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INDUSTRIAL DETERMINANTS OF ENTRY AND SURVIVAL: THE CASE OF AVE

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ABSTRACT

The Portuguese region of Ave experienced, in the eighties, a process of crisis, followed by a noticeable recovery. The aim of this paper is to find industry specific determinants of firms' entry and survival for Ave during that period. Results appear to be different from those of other studies. In Ave, variables like industry profit rates, minimum economic dimension, the importance of foreign trade, and industry relative size seem to have decisively influenced entry. Survival determinants are less clear, though the influence of foreign trade and firms debts look like to have contributed to firms' survival.

RESUMO

A região do Ave registou, durante a década de 80, um processo de crise, seguido de uma considerável recuperação. O objectivo deste artigo é o de encontrar as determinantes, específicas da indústria, da entrada de novas empresas, e da sobrevivência das existentes, durante esse período. Alguns resultados são diferentes dos de outros estudos, em relação a outros casos. Nomeadamente, variáveis como a taxa de lucro, a dimensão económica mínima, a importância do comércio externo, e a dimensão relativa de cada indústria parecem ter influenciado decisivamente a entrada. As determinantes da sobrevivência são menos claras, embora a influência do comércio externo e o endividamento das empresas pareçam ter tido um contributo significativo.

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1. INTRODUCTORY NOTE

This paper focuses on firms' entry and survival in the Portuguese region of Ave. The Ave region is located in the North of Portugal, and its economy was formerly based on agriculture. In the second half of the 20th century, manufacturing had an extraordinary development there, mainly due to the establishment of textile and clothing industries.

In fact, employment structure in Ave is characterised by a sharp domination of manufacturing, with 60% of its employees working in this sector, in 1997¹. Besides, textile and clothing industries included, in the same year, 73% of all employment in manufacturing², and this pattern of a strong specialisation hasn't changed much, since the same figure was of 79% in 1985. Footwear industry used, in 1997, 7% of the employment, and no other industry would even reach 3%. So, textile and clothing still employ a great majority of workers, while textile, clothing and footwear represent 80% of all manufacturing employment.

During the 80's and the 90's, the Ave region has experienced a process of industrial crisis, including the exit of an important number of firms. Competition from Asian countries manufactures may have been one of the leading factors of the crisis, together with a wage raise due to a shortage in labour offer.

However, this process was followed by a noticeable recovery. Indeed, manufacturing employment fell by 2.9% throughout the period, both by the exit of firms and by size reduction of surviving and new firms. And total employment, excluding the agricultural sector, increased, thanks to the development of trade and services.

Instead of bringing an industrial diversification, re-estructuration in manufacturing proved to be mainly inside the textile and clothing industries. These latter display a higher entry rate, as well as a lower survival rate³. Average size had also a much larger reduction in textile and clothing than in all other industries. Basically, the most important features of the change in the manufacturing pattern of Ave were a noticeable increase in clothing industry employment and firms and a fall, in the same items, in spinning and weaving.

¹ Data on line, from the INE (Instituto Nacional de Estatística).

² These and the following data, when its source is not mentioned, are from DETEFP (Departamento de Estatística do Trabalho, do Emprego e Formação Profissional). They are unpublished data.

³ These rates will be specified below.

These brief remarks on Ave's process of crisis and recovery are meant to show the point of this essay. I intend to find which variables influenced entry and survival, in a context of deep crisis and noticeable recovery, rather than in a more gradual evolution context. So, that's why the case of Ave, as well as the period of the 80's and 90's, were chosen as the object of this study, and not, for instance, the whole country in a less turbulent period.

Thus, with this paper, I try to find if there are sector or industry specific determinants of entry and survival. Indeed, some works⁴ about entry and survival have focused on size, age, or other characteristics that are more firm specific than industry specific. However, I believe it may be interesting to investigate which industry characteristics may influence entry and survival.

Section 2 displays a brief survey of entry and survival conditions, both at the theoretical and at the empirical levels. In Section 3 the case of Ave is presented. Section 4 deals with size changes in Ave, while a few concluding remarks in Section 5 complete the paper.

2. ENTRY AND SURVIVAL

Microeconomic theory tells us that entry is mainly conditioned by industry attractiveness, namely by the profits incumbent firms are making, by its growth, and by the existence of barriers to entry.

High profits usually attract new firms, if entry is free. However, some arguments on the effectiveness of this mechanism have been pointed out. Geroski (1995) presents evidence on the fact that entry reacts slowly to high expected profits, and that only important differences of expected profits among industries may lead to different rates of entry. According to this point of view, profits are a sign of industry attractiveness only if they are relatively high, and the answer by potential entrants is slow. In what concerns the speed of entry as a reaction to high profits, one may argue that it may depend on other factors connected with the entry of a new firm, such as capital and technology requirements, and transaction costs. But these factors are mainly industry specific, which would lead us to suppose that entry reaction to high profits might depend on the industry.

Geroski (1995) concludes that empirical research results are misleading, because differences among profit rates are steady for a long period of time, while differences among entry rates express deep changes.

⁴ A good example of these works for Portuguese manufacturing is Mata and Portugal (1994).

Industry growth is another important determinant of entry, as growing industries obviously attract new firms. Audretsch (1997) suggests that, if empirical evidence shows a strong relation between industry growth and entry, this happens because high growth rates cause a rise in prices, and in the expected rate of profit. So, the final determinant would be the rate of profit, and not growth itself.

In the case of Ave, it wouldn't be adequate to use industry growth rates to account for raises in the level of the demand function. This is because its most important industries are export oriented, and the region output is only a small part of the world output. There would only be a point for local growth in industries with an important local market, such as bakery and confectionery, which experienced an important growth in the period between 1985 and 1997, owing to the changing habits of consumers. But that is special case of two industries among a total number of forty-five.

So, industry expansion should be better picked up in a world-wide context.

As for barriers to entry, structural barriers may exist, namely those connected with scale economies, and a variable expressing these economies should be introduced. Strategic barriers are unlikely to exist, as local market power is limited, and Ave's firms probably won't be able to develop strategic behaviour.

Related to barriers to entry are transaction costs. In fact, large transaction costs may prevent or delay entry. On the contrary, the existence of an efficient network of connections to suppliers, and to distributors or retailers, may make entry easier.

Survival and exit depend basically on the same variables as entry. Minimal industry profit rates are probably a condition for survival, as well as industry growth, while losses and decline lead to exit. Barriers to entry offset competition, thus helping survival. Large transaction costs may cause losses or other difficulties, and, so, the exit of firms. And, of course, the existence of sunk costs in an industry affect survival, preventing or delaying exit.

Empirical research about the influence of industry structure on entry and survival is scarce in Portugal. However, in a very interesting paper, Mata and Portugal (1994) study the determinants of Portuguese firms' lifetime. In what concerns industry specific determinants, they find a positive correlation between survival and industry growth, and a lack of significance for variables such as concentration ratios and minimum efficient scale.

3. The Case of Ave

3.1. Explanatory Variables and Data

Data on firms used in this paper was provided by DETEFP, for 1985 and 1997. This period is quite adequate to pick up crisis and recovery. Years like 1982 or 1983 would probably be better. However, 1985 is the first year for which a large number of firms, or almost all of them, were recorded by the DETEFP inquiry, while data for the precedent years display a very poor coverage. The year of 1997 was the last one with available data, by the time this study was carried on.

One firm is considered as *new* if it is recorded in 1997 files, but not in 1985 ones. If, on the contrary, it is displayed in both years' files, it is considered as a *surviving firm*⁵.

Of the 45 manufacturing industries present in Ave, some had a very small number of firms. This could cause problems. For instance, if one industry has only one firm, and if it exits in the period I considered, survival rate is zero, though the fact is meaningless. Thus, data included only industries with more than 5 firms in 1985. If the limiting number of firms was increased, some observations would be lost, and results would become poorer. Then, the 45 initial observations were reduced to 34.

The rate of entry (**E**) is defined as the ratio between the number of new firms in 1997, and the total number of firms in 1985. There may be other definitions. GEROSKI (1995) suggests the ratio of the whole number of firms in the last year to the same number in the first year. I don't think this ratio would be adequate in the present study, as it seems to fit better in shorter and a more steady periods of time. In this case, the period lasts twelve years, and new entrants have an important weigh in the total number of firms, which would make the ratio assume a very large value.

Survival and exit rates are complements, and so only one of them was to be chosen. Anyone could do, and I chose the survival rate (**S**), defined as the ratio of firms which existed both in 1985 and in 1997, to the whole number of firms in 1985.

⁵ It is difficult to find a proxy for transaction costs. The best one I could find was a measure of industry relative size (IS), in a local context. Thus, IS is the ratio of employment in an industry to total employment in Ave. It is expected that the larger is the local importance of one industry, the easier it is to establish a new firm. This happens on account of lower transaction costs, connected with better facilities of upstream and downstream markets, with the existence of technological assistance contracts and of industry associations, among other factors. IS was measured for average of 1997 and 1985 data.

Explanatory variables should be adequate to *local* entry and survival, and to a context of a crisis and recovery. With this purpose, the selected explanatory variables are the following:

1. As for a measure of the rate of profit, it seems more adequate to relate profits to capital, rather than using price cost margins. This is so because capital requirements are more industry specific than margins, and, also, as decisions concerning entry and exit are obviously related to financial considerations that must include expenditures on capital. So the variable **PTA**, which is the ratio of *net profits* to *total assets* (both by self financing and by loans), accounts for the profit rate. Data for this ratio is provided by Banco de Portugal (1995), for the median of each industry. I chose data on **PTA** for 1995, because, though this year lies in the end of the period, it may capture the idea of expected profits.

As stated in the previous section, a positive correlation between **PTA** and both entry and survival is to be expected.

2. Industry growth would be better measured by a variable that expresses the importance of external trade in each industry, as local growth wouldn't be meaningful. Data for world trade is too much aggregated and is unavailable for the 34 sectors selected for Ave. In a first attempt to select the right variable, national growth of exports and imports proved to be non significant. It may well be so, both because this indicator is connected with the country's competitiveness, and on account of an irregular behaviour in this period, as it comprehends Portugal's adhesion to the European Union, and the consequent trade intensification.

So, I tried to find a measure of the importance of foreign trade in each industry. This is by no means a proxy for industrial growth. Rather, it may account for a different behaviour in industries opened to foreign trade, probably increasing entry and decreasing survival. This variable (**FT**) is the ratio of the sum of an industry exports and imports to its total employment. It is not clear that the sign of **FT** may be definitely positive or negative. Export oriented industries may be more attractive if exports are growing. But selling abroad may prove to be more difficult. The importance of imports is still less clear. A greater external competitiveness may be a negative determinant of entry, though it may also mean demand is growing, and, so, attract entry. INE (1985) and INE (1997) provide data for exports and imports. The

ratio used in the equations below contains the average values (of 1985 and 1997) for imports, exports, and employment.

3. Minimum efficient scale (**MES**) should be negatively correlated with the entry of new firms, as it works as barrier to entry. The picture is not so clear for survival. In fact, a large **MES** may make it harder for firms to survive, as it is related to more capital requirements and often to larger amounts of loans. On the other hand, **MES** may act as a proxy for sunk costs, and a large **MES** could delay survival. As **MES** initially proved to be non significant for survival, probably on account of these contradictory effects, it was excluded from the final survival equation.

Mata and Portugal (1994) use a measure of **MES**, which they computed for Portugal, following the methodology suggested by Lyons (1980). I used Lyons' results for the UK. As **MES** is a technological concept, and is not a nation specific measure, I thought it would be better to take the UK measure, as it was computed in a wider basis, owing to the much larger number of firms in the UK, compared to Portuguese ones. Besides, British **MES** would probably be better suited to modern technology than the Portuguese one, and therefore it may account for technological transformations in Ave's industries in this period.

4. I also use a measure of relative firms dimension, the ratio of average industry size in 1985 to Lyons' **MES**. This measure (**RS**) looks like more adequate to explain survival than **MES** itself. Indeed, survival may not be affected by technological *a priori* restrictions, but rather by the way industry in Ave is actually positioned against these restrictions.
5. It is difficult to find a proxy for transaction costs. The best one I could find was a measure of industry relative size (**IS**), in a local context. Thus, **IS** is the ratio of employment in an industry to total employment in Ave. It is expected that the larger is the local importance of one industry, the easier it is to establish a new firm. This happens on account of lower transaction costs, connected with better facilities of upstream and downstream markets, with the existence of technological assistance contracts and of industry associations, among other factors. **IS** was measured for average of 1997 and 1985 data.
6. It is obvious that financial difficulties lead to exit and, so, are connected with a lower survival. What is not so obvious is the fact that these difficulties may be an industry

specific indicator. Anyway, it would be interesting to test it, though this indicator is related to difficulties in the market, among others. In order to consider the explanatory importance of financial difficulties firms may face, I used the ratio of external assets, measured by long term debts, to total assets (**DTA**), which is provided by Banco de Portugal (1995). Like **PTA**, this ratio is the median for each industry.

3.2. Behaviour of Explanatory Variables

Table 1 presents the behaviour of chosen variables between 1985 and 1997. Entry, expressed by the respective rate, was noticeably high, with an average value of 102%, corresponding to a duplication of the number of existing firms. The mean for survival is much smaller, indicating that in 1997 most of the firms were new ones. Both entry and survival present a small dispersion, and medians equal average values, which means the process was generalised among industries.

The evidence for **RS** shows that Ave's firms were much smaller than their corresponding **MES**, as computed for the U.K., and, in average, about 50% of the efficient scale. However, the other statistical measures suggest a wide dispersion, with a few highly over dimensioned industries. The same happens with **IS**, as textile and clothing specialisation is strong in Ave.

FT also displays a wide dispersion among industries, with lower than average values for most of them.

Correlation between explanatory variables is, in general, low, and the values of correlation matrix are quite acceptable.

Insert Table 1 here

Correlation coefficients only exceed the value of 0.4 for the case of **DTA** and **MES** (-0.46). One may argue this correlation should be positive, as a higher minimum efficient size usually requires larger assets, and, in some cases, higher debts. Anyway, these two variables aren't used together in the same regression.

3.3. Equations Specification and Results

Following my considerations about the explanatory variables, referred in sections 2 and 3.1., I chose the following equation specifications:

$$E = C + b_1 \text{MES} + b_2 \text{PTA} + b_3 \text{IS} + b_4 \text{FT} + \mu$$

$$S = C + b_1 \text{PTA} + b_2 \text{RS} + b_3 \text{FT} + b_4 \text{DTA} + \mu$$

In these regressions I used OLS method.

Results for entry are displayed in Table 2. As a whole, regression is significant at a 1% level (F statistic is of 3.78). All the explanatory variables are significant, at least at a 5% level. This makes results satisfactory and reliable. The value for R^2 is also acceptable, as I am using cross section data.

 Insert Table 2 here

Also, the conclusions I get for Ave region, during the chosen period, are quite interesting, as they oppose to other findings, mainly to Mata and Portugal (1994), in what concerns **MES**, and to Geroski (1995) considerations about the effect of profit rates.

So, and as it was expected, **MES** coefficient has a negative sign, and so minimum efficient scale was definitively an obstacle to entry, as new firms prefer industries with a smaller **MES**.

PTA influences entry in a positive way, and with a good level of significance, meaning that, in this case, industry profits effectively attracted entry.

Also, the effect of industry relative size is, no doubt, significant, and positive, as expected. This is probably related with less transaction costs, as was suggested above. This result is interesting, because it shows that, in some cases, recovery from crisis doesn't always follow a pattern of industrial diversification. On the contrary, and as it happened in Ave, the pattern of specialisation tends to be deepened.

Finally, industry exports and imports influence decisively entry. This may happen on account of a growing demand. If this is the case, the variable FT acts as a proxy for industry expansion. Otherwise, one might think that a region where export oriented industries dominate tends to deepen this pattern of industrialisation. Indeed, transaction costs related to the activity of exports may be lower, due to the existence of a long experience in dealing with foreign markets.

Results for survival, as displayed in table 3, are not so good. Though regression is significant at a 5% level (F statistic is 2.79), variables like **PTA** and **RS** are clearly non significant.

As for **PTA**, the sign is positive, as expected, and, though the level of significance (12%) is bad, it isn't too far from acceptable limits. Anyway, a better result for this variable was expected. It is possible that sunk costs offset the importance of this variable, delayed exit even if industry's profits are low or negative.

Insert Table 3 here

RS is no doubt irrelevant for survival, meaning that the average size of Ave's industries, compared to **MES**, has nothing to do with exit and survival. Firms may exit or not, independently of their relative size. As stated above, this variable displays a wide dispersion, and, so, its effects are probably more firm than industry specific.

FT is the only variable with a good level of significance. Its coefficient is much smaller than in the entry regression, and, so, the influence on survival is weaker. The negative sign indicates less survival in industries opened to foreign trade. External competition, both in exports and in imports, affected negatively firms' survival. Thus, this kind of industries has experienced more entry, but less survival, what makes them more attractive, but also more prone to firms' exit. This is an interesting result, because, and as it was noticed above, the importance of foreign trade in an industry has a variety of effects, some of them contradictory.

DTA has a 10% level of significance, and its coefficient displays the expected sign. So, this variable comes to be, in a way, an industry specific determinant, as industries having higher shares of external assets are less likely to survive.

4. SIZE CHANGES

One of the most striking features of Ave's recovery was a striking change in industries average size. For the whole of manufacturing, in these twelve years, average size changed from 63 to 24 workers by firm, which represents a decrease of 61%, making way for a growing importance of SME's. This is an evidence of a crisis and recovery process that kept up with size changes that significantly lower average industry size.

Spilling (1998), in his paper about size change in Norway, from 1970 to 1990, finds a positive and strong correlation between increases in industry growth, measured both by absolute and relative changes in employment, and increases in average size. So, he concludes that size decreases appear to be typical of declining industries.

Next, I try to find industry specific determinants of size changes in the case of Ave. The dependent variable, changes in average size, is taken in relative terms, and is the rate of increase of each industry average size from 1985 to 1997. This rate is negative, except for three industries (meat products, goldsmith and glassware). In order to make results easier to read, I gave the rate a positive sign, and it means then the relative magnitude of the decrease. For the three industries in which size increased, I considered a value of zero (no decrease).

Following Spilling (1998), for industry growth, I used relative employment changes (EC), between 1985 and 1997, as an explanatory variable, though these changes only reflect local industry growth. One can't be sure if the sign of its coefficient is negative, as suggested for Norway. Indeed, size decreases may also go together with industry growth, at least because new firms usually have smaller sizes, and a growing industry experiences a strong entry process.

Of all the variables used in precedent sections, only **RS** seems be suitable to explain changes in average size. Wider changes would be consistent with higher relative dimensioning, as firms try to recover industries' MES. Then, a positive sign is to be expected for the coefficient of **RS**. The more under dimensioned an industry is, or the lower the value of **RS**, the less size should decrease.

Besides, entry could explain size change, for reasons stated above. As this variable is correlated with **RS** (correlation coefficient is 0.59), it was not included in the equation.

Regression was again performed with OLS, and results can be seen in Table 4.

Insert Table 4 here

Both **RS** and **EC** are acceptable as explaining size change. The coefficient of Employment Change is negative, meaning that the more an industry grows, the less average size decreases. This is consistent with Spilling's hypothesis. In fact, and though growth keeps up with the entry of usually small new firms, as happened in Ave, following the coefficient of correlation of entry and growth, growth meant inferior decreases of average size. In fact, average size for entrants was 16 workers, while firms that exit had an average size of 52.

RS has the expected sign. This suggests that, at least, the situation of low dimensioning wasn't deepened.

5. CONCLUDING REMARKS

The initial purpose of this paper was to find out if there were industry, rather than firm, determinants of entry and survival. The case of Ave shows that industry determinants may be more suitable to explain entry than survival, or exit.

Besides, this case shows a few peculiarities in what concerns the influence of variables that had a different behaviour elsewhere.

Namely, here industry profits were clearly a factor of attraction of new firms in the twelve years considered in this study. Also, minimum efficient scale proved to be meaningful, as new firms prefer industries with lower **MES**. These results oppose to some precedent case studies for other regions and other periods.

The importance of foreign trade in each industry seems to have influenced positively entry, and negatively survival. Thus, in Ave, the larger is the importance of foreign trade, the higher is firms' mobility.

Survival looks to be also conditioned by industry financial situation.

One should notice, however, that these results hold for a situation of deep crisis and recovery, in a context of strong specialisation with a wide presence of export oriented industries.

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TABLE 1: BEHAVIOUR OF EXPLANATORY VARIABLES

	Average	Standard Deviation	Median	Highest Value (HV)	HV Industry	Lowest Value (LV)	LV Industry
Entry	1.02	1.30	1.02	1.78	Cloth. Accessories	0.45	Wood Work
Survival	0.42	0.12	0.42	0.80	Optics, Med. Material	0.20	Textile Fibres
PTA	8.12	1.87	8.44	11.60	Plastics	1.62	Wool, Mechanical activities
RS	0.52	0.51	0.29	1.82	Cotton	0.03	Goldsmith
IS	0.03	0.06	0.01	0.34	Clothing	0.003	Optics, Med. Material
FT*	122.64	302.40	42.45	1797.00	Textile Fibres	7.06	Bread, Confectionery
DTA	28.10	13.49	24.60	61.32	Wooden Products	0	Optics, Med. Material

TABLE 2: RESULTS FOR ENTRY

Entry Rate	
MES	-0.1449 (0.0408)
PTA	6.3412 (0.0004)
IS	1.2552 (0.0011)
FT	0.0183 (0.0004)
C	61.8111 (0.0135)
F Statistic-Prob	0.0135
R squared	0.343

TABLE 3: RESULTS FOR SURVIVAL

Survival Rate	
PTA	0.0148 (0.1182)
RS	0.0125 (0.7637)
FT	-0.0001 (0.0001)
DTA	-0.0030 (0.0975)
C	0.3970 (0.0000)
F Statistic-Prob	0.045
R squared	0.278

TABLE 4: CHANGES IN AVERAGE SIZE

RS	0.1434 (0.0585)
EC	-0.0721 (0.0542)
C	0.3124 (0.0000)
F Statistic-Prob	0.0206
R squared	0.22