the values of the same explanatory variable were often highly correlated across the size class equations.

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