Net Entry of Firms into Greek Manufacturing: The Effects of Business Conditions

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ABSTRACT. This research explores the nature and causes of net entry into manufacturing industry in Greece. Previous work has rarely considered these issues in the context of small, but open, and not particularly industrialised economies. The exact nature of the focus of interest – net entry – is discussed first, illustrating that this is a complex variable to account for, although arguably still interesting and useful. Net entry needs to be considered as variable worthy of study in its own right as it reflects an outcome of processes of gross entry and exit. Certainly it need not be interpreted only as entry as is often the case. Next comes the question of the degree of variation, both temporally and sectorally, that net entry exhibits in the context of contemporary Greek manufacturing. Some temporal variation in net entry rates is demonstrated, and there follows a discussion of how such variation might be explained potentially in theory. The empirical testing of these hypotheses point to findings that are different to those discovered in different contexts. For Greek manufacturing, profitable business opportunities were not shown to be a sufficient condition of higher net entry, but the cost advantages of large scale operations did both encourage entry and discourage exit. The cost of capital and the overall condition of the economy were negatively related to net entry. However the role of industry growth, import penetration and export orientation tend to confirm findings in other studies.

1. Introduction

In this research the influence of demand fluctuations and cyclical business conditions on net entry (including net exit) of firms in Greek manufacturing is examined. Entry and exit of firms in industrial sectors has, to date, been recognised as having a twofold effect on industrial evolution. First, to the extent that firms are attracted into newer more 'innovative' industries, this could result in a healthier industrial structure. Second, when this kind of 'turnover' occurs in traditionally declining sectors, further industrial decay can result (Binks and Jennings, 1986).

These aspects of entry and exit clearly call for an evaluation of policies that aim to encourage new firm generation. Furthermore, besides the kind of the industry which should enjoy assistance from designated policies, the policy makers should be aware of the sensitivity of entry decisions to shortrun disturbances, as the latter are determined by prevailing macroeconomic conditions which themselves can be influenced by policy.

Despite the importance of cyclical business conditions in affecting entry and exit conditions in the short-run, previous empirical work on this topic is scarce. What is available concentrates heavily on highly industrialised and developed countries (Highfield and Smiley, 1987; Acs and Audretsch, 1988; Yamawaki, 1991; Wagner, 1994). These studies, however, have not offered an unequivocal understanding of the conditions favouring new firm generation. Moreover, there is rarely more than one study available for each country making it often difficult to judge the validity of results in such a context, before further seeking similarities and differences through international comparisons.

The present study aims to enrich the existing empirical evidence, drawing evidence from a less industrialised country, a small open economy – Greece. It seems reasonable to hypothesise that in a country like Greece, cyclical macroeconomic and business conditions do affect entry and exit conditions. Without having strong preconceptions

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about the exact direction of the relationships between firm entry and exit and macro-conditions, they are expected to be significant.

To analyze the relationships mentioned above, this research is organised as follows. In the next section the measure of firm entry to be used and its limitations are described. Descriptive statistics are given for net entry rates of Greek manufacturing industries for the period 1981–1991. A series of analyses of variance measures are also calculated to reveal the degree and main sources of variation of firm entry.

In the third section hypotheses concerning potential determinants of net entry rates are stated. In addition, a number of different hypotheses and their outcomes are considered to denote the cases where no clear-cut conclusion can be made for the validity of the hypotheses presented. The fourth section contains some econometric analysis to account for variations in net entry using both macroeconomic and industry specific variables.

2. The measurement of firm entry and the temporal/sectoral variation in net entry

The measure or definition which should be used to consider entry of firms into an economy is influenced by two important factors. The first is the nature of the variable the measure has to capture. The second is the data availability permitting the use of the desired measure. Inevitably the choice of empirical measures of firm entry is the product of constrained selections.

In empirical work two categories of measurement have been used, gross entry and net entry. The former relates directly to the number of new firms in the market over a period (actual entry), whereas the latter is simply the change in the total number of firms in an industry over a period. In this sense the net entry measure treats exits as negative entries. The use of this latter kind of measure arose mainly out of data constraints preventing researchers from using more conceptually secure gross entry figures.

The use of a net entry measure in industrial studies has been widely criticised in that it necessarily excludes detail on firm turnover that is the outcome of the number of entries and exits. Clearly a net entry figure near zero may result either from near zero entry and near zero exit or from equally large numbers of entries and exits. More important, however, is the criticism based on concerns of having such a measure as a dependent variable in structural industrial studies. The existence of symmetry or otherwise in the determinants of both entry and exit has been questioned. Orr (1974) in his seminal work on entry, using a net entry measure, excluded industries presenting negative values, maintaining that there is no obvious symmetry between barriers to entry (Bain, 1956) and exit. However, later research by Caves and Porter (1976) argued that barriers to entry are also barriers to exit, especially if there is a degree of 'sunkness' in costs and other commitments related to the development of protection against newcomers in an industry. Shapiro and Khemani (1986) also offer empirical support to Caves and Porter in this respect. Nevertheless when modelling firm entry and exit, the prime determinants of each need not be the same. As Evans and Siegfried (1992) have pointed out, when gross entry and exit are combined into a net measure, this necessarily forces the same causal underpinnings to be considered. Unfortunately, this non-optional requirement for symmetry in explanation may be unhelpful in discovering the real causality.

Still, McGuckin (1972) has maintained that net entry is useful in explaining changes in industrial structure and performance. If what matters is the impact of firm turnover on industry output and performance, then net entry may be adequate to reflect it. Geroski (1991) has helpfully indicated that the critical importance between the net and gross measures depends on whether the key processes involved relate specifically to the number of survivors (net entry) or the total number of participants (gross entry).

In the present research the use of a net entry measure was forced by the lack of suitable alternative data. The use of the annual statistical surveys of Greek manufacturing from the National Statistical Service of Greece (NSSG) necessitated the use of net entry. These data do not take into account firms employing less than ten employees. This may result in an underestimation of real activity in terms of net entry since in smaller size classes there are likely to be a larger number of births and deaths of firms. Analysis was based on the two digit level because sectoral variation (as

well as temporal variation) in net entry rates appeared also to be absent in higher levels of disaggregation. An alternative source was the sequential manufacturing censuses, which being more detailed cover even the smallest size classes. Unfortunately, when this data source was tried at the two digit level, it also did not provide statistically significant levels of sectoral variation. It also had the disadvantage of not being an annual series. Other research on this topic in the Greek context has used gross entry data from the Statistical Service of the Greek Confederation of Industries (Anagnostaki and Louri, 1994, 1995). However, these data only relate to large firms. So, in as far as the analysis to be used here utilises an abstract measure of entry such as net entry, it was felt that the annual statistical surveys did permit reliable enough conclusions to be drawn without loss of essence. Table I presents the descriptive statistics for the net entry rate for the period 1981 to 1991.

The pattern that is emerging is that the means of the net entry rates are small and most certainly not constant over time. The highest positive net entry rate occurs between 1986 and 1987, when incidentally the rate of growth of real GDP was the lowest of the period. Conversely, the second lowest rate of GDP growth for the study period coincides with the existence of the highest negative net entry rate (net exit). As a result, it may be assumed that lower rates of real GDP growth result in greater 'activity' in terms of the net entry rate considered in absolute terms. Another important observation is that the average net entry rate was by no means always positive over the study period.

Table II gives the sectoral means and other descriptive statistics of the net entry rate for the same period (20 two-digit sectors of manufacturing). The sectoral means in the net entry rate measure are quite different. Around half the sectors result in average net entry and half average net exit, and only rarely are the maximum and minimum values by sector of the same positive or negative sign.

So much for the descriptive parameters of the variable of interest – net entry – next it is important to focus on the existence, or otherwise, of temporal and sectoral variations. (Net entry of firms into Greek manufacturing will be treated as a dependent variable in some regression analysis later in the paper.) The net entry rate was examined using analysis of variance in relation to two experimental factors. The first accounts for sectoral differences in the net entry performance across the ten year period, 1982–1991 (the 1981 data are used as a denominator in calculating the net entry rate for the period 1981–1982, and so on). The second accounts for yearly differences of the net entry rate across the twenty sectors of Greek manufacturing.

The results revealed statistically significant temporal variation in firm net entry rates, but this was not evident for sectoral differences. The interpretation of the results of this initial two-way analysis of variance, shown in Table III, indicates that the time series means by sector do not seem to be statistically different, while the overall yearly

TABLE I
Descriptive statistics for net entry rates into Greek manufacturing, 1981–1991

	Mean	Standard deviation	Minimum value	Maximum value
(N82-N81)/N81	0.0043	0.0249	–0.0375	0.0552
(N83-N82)/N82	–0.0075	0.0129	–0.0385	0.0112
(N84-N83)/N83	0.0029	0.0194	–0.0311	0.0560
(N85-N84)/N84	–0.0109	0.0111	–0.0251	0.0192
(N86-N85)/N85	–0.0144	0.0151	–0.0405	0.0105
(N87-N86)/N86	0.0411	0.1169	–0.1785	0.2745
(N88-N87)/N87	–0.0009	0.0117	–0.0308	0.0167
(N89-N88)/N88	–0.0069	0.0141	–0.0460	0.0153
(N90-N89)/N89	0.0017	0.0215	–0.0392	0.0635
(N91-N90)/N90	–0.0173	0.0390	–0.1728	0.0150

Note: N is the number of firms in the two-digit industry.

TABLE II
Descriptive statistics for net entry rates by sectors into Greek manufacturing, 1981–1991

	Mean	Standard deviation	Minimum value	Maximum value
Food preparation except beverages	–0.0041	0.0110	–0.0215	0.0086
Beverages	–0.0061	0.0143	–0.0302	0.0255
Tobacco manufactures	–0.0135	0.0974	–0.1728	0.2254
Manufacture of textiles	–0.0239	0.0309	–0.1072	–0.0011
Manufacture of footwear & sewing of fabric	0.0088	0.0283	–0.0214	0.0789
Wood and cork	–0.0195	0.0570	–0.1785	0.0164
Furniture and fixtures	0.0153	0.0529	–0.0123	0.1642
Manufacture of paper	0.0164	0.0412	–0.0385	0.1053
Printing and publishing	–0.0116	0.0267	–0.0806	0.0120
Leather and fur products	0.0072	0.0278	–0.0207	0.0772
Rubber and plastic products	–0.0023	0.0275	–0.0212	0.0669
Chemical industries	0.0053	0.0328	–0.0251	0.0900
Petroleum and coal refining	0.0183	0.0678	–0.0385	0.2000
Non metallic mineral products	–0.0004	0.0137	–0.0228	0.0233
Basic metal products	0.0309	0.0910	–0.0377	0.2745
Fabricated metal products except machinery	–0.0134	0.0354	–0.1105	0.0105
Machinery and appliances except electrical	–0.0032	0.0087	–0.0145	0.0098
Electrical machinery, apparatus, appliances and supply	–0.0130	0.0121	–0.0365	0.0000
Transport equipment	–0.0080	0.0136	–0.0311	0.0153
Miscellaneous manufacturing industries	0.0011	0.0304	–0.0458	0.0552

TABLE III
Analysis of variance of net entry rates into Greek manufacturing by years and sectors

Source of variation	Sum of squares	DF	Mean square	F	Significance of F
Years	0.049	9	0.005	3.139	0.002
Sectors	0.037	19	0.002	1.125	0.330
Explained	0.086	28	0.003	1.772	0.014
Nonadditivity	0.114	1	0.114	Tukey's F	
Remainder	0.182	170	0.001	106.331	0.000
Total	0.381	199	0.002		

Tukey's F = MS nonadditivity / MS remainder.

means of all sectors are. Clearly, this is an unreplicated analysis of variance design (one element per cell) and this means that simple interaction effects cannot be detected. However, Tukey's test for non-additivity is relevant here, and the results of which indicate that a significant interaction effect between years and sectors is present.

Ranks of the net entry rate by sector for each of the study years, as in Table IV, further demonstrates that there is no stability within the ranking of the sectors from one year to another. For example, the paper industry at the start was ranked second, but only reached number thirteen by the end of the period. Similarly, the miscellaneous industries sector found itself ranked first at the start but only seventeenth by the end. Some other industries, however, produced considerable gains in rank by the end of the period. Rubber and plastics, printing and publishing, non metallic mineral products, and machinery, were industries that improved their positioning by the end of the period, having travelled around different rank positions over time.

Conversely, some sectors like food, beverages, tobacco, petroleum and coal, basic metal industries, electrical machinery, textiles and footwear, achieved rank positions close to their initial ones by the end of the period. Spearman's rank corre-

Table IV
Yearly ranking of net entry rates by sectors into Greek manufacturing

	81–82	82–83	83–84	84–85	85–86	86–87	87–88	88–89	89–90	90–91
Food preparation except beverages	7	4	1	17	10	11	12	17	8	7
Beverages	11	12	2	9	16	13	18	7	9	11
Tobacco manufactures	19	18	9	10	19	2	10	18	17	18
Manufacture of textiles	16	14	12	11	5	17	16	11	18	14
Manufacture of footwear and sewing of fabric	12	2	5	7	7	7	3	10	2	15
Wood and Cork	5	7	15	13	6	19	13	4	4	6
Furniture and fixtures	6	5	11	5	9	4	5	6	13	8
Manufacture of paper	2	19	1	2	4	5	10	2	10	13
Printing and publishing	10	13	9	20	2	16	6	14	6	5
Leather and fur products	8	1	6	3	11	8	4	16	15	2
Rubber and plastic products	17	16	16	8	12	9	17	12	3	4
Chemical industries	4	10	13	12	14	6	14	5	12	1
Petroleum and coal refining	3	17	4	15	18	3	1	15	10	4
Non metallic mineral products	9	6	3	19	13	12	9	9	5	3
Basic metal products	3	17	9	1	17	1	19	5	1	4
Fabricated metal products except machinery	15	8	14	6	1	18	11	3	7	12
Machinery and appliances except electrical	14	3	7	4	8	12	7	13	14	9
Electrical machinery, apparatus, appliances and supply	18	9	9	18	4	14	15	8	16	16
Transport equipment	13	11	17	14	3	15	8	1	11	10
Miscellaneous manufacturing industries	1	15	8	16	15	10	2	5	10	17

lation for yearly rank distributions, show that the ranks from year to year are almost completely uncorrelated and overall this indicates that autoregressive effects are unlikely.

Measures of net entry rate, absolute net entry rate, net entry and absolute net entry, have also been derived and the averages for the decade ranked. Absolute measures, where the sign of the variable is ignored, tend give a clear indication of the most active sectors. By the end of the period the more active sectors (absolute values of either net exit or net entry) in terms of numbers of firms were found to be textiles, footwear and sewing of fabric, fabricated metal products except machinery, wood and cork, furniture and fixtures, electrical machinery, apparatus appliances and supply. In two earlier studies Giannitsis (1985, 1988), using a somewhat different definition of net entry found that the five most active sectors in the period 1978–1984 were the same as for the earlier 1969–1978 period. These were those of transport equipment, footwear and sewing of fabric, fabricated metal products except machinery, food, and wood and cork. Three out of five sectors were then the same as for this research.

3. Some potential determinants of net entry (exit)

Some attempts are made next to hypothesize relationships that might account for the net entry of firms into Greek manufacturing between 1982 and 1991. Two types of determinants of the net entry rate are employed. Macroeconomic variables, such as the rate of growth of real GDP, the cost of capital, and the unemployment rate have the rationale that, to the extent that temporal variation occurs, this could be the result of sectorally independent influences of wider movements in the economy. Industry or sector-specific variables are also deployed in the anticipation that they could be associated with the net entry performance. The inclusion of such variables can be justified for three reasons. First, it should be recognised that the two techniques of regression and analysis of variance are not the same in that statistical infer-

ence is based on a conditional mean in the case of the former and an unconditional mean in the case of the latter. Second, the analysis of variance previously reported on does indicate a lack of sectoral variation in the data, but there do seem also to be interaction effects between the cross-sectional and time-series units. Interaction effects issue a warning signal that effects attributed to a factor (years) are best qualified by also specifying the level of the other factor (sectors). Third, industry-specific variables employed here can, of course, at the same time present temporal as well as sectoral variation.

Highfield and Smiley (1987) addressed the question of the type of business climate that leads to a greater increase in the rate of formation of new firms. They provide two macroeconomic scenarios relevant to increasing new firm start-ups. The first is based on the rather naive assumption that the individuals starting up new businesses take into account the prevailing macroeconomic conditions and expect these conditions to persist. According to this scenario, usefully characterised as driven by a kind of 'pull' hypothesis, high rates of growth of real GNP, lower real interest rates, high inflation rates, high new plant and equipment expenditure growth and decreases in the unemployment rate favour higher rates in new firm start-ups. (Terms such as 'push' and 'pull' have been borrowed from studies discussing the role of unemployment in new firm formation, Hamilton, 1986; Harrison and Hart, 1983; Creedy and Johnson, 1983.)

The alternative scenario is an 'opportunistic' one. Here, decreasing rates relating to expenditures on new plant and equipment may present opportunity for newcomers by reducing entry barriers that have to be met and overcome. Additionally, an increasing unemployment rate may be interpreted by potential entrepreneurs as an opportunity of attracting better quality, lower cost labour. Or, it could also mean, in a labour market context, that during a period of increasing unemployment, individuals are 'pushed' into undertaking entrepreneurial initiatives as a result of the fear of becoming unemployed (Storey and Jones, 1987; Storey, 1991). This theorisation concerning the role of unemployment must necessarily be associated more with small firms. In addition, lower rates of growth in real GNP, lower rates of inflation, and high real interest rates could, according to Highfield and Smiley, also lead to an increase in the rate of new firm formation. They concluded that for the U.S. economy at that time the second scenario reflects what prevails in practice.

A later study by Yamawaki (1991) for Japanese manufacturing industries concluded almost exactly the opposite. Here was found a positive relation between the GNP growth and firm entry, while at the same time the relation between cost of capital (discount rate of the central bank and price index of investment goods) and entry rates was negative. It is worth mentioning, however, that while Highfield and Smiley used a gross entry measure, Yamawaki used a net entry one. Audretsch and Acs (1994), using the U.S. Small Business Database, found the GDP growth rate to be positive and significant, and additionally unemployment was shown to be positive and significant, in relation to new firm startups. The same outcome for unemployment was also evident, but not significant, in Wagner (1994) in a study examining the determinants of new firm formation in manufacturing industries of Lower Saxony. The discount rate on the other hand was significant and negatively related to small firm entry.

It could be argued here that when a combination of cross section and time series data are used in explaining patterns of a net entry measure, the interpretation of whatever results follow should be treated with caution. What the above implies is analyzed in the following examples. The first refers to what might be termed a 'recession push' hypothesis. (Since both the 'pull' and 'push' hypotheses, as originally stated, referred to gross entry measures, they need to be modified to accommodate the outcome of exit as well.) Under this hypothesis, lower growth rates of real GNP could lead to an increasing level of new firm formation. It might be anticipated that lower GNP growth should be accompanied by an increasing entry figure when gross entry is used. Thus, there is negative relation between the gross entry rate and lower GNP growth rates. The question, however, is whether the same negative relation is evident when this explanatory variable has to deal with exit figures. Since there is little to logically justify that exit should be obstructed in the case of recession, it should be

assumed that there is also a negative relation between exit and lower GNP growth. Thus, it can be deduced that under a 'push' theorisation the sign of the relation holds for both cases – entry and exit.

What might be expected in practice is that recession leads to higher firm turnover – higher levels of both births as well as deaths (entry plus exit). This in turn results in higher volatility in the net entry measure providing the base for a higher degree of displacement effect. It can be shown that both the cases of negative and positive net entry can exist under the 'push' hypothesis here modified to encompass also exit.

In Figure 1, if the relation of entry with GNP is steeper than the relation of exit with GNP, then it follows that net entry rates become a negative function of increasing GNP rates. But when exit is steeper than entry, net entry rates become a positive function of GNP rates and this may be called a 'pseudo-pull' since net entry rates become higher with higher GNP growth rates (Figure 2).

What happens logically then under a 'push' theorisation is dependent on the values of the relative entry and exit elasticity in response to GNP rates. As far as the alternative hypothesis is concerned, it could be said that higher growth rates of GNP 'pull' individuals to establish their own firms. Under this hypothesis it is clear that the relation to be expected between GNP growth and entry rates is positive. The important question here, however, is whether the relationship between higher GNP growth rates and exit rates can be positive as well. An intuitive answer to this question indicates that since there is no reason

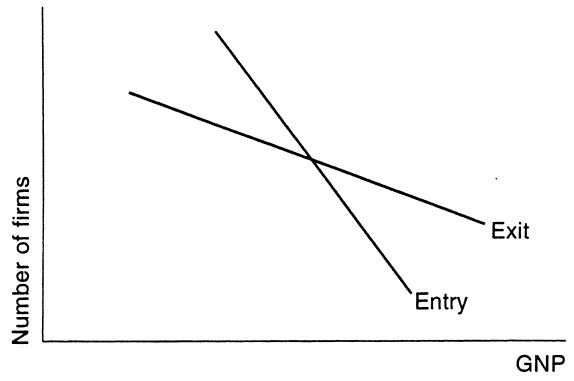

Fig. 1. Hypothetical relationship between firm entry and exit with levels of GNP where entry is more elastic than exit.

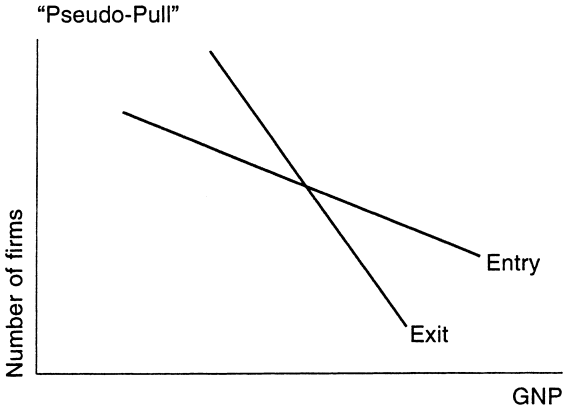

Fig. 2. Hypothetical relationship between firm entry and exit with levels of GNP where exit is more elastic than entry.

why exit should be facilitated in times of recovery or fast growth, the relationship between exit and ameliorating economic conditions should be far from positive. The rationale behind such an answer is that if firms are 'pulled' into markets they enjoy greater probability of continuing their operations within these markets under favourable economic conditions.

This reasoning ignores, however, the possibility that the process of increasing entry under the 'pull' hypothesis can itself create a tendency towards increased exit. This is because even an expanding economy has finite ability to accommodate new entrants and there should be a point beyond which the increasing supply of firms is not digested by the markets. Furthermore, the existence of this surplus may in turn result in the initiation of exit which may be, in volume terms, far more than what otherwise should be. In addition, to the extent that entry and exit from the markets is a selective process determining survivors and losers, it could be that the existence of surplus in the supply of firms during recovery has the potential to give way to replacement effects as well.

So, under a modified 'pull' theorisation both symmetry and asymmetry in the relationship between entry and exit and economic growth can be found. The 'pull' hypothesis under asymmetry is shown in Figure 3 where increasing net entry rates or decreasing net exit rates are related to higher GNP.

The opposite is the case when allowance for the

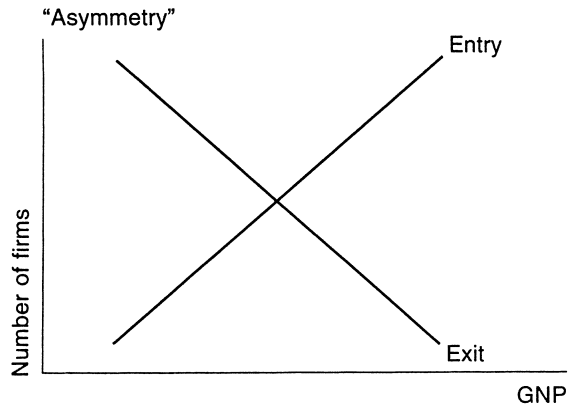

Fig. 3. Hypothetical relationship between entry and exit with GNP under condition of asymmetry.

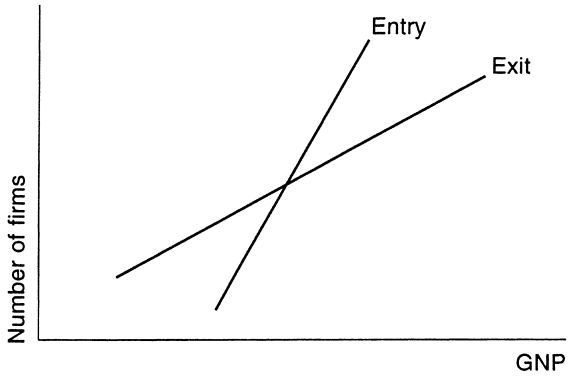

Fig. 4. Hypothetical relationship between firm entry and exit with GNP under condition of symmetry where exit is more elastic than entry to changes in GNP.

existence of symmetry is assumed. In Figure 4 when entry and exit are both positive functions of higher GNP growth rates, and the relationship with GNP for exit is steeper than for entry, higher rates of GNP growth are accompanied by lower net entry rates and higher exit rates. Since there may be a surplus in the supply of firms, entry is less elastic in response to higher GNP rates than exit. This might be usefully termed 'pseudo-push' in that lower GNP rates are related to higher net entry rates.

A second case under symmetry and within the limits of the 'push' hypothesis could reflect a situation where the entry relation is steeper than for exit (Figure 5). Entry is more elastic in responding to recovery than exit and the system

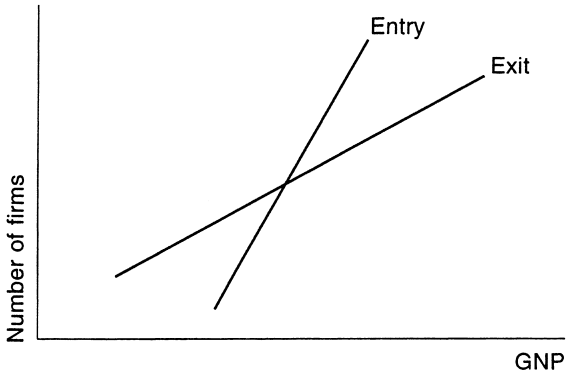

Fig. 5. Hypothetical relationship between firm entry and exit with GNP under condition of symmetry where entry is more elastic than exit to changes in GNP.

is more accommodating of new firms than previously. Therefore, given the ameliorating economic conditions, net entry rates become higher. It can be seen that the results obtained when entry rates are used under this latter variant of the symmetry hypothesis are identical to those of the asymmetry hypothesis.

The adoption of a symmetry approach has the advantage of taking account of entry as a cause of exit also allowing for a limited capacity of accommodating potential entrants. The latter can additionally explain the case when expansion in the economy is absorbed by increasing capacity of incumbent firms, which can be seen as a form of unmeasured entry.

When the entry curve is steeper than that of exit, this does not mean that the system has an unlimited capacity to accommodate new entrants. It means that for the given stage of economic growth, for a given degree of industrial saturation of the existing industrial mix, the system is still flexible enough to allow for entry elasticity higher than that of exit.Here the supply of firms is unrestricted by the limit determined by factors such as those presented above. When, however, this supply exceeds the tolerance limits of the system, then entry becomes less elastic than exit, leading to lower entry rates. As the net entry rates decrease but the economy is still on its way to recovery, new room is made for entrants, entry becomes more elastic and entry rates increase until the point where over optimistic reactions of potential entrants may create oversupply, which in turn

readjusts the relations of the relative elasticity of entry and exit.

Although the 'pull' and 'push' hypotheses appear to be controversial, they seem to apply to real world conditions. There is no reason to assume that once one has been proved to hold, this will continue to hold forever and for all the economic players involved. Much depends on the point of the economic cycle an economy is at, what the past has brought and what the future holds.

The macroeconomic variables deployed are the growth rates of real GDP (RGDPGR), and the price index of investment goods (PINVR). The first captures conditions of the overall state of the economy and demand fluctuations, whereas the second reflects the cost of capital. The rationale behind the introduction of a cost of capital component as a determinant of entry rates is justified because entry usually is also an investment decision. The higher the cost of capital the lower should be the entry rate.

Yamawaki (1991) included, as a second component of the cost of capital, the discount rate of the central bank. In the Greek case this was, during the study period, stable enough not to offer much scope. An alternative was lending rates which varied more from year to year. However because of collinearity between the growth rate of the price index of investment goods and the lending rates, the latter were excluded as they produced inferior results.

Unemployment rates, both in-phase and lagged one year, were also used in the calibrations. There were indications that unemployment was positively related to net entry, as in other studies, but the results here were not significant. In addition there were clear problems of severe collinearity with other macroeconomic variables used and as a result the unemployment indicators were excluded from the analysis.

A number of industry-specific variables were also employed. Some refer to sectoral growth and opportunity. Industry growth of employment can be thought of as a factor inducing entry in that as the market size increases any entry activity has a greater possibility to go unnoticed by incumbent firms. In this sense, industry growth seems to make room for potential entrants. The price-cost margin (PCM), a proxy for sectoral profitability and defined here as value-added minus payroll over sales, is generally expected to be positively associated with net entry rates. It is possible, however, to obtain a negative sign in cases where higher price-cost margins reflect a situation where industry profitability is attributed to 'blockaded' entry (Duetsch, 1975). Thus, PCM should be seen in conjunction with the effectiveness of barriers to entry. When PCM is high and both entry and exit are high, this could mean that there are low barriers to entry and exit and what industry experiences in practice is 'hit and run' entry. The latter offers support for the existence of contestable markets. But when a high PCM is accompanied by both low entry and exit, barriers to entry are high, entry is unattractive and exit is deterred – entry is 'blockaded'.

Since a net entry definition is used in this study, it will be worthwhile to see the possible outcomes of the relationship between PCM and net entry rates under both symmetry and asymmetry assumptions. Under the latter, entry is positively related to PCM while the relation between the number of exiting firms and PCM is negative. Thus, it is expected that, to the extent that the asymmetry assumption holds in practice, net entry rates should be a positive function of higher PCM values.

When symmetry is assumed, that is, both entry and exit are positive functions of PCM, then two sub cases may emerge. When entry is less elastic than exit in response to higher PCM values, the relation between net entry rates and PCM should be negative. Figure 4 is helpful in this case (replacing GNP on the horizontal axis by PCM). As a result, although PCM induces entry it does so to lesser degree than it does for exit. Potential entrants find it difficult to be accommodated in industries where other factors deterring entry become more significant than higher PCM values, or other factors inducing entry. If there is surplus of firms attempting entry, they cannot all be absorbed by an industry, even where barriers to entry are low. The existence of surplus can, in turn, lead to the replacement of less efficient firms by more efficient ones overall increasing exit.

The converse is when, under the symmetry assumption, entry is more elastic than exit to changes in PCM and the relation between net entry rates and PCM is positive. This means that PCM

as a factor inducing entry is more effective than others inducing exit and that the particular industry is not yet saturated. Figure 5 is illustrative of this case having changed the explanatory variable to PCM. Both the asymmetry hypothesis and the latter case of a symmetry assumption with a steeper entry curve result in higher net entry rates. But when entry rates become lower, given increases in PCM, then inference can be made for the existence of symmetry even when a net entry definition is used. It should be noted that the PCM variable used in this study was taken in logarithmic form (LPCM).

As an entry barrier, the concept of economies of scale in production was represented by the cost disadvantage ratio (CDR). This was defined as value-added per employee in the largest size class available (> 100 employees) divided by that in the smallest (10–19 employees). The CDR is usually defined as the average-value added per employee in plants which provide the top 50% percent of industry output, over the average value-added per employee in plants supplying the bottom 50% of the industry output. The definition used here was dictated by data availability and justified because the highest size class does consistently provide more than the 50% of industry output in all sectors in all study years. The greater the value of CDR, the greater the difficulty that is met by potential entrants establishing units in the lowest size class and the more difficult becomes the exit of firms belonging to highest size class if the symmetry assumption holds. The existence of cost advantages favouring larger firm sizes can be in turn attributed to the existence of economies of scale in production.

An alternative involves a composite between the minimum efficient size (MES) and CDR. When this was attempted, MES was defined following Weiss (1963) as the net output of the size class containing the mid-point of the cumulative distribution of net output, divided by the number of plants in the class and expressed as percentage of the industry output. However analysis proved that this variable exhibited an inferior performance to CDR alone.

The interpretation of the signs of the relationships between CDR and net entry rates is again susceptible as to whether CDR as a barrier to entry is symmetrical or not against both entry and exit. Under asymmetry, higher values of CDR result in lower entry rates, and in higher exit rates when there is a low degree of 'sunkness' in costs to achieve production economies of scale. Under asymmetry, it follows that net entry rates become lower as the cost advantages of operating at higher production scales increase. This is shown in Figure 6.

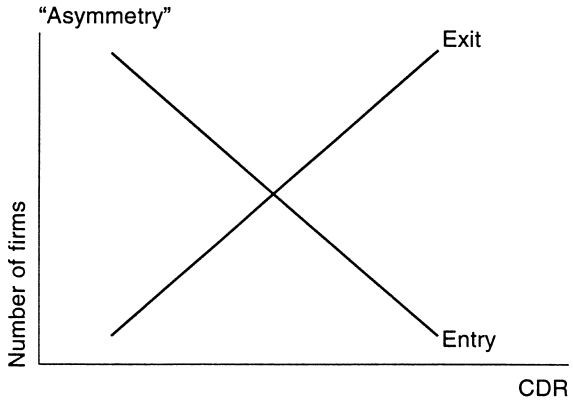

Fig. 6. Hypothetical relationship between entry and exit with CDR under condition of asymmetry.

When symmetry holds two cases may emerge. The first refers to a situation where entry is less elastic than exit in response to increasing cost advantages by higher levels of production scale. This means that although economies of scale are a significant barrier to both entry and exit, the variable becomes more powerful when it deals with exit. Higher net entry rates in that case should be attributed to lower exit rates rather than to higher entry rates. Figure 2 can be used to illustrate this case substituting CDR. When entry becomes steeper than exit, economies of scale are still a significant barrier to both entry and exit, but this time are more important on the entry side. Net entry rates become lower as economies of scale become more beneficial to size. These lower net entry rates, however should be now attributed to lower entry rates. Figure 1 is helpful here again substituting CDR.

Different outcomes under the symmetry assumption are possible when the net entry measure is used, and these clearly beg the question about the quality of entry and exit. Thus, under the first symmetry case, firms entering an industry are likely to be efficient enough to overcome entry

barriers. This means that firms are of larger size and/or are more productive than usual. Given the second symmetry assumption, however, there are likely to be more under-qualified potential entrants from which the final survivors are selected. The overwhelming majority cannot deliver the requirements of successful entry.

The relationships between other factors affecting entry and exit and net entry rates could be considered in the same vein but space does not permit. Capital requirements for entry were proxied as ratio of sectoral fuel and energy consumption in monetary values to the total value of production (KR). Since mechanisation (measured through fuel and energy consumption) and capital intensity go in hand, the variable can be thought of as representing capital intensity (Droucopoulos and Thomadakis, 1993). 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 research expenditure for each sector that includes both product research and market research, this summary variable was used as an alternative to individual variables capturing advertising and R&D expenditures, both over sales (Thomadakis and Droucopoulos, 1994). Following Sleuwaegen and Dehandschutter (1991) and Anagnostaki and Louri (1995), the effects of trade conditions for each sector on firm entry were examined. Greece is an open economy, especially after EU accession. Import penetration should deter entry, unless increasing import penetration widens the domestic market, increasing the number of units and reducing collusive reaction of incumbent firms to domestic entry. Import penetration (IMP) is defined as the value of imports over the apparent consumption. Export orientation (EXP) is related to greater opportunities to satisfy demand beyond the given domestic limits, thus encouraging entrants. It is defined as the ratio of sectoral exports to sales.

4. Model estimation and results

Since this research deals with both cross-section and time-series data, the regression modelling disturbance terms could be both heteroscedastic, usually the case with cross-sectional data, and autocorrelated, often evident in time-series models. To overcome these problems a Kmenta (1986) type of model was adopted. The model assumes heteroscedasticity, cross sectional independence and autocorrelation in the residuals.

One of the possible drawbacks of the model is the presence of a degree of collinearity among some of the industry-specific variables. Nevertheless none of the variables was dropped in the analysis since the regression coefficients, which are not individually significant, did not improve their significance level when others, collinear with them, were excluded. Multicollinearity was regarded, then, as not being particularly harmful in this case. Regression results of alternative model specifications are provided to support the argument.

The results of the estimation are presented in Table V. Equation (1) represents a version of the model where only those independent variables which are uncorrelated with each other are included. Equation (2) includes a wider range of explanatory variables which sometimes are modestly intercorrelated. This specification is that used for the commentary which is to follow. Finally, equation (3) is similar to (2) excluding the product differentiation variable which was not significant in equation (2) and when absent from equation (3) does not affect the results, indicating the effects of collinearity are not particularly serious.

In equation (2), the proxy for sectoral profitability (LPCM) was negative and of moderate significance signifying the lower the sectoral profitability the higher the exit rates and lower the entry rates in an industry. This seems to reflect a situation where entry barriers are more important than factors inducing entry and/or there is an excess supply of entrants which cannot be accommodated in the industry. Entry appears to be 'blockaded'. This result can be combined with the sign and the significance level of the cost disadvantage ratio. The CDR was found to be significant and positive pointing to a direct impact on net entry rates. Furthermore, CDR should be a harder barrier to exit than entry. When entry responds to higher PCM values, it is likely to apply only for the more efficient firms.

Capital requirements (KR) were found to be of moderate significance and positive, reinforcing the conclusions drawn above for the relationships

TABLE V
Results of regressions accounting for net entry rates into Greek manufacturing, 1982–1991

Variable name	Estimated coefficient (1)	(2)	(3)
LPCM	-0.10043×10^{-1} (–1.952)	-0.15117×10^{-1} (–2.588)	-0.15226×10^{-1} (–2.583)
CDR	0.75786×10^{-2} (2.748)	0.88973×10^{-2} (3.200)	0.87517×10^{-2} (3.176)
RGDPGR	-0.35970×10^{-2} (–4.281)	-0.38449×10^{-2} (–4.258)	-0.38615×10^{-2} (–4.285)
PINVR	–0.17013 (–4.872)	–0.19105 (–5.026)	–0.19061 (–5.016)
EMPLGR	0.48041×10^{-1} (2.294)	0.31825×10^{-1} (1.345)	0.31538×10^{-1} (1.335)
ARDT		-0.47502×10^{-1} (–0.4585)	
KR		0.62720×10^{-1} (1.586)	0.63937×10^{-1} (1.633)
IMP		0.17175×10^{-3} (1.811)	0.17614×10^{-3} (1.847)
EXP		-0.17484×10^{-3} (–1.054)	-0.17091×10^{-3} (–1.031)
CONSTANT	0.41580×10^{-2} (0.4156)	-0.83191×10^{-2} (–0.6114)	-0.91942×10^{-2} (–0.6751)
Buse R^2	0.1733	0.2131	0.2133
R^2 between observed and predicted	0.2513	0.2895	0.2890
DW	1.9477	1.9360	1.9371
N	200	190	190

Notes:
T-values in parentheses.
Where IMP and EXP are used the printing and publishing sector was not included since there were no data provided.

between PCM and CDR and net entry rates. Industry growth in terms of employment was found to be positively related to net entry rates in agreement with prior expectations and results in previous studies.

Import penetration was found to be of only moderate significance and positively related to net entry rates. This result confirms earlier findings by Anagnostaki and Louri (1995), their study using gross entry and exit, finding that import penetration was negatively related to both entry and exit. Moreover, it was found that import penetration appears to be less important as an explanation on the entry side, perhaps referring to the hypothetical situation presented in Figure 2 (substituting IMP). In that case both entry and exit are negatively related to higher IMP rates but exit is more elastic than entry. Manufacturing firms in Greece, then, are less discouraged to entry than they are forced to exit under international competition. Conversely export orientation was of moderate insignificance and negatively related to net entry rates. The hypothetical relationship described in Figure 4 seems to match these results (substituting EXP). In this case both entry and exit are positively associated with increasing export orientation, but exit is more elastic than entry. Sectors characterised by a better export performance may attract entry, perhaps reflecting a high number of low quality, uncompetitive firms which may soon contribute to exit. The more firms attempt to enter into export intensive sectors the more fail to survive a finding also drawn by Anagnostaki and Louri (1995).

Product differentiation, as captured by ARDT, was not found to be a significant barrier to either entry or exit. Its negative sign, seen with other important barriers to entry, may indicate that this acts in a symmetrical manner, but it might be more important when entry is concerned.

For macroeconomic conditions, values of gross domestic product (RGDPGR) were found to have significant negative effects on entry rates. The interpretation, however, of this negative relation is not at all clear cut. It appears that the ‘push’ hypothesis holds. But recall from section 2 that during the 1986–1987 period the lowest growth rate of real GDP in the study period coincided on average with the highest positive net entry figure, whereas the second lowest GDP growth rate (1990–1991) corresponded with the highest negative net entry rate. This is insufficient evidence for the validity of the ‘push’ hypothesis in the case of Greek manufacturing. What seems more plausible is that both entry and exit were positive functions of higher GDP growth rates, but

exit was more elastic than entry. This indicates that the 'pseudo-push' hypothesis presented holds. It seems that potential entrants into Greek manufacturing industries overreact to ameliorating economic conditions producing an oversupply of new firms, which in turn creates exit as a reaction to that surplus. As a result, net entry rates appear to be a negative function of higher GDP growth rates.

The proxy for capital effects (PINVR) appears to be significant and negative. Lower net entry rates were associated with higher cost of capital conditions, and this conforms with theoretical expectations.

The possible role of time-lags in the independent variables were explored by incorporating time-lags up to three years in the model. Lagged, adaptive and rational forms of expectations were used to produce a better estimated proxy for perceived profitability in each one of the industries concerned. The results obtained, however, did not confirm these hypotheses. Thus, as for Yamawaki (1991), the PCM values used as the explanatory variable refer to time t and were taken as corresponding to net entry for the period from t-1 to t. Arguably, however, although this time-definition of PCM has been used elsewhere, it does tend to obscure causalities. It is difficult to distinguish between the role of PCM as a cause of entry and the determination of the ex-post level of PCM as the result of entry and exit activity. The entry definition in use here encompasses both entry and exit action. This, coupled with the fact that PCM was negatively related to net entry (exit is more elastic than entry in response to PCM values), means that the selection of PCM values at time t can be justified, arguing that exit is more quickly responding to changes in profit levels than is entry (Shapiro and Khemani, 1987). Time-lags were also tried in other independent variables. Among them, one year lags were found to perform better when applied to the product differentiation, import penetration and export orientation variables and results are given in Table VI. The main difference between these results and those of Table V concern mainly the significance levels of KR and ARDT and EXP. The product differentiation proxy performs better when is lagged. Export orientation is also improved when lagged. The opposite is, however, the case for the capital requirements proxy, which becomes highly insignificant. The overall explanatory power of the model is increased at the expense of higher multicollinearity between some of the independent variables. The signs of the relationships, however, seem to hold in all the different model specifications.

TABLE VI
Results of regression using one year lags in selected variables accounting for net entry rates into Greek manufacturing, 1982–1991

Variable name	Estimated coefficient	T-ratio
LPCM	-0.11697×10^{-1}	–2.013
CDR	0.91421×10^{-2}	3.252
RGDPGR	-0.41035×10^{-2}	–4.538
PINVR	–0.21508	–5.481
EMPLGR	0.56810×10^{-1}	2.307
ARDT (one year lag)	–0.99315	–2.960
KR	0.47291×10^{-2}	0.1296
IMP (one-year lag)	0.64737×10^{-3}	1.862
EXP (one-year lag)	-0.47422×10^{-3}	–1.774
CONSTANT	0.88399×10^{-2}	0.8319
Buse R^2	0.3222	
R^2 between observed and predicted	0.3751	
DW	1.9914	
N	171	

Note: Where IMP and EXP are used the printing and publishing sector was not included since there were no data provided.

Probably the most important drawback of the models presented is the assumption of zero correlation across the cross sectional units, especially when these units refer to the total number of two digit sectors of one country as in the present case. The model is most appropriately used, however, in cases where the number of the time periods (T) concerned is higher than the number of cross sectional units (N) used, since the properties of the estimators depend on an increase in the number of the former (Greene, 1993). Here the larger number of cross-sectional units resulted in the singularity of the residual variance-covariance matrix meaning the extended model, accounting for cross-sectional correlation, could not be undertaken. The generally low explanatory power of the model should be attributed to this technical problem. One way to overcome the problem, accounting for cross sectional dependency on the one hand, and enhancing understanding of the

determinants of net entry in Greek manufacturing industries on the other, is to divide the two digit industries in groups in order to satisfy the condition N < T. These experiments are in preparation.

5. Conclusions

Gross firm entry measures are clearly of the highest value in process terms, but it is argued here that net entry is worthy of study in its own right as it reflects the outcome of the combination of processes. Certainly it need not be interpreted simply as entry as is often the case. Dealing with a net entry definition makes the attempt to model and explain variations in firm entry across industries and over time a difficult task. Different assumptions of the mechanisms behind firms' entry and exit can lead to seemingly identical results when net entry is used. As a result, it has been argued throughout this paper that great care should be taken in the interpretation of relationships found in the empirical studies. Mention must be made of different hypotheses and their outcomes in order to denote the cases where no straightforward answer can be given about the validity of a particular assumption. Within the limits of this study, a series of different assumptions have been analyzed providing indications for the existence of cases where no decision can be made about the adoption of particular hypotheses or the exclusion of others.

Net entry rates in Greek manufacturing industries do appear to be characterised by significant temporal variation but not sectoral variation. The absence of the latter appears to characterise net entry rates in the Greek situation at this time, although in other net entry research contexts sectoral variation has been shown to be present (Yamawaki, 1991). A large number of industrial sectors were found to be by the end of the study period in the same position in net entry rate ranks as they were at the start. This indicates that the benefits of the sectoral policy applied during the study period aiming to enhance new firm creation in selected sectors did not result in stable and/or positive net entry patterns of these sectors.

The existence of profitable business opportunities was not shown to be a sufficient condition leading to higher net entry rates. But the existence of cost advantages of operating at larger scales did tend to result in lower exit rates, while at the same time promoting successful entry of perhaps more efficient firms. Industry growth had a positive impact on net entry rates which is in agreement with results of other studies and theoretical expectations.

Cost of capital conditions had a direct and negative impact on entry rates. The overall condition of the economy, as reflected by the real growth of GDP, had a significant negative effect on net entry rates. This may be attributed to an overreaction of potential entrants in response to improvements in such conditions.

The results of the present research on import penetration and export orientation tend to agree with those of earlier studies. The role of export orientation seems to offer additional evidence for the interpretation of the findings about GDP growth rates. In both the cases, it seems that the response of potential entrants creates surplus in the supply of new firms, thus resulting over time in increased exit. Import penetration seems to affect entry less markedly than exit. This may also indicate that optimism governs the entrepreneurial initiatives in the case of Greek manufacturing. The model used was not efficient in capturing individual responses to conditions prevailing in manufacturing and the economy in general. This signifies that models of greater flexibility in future research are required for advancement in this area. Furthermore, analyses comparing entry conditions of different size classes across industries over time will also be helpful in enhancing understanding of the causalities of the phenomenon under study.

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