UNIVERSIDAD CARLOS III DE MADRID working papers

Working Paper 02-47
Business Economics Series 17
October 2002

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SURVIVAL AS A SUCCESS IN THE FACE OF A SCARCITY OF RESOURCES

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Abstract

From institutional, resource dependence and organizational ecology perspectives, there are two initial requirements for organizational survival: 1) there are sufficient resources in the niche, and 2) the organization can obtain these resources. A new concept, saturation, is created to measure the scarcity of resources by analyzing its influence on survival. However, organizational success also depends on organizational characteristics, which can hinder the securing of the resources necessary for survival. This article researches ownership structure as an organizational characteristic. These influences are tested utilizing data from a population of 1298 Spanish olive oil mills.

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Main text

The struggle for organizational survival is considered as competition between organizations to obtain the resources available in the environment (McKelvey and Aldrich, 1983, p. 115). It is implicitly understood that there are resources that are essential for an organization to survive (Pfeffer and Salancik, 1978, p. 41). Competition also intensifies when necessary resources become scarcer (Hannan and Freeman, 1977, p. 940). The securing of resources will depend on the environment's characteristics, the population (Hannan, 1989; Barnett and Amburgey, 1990) and/or the strategies used by organizations to obtain them (Oliver, 1991). The idea of measuring the quantity of resources necessary for a population to survive is covered by the concept of niche, which is defined as the space of n-dimensional resources where a population can exist (Hutchinson, 1957). However, no attempts have been made to measure this concept directly. Generally, it has been taken as being constant, or it has been assumed to vary in terms of population size, or it has been measured by much more global environmental variables such as economic indices and the frequency of good years (Carroll, 1985; Hannan, 1989; Barnett and Amburgey, 1990).

In light of this situation, the aim of this paper is to measure the limitation of resources available in the niche and its influence on survival, for which we will create a new concept called saturation. We define saturation as a measure of the scarcity of the existing resources that allow a population to survive. Once the limitations of the resources available in the environment have been analyzed, further analyses of the possibility of access to these resources will be made, depending on a population characteristic, on concentration, or on the relationship between the sizes of organizations that make up the population (Pfeffer and Salancik, 1978, p. 50). Lastly, further analysis will be made, to see if certain organizational characteristics, or certain

strategies designed to secure the supply of resources, are successful in terms of the fight for survival.

These objectives will be achieved firstly by developing the theoretical background. Later, the population used will be described—the olive oil production industry in Spain from 1944 to 1998. Following this, the statistical methodology used will be explained in detail. Lastly, the results obtained will be discussed, and we will set out our conclusions.

THE THEORETICAL BACKGROUND

When resources in a niche are abundant, organizations have no difficulty in obtaining the quantities of these that they need to survive. Organizational vulnerability arises when the niche does not guarantee the supply of resources needed to continue running (Pfeffer and Salancik, 1978, p. 47). In this situation, the greater the scarcity, the greater will be the fight to obtain these resources; that is, there will be more competition within the population (Hannan and Freeman, 1977, p. 940). However, to speculate about this reasoning, we must first know if we are able to calculate the level of resource limitation or abundance.

Traditionally, the effect of competition on survival has been studied through population size (density, mass) and by assuming that the resources available in the environment (niche carrying capacity) were constant, varied in terms of the population size, or were estimated using environmental variables such as economic indices (Carroll, 1985; Hannan, 1989; Barnett and Amburgey, 1990). Other types of approach have not proved much better, given that the characteristics of the niche are taken exogenously, and the objective being sought is to analyze what characteristics the organizations possess to face up to a given environment or how these organizations act to adapt to it (Oliver,

1991). That is, the concept of abundance or scarcity of resources in the niche, despite being a basic assumption of several theories, has not really been identified explicitly. To fill this gap, we have created a measurement, which we have called saturation, that gives the availability of niche resources. This new measurement is defined as the difference between the potential demand of resources that members of a population may create and the volume of existing resources in the niche. The higher the measurement (positive values), the more saturated the niche will be, thereby resulting in greater scarcity of resources. To put it another way, if there is more demand than can be supplied by the environment, then there will not be enough resources to meet the population's needs. On the other hand, the lower the measurement (negative values), the less saturation there will be, which will mean a greater abundance of resources. Given that scarcity of resources intensifies the fight among organizations to obtain them, increasing the saturation level of the niche will raise competition at an ever-increasing rate. If competition is directly and positively related to the probability of organizational death (Hannan and Freeman, 1977, 1989), then it is possible to foresee a link between the niche saturation level and the probability of organizational failure, as is established in the following hypothesis.

Hypothesis 1: An increase in the saturation level of the niche implies an increase in the probability of organizational failure.

However, not all organizations compete in the same way and, in the event of scarcity or abundance of resources, there may be certain characteristics of the population that make it easier or more difficult to obtain the resources and, therefore, influence the probability

of survival. One of these characteristics could be the relationship with size that exists among all the organizations of a population:

"Within any area of activity, patterns of resource use will tend to be specialized to segments of the size distribution" (Hannan and Freeman, 1977, p. 945).

According to this reasoning, organizations compete more intensely with those that are of a similar size, given that, in this case, they use similar strategies and organizational structures and identical sets of environmental resources (Hannan and Freeman, 1977, p. 945; Hannan, Ranger-Moore and Banaszak-Holl, 1990; Baum and Mezias, 1992). This implies that, in a perfectly competitive market, where the number of organizations tends to be infinite and their relative size tends towards zero, the concentration index[1] will be lower and, therefore, competition will be greater. However, if concentration rises, the difference in organizational size will also increase, which would imply less competition and, therefore, less probability of failure.

The impact of concentration on organizational survival is also considered in resource dependence theory (Pfeffer and Salancik, 1978, p. 50-51); however, Pfeffer and Salancik (1978) draw completely opposite conclusions to those developed in organizational ecology. This theory assumes that the concentration of the control of resources by a small number of organizations, together with the importance of these resources, determines the dependence of one organization on another (Pfeffer and Salancik, 1978, p. 51). That is, if the concentration index rises, most of the resources come under the control of a few organizations, which in turn will influence the life chances of the rest because there would be fewer resources available to share among them.

As we have seen, the two previous explanations allow us to draw opposite conclusions. For this reason, we formulate Hypothesis 2 on the organizational ecology approach and, simultaneously, the alternative hypothesis based on reasoning derived from the resource dependence theory:

Hypothesis 2 (alternative): A rise in the concentration level implies a reduction (increase) in the probability of organizational failure.

Finally, depending on the theoretical approach considered, the organization may or may not be in a position to face up to the environment. In this respect, we can analyze the organizational characteristics or performance strategies that may make securing resources and, therefore, survival, easier.

Although, in this paper, we are not interested in analyzing the influence of ownership structure on survival, this could be a criterion used in the classification of organizational forms with distinctive characteristics (Aldrich and Marsden, 1988; Meyer and Zucker, 1989). In this way, by taking into account ownership structure, it is possible to determine two organizational forms: stock form and mutual form (Barnett and Carroll, 1987; Haveman, 1992; Barron, West and Hannan, 1994, 1998). Both forms differ in numerous ways, such as in the nature and motivation of those who make up the organization; the governance system (Barron, West and Hannan, 1994), the support received from public administration (Barron, West and Hannan, 1998), profit-sharing, and the taxation status (Barron, 1995; Barron, West and Hannan, 1998). However, in reference to the topic developed in this paper, the securing of resources necessary for the organizations also has distinctive characteristics that could well make survival easier for one organizational form as opposed to another.

One fundamental characteristic that differentiates both organizational forms is the double role of member and supplier (or customer) on the part of the owners of the mutual organization. This implies that the member participates in the organization as a supplier and, as a result, has greater identity and commitment towards it. Moreover, it would be necessary to consider that cooperative principles applicable in the mutual form reaffirm this level of commitment by obliging members to participate in the organization's production process (International Cooperative Alliance, 1995). That is, the member has an exclusive commitment to the organization, preventing any other outside activity. This implies that the organization would have the supply of resources guaranteed by all of the supplier-members, as well as competing under the same conditions for the rest of the resources, which are provided by other types of suppliers. That is, mutual organizations, having their supply of resources guaranteed by the supplier-members, would reduce the uncertainty created by environmental conditions, thereby increasing their life chances (Pfeffer and Salancik, 1978). In the same way, the exclusive commitment of the members presumes that these organizations would not have to compete fiercely to secure resources, thereby reducing their probability of failure.

However, the advantages of the mutual form do not stop here as far as the obtaining of resources goes. According to institutional theory, the increase in embeddedness of a population in its institutional environment facilitates, with time, its growth and survival (Meyer and Rowan, 1977; Meyer and Scott, 1983). This supposition is also confirmed in organizational ecology, according to which the said link increases a population's chances of surviving and growing, and thus improves the capacity of the population members to mobilize resources and increase their legitimacy (Hannan and Carroll, 1992, p. 41). In fact, various papers confirm that links with the institutional environment

increase organizational survival chances (Singh, Tucker and House, 1986; Miner, Amburgey and Stearns, 1990; Baum and Oliver, 1991, 1992). In addition, institutions establish incentives to benefit certain sets of organizations (Ingram and Inman, 1996). The link with the institutional environment can be seen both in the incentives received by the mutual form (Barron, West and Hannan, 1998), and in the favorable legislation they are granted (Ingram and Simons, 2000). By combining all of these theoretical explanations, we formulate the following hypothesis:

Hypothesis 3: The organizations making up the mutual form are less likely to fail than those in the stock form.

The olive oil production industry

To test these hypotheses, we have used the olive oil production industry in the province of Jaén (Spain) from 1944 to 1998.

This industry was chosen because the province is a leader in the production of olive oil, with an average annual production of 312,000 t of olive oil, which constitutes 13.8% and 17.7% of world and European production, respectively (Consejo Oleicola Internacional, 2001). This prominence goes back as far as the middle ages, to the twelfth century, when this province was one of the outstanding centers of olive oil production on a worldwide scale (Comet, 1996, p. 50).

The olive oil production industry is a suitable industry to use to achieve the objectives of this paper because of this population's unitary character. That is, the organizations of this industry—oil mills ("almazaras")—share the consequences of organizational

success or failure because they are similarly affected by changes in the environment (Hannan and Freeman, 1989).

Its activity is centered on extraction, marketing and storage of virgin olive oil. However, during the study period, marketing has been undertaken through middle-men, and has been given little importance as an internal organizational activity. Only now are these organizations becoming aware of the advantages to be gained by making this an internal activity (Ernst & Young Asesores, 1992, p. 175). In the same way, storage is a necessary activity, but it does not entail a great consumption of either human or material resources, and could be considered an irrelevant activity. Therefore, as the extraction stage is the fundamental activity of an oil mill, the differences between the mills at this stage are determined by their internal characteristics (such as the extraction technology used, the power installed, the number of employees and the milling capacity). The significance of this stage implies that the olive (sole raw material) is the critical resource of the niche in which the oil mills operate. No other relevant resource can be found. A specialized work force is not required. The customers are large companies that work in an oligopoly and release the olive oil onto the final market. To sum up, competition in this industry is generated by the need to obtain a basic resource: the olive.

The quantity of this resource (or niche size) has risen during the twentieth century for three reasons: 1) there has been an increase in the area of olive grove cultivated, 2) farmers have improved agronomic management (Zambrana-Pineda, 1987, p. 88–89), and 3) irrigated areas have been extended (Civantos-López-Villalta, 1997). Despite these circumstances, the biological nature of this resource means that its transformation process depends on a biological system involving many factors that are difficult to predict and control, such as climate and diseases.

This aspect creates great uncertainty in this sector, thereby increasing the likelihood of miscalculating the estimates and plans made by companies. The oil mill cannot anticipate the size of the next crop or its production quality, the market price or the costs of production, and this situation is made more difficult by the enormous differences in the quantity of production from one year to the next because of the changeable nature of the olive tree. In Figure 1, constant fluctuations in the size of the niche can be seen during the study period.

INSERT FIGURE 1 ABOUT HERE

What is more, the rapid rotting of the fruit from the moment it is harvested means that it must undergo an immediate transformation process to convert it into oil so that its quality does not suffer and its market value is not reduced (Uceda-Ojeda and Hermoso-Fernández, 1997). This forces the oil mills to install adequate milling capacity. However, the difficulty in predicting the exact amount of fruit available in any particular harvest and the need to guarantee its rapid transformation forces the oil mills to install productive capacities according to the maximum fruit delivery.

If we add to the previously mentioned factors the technological change undergone in the extraction systems used in this industry, we can see how these organizations have increased their size over the years. To measure the size, or potential resource demand, we have used the milling capacity installed by the oil mill, with the capacity of raw material transformation being the most suitable indicator to quantify the individual size in the agricultural sector (Ministerio de Agricultura, 1979). In Figure 2, we graphically represent the aggregate size (or population mass) of the oil mills that were operating in each of the years studied.

INSERT FIGURE 2 ABOUT HERE

From this graph, we can deduce a more or less regular growth in the population mass, or the potential resource demand, during the entire period studied. Nevertheless, this growth is more notable after the 1980s because of the effort made by these companies to modernize (technological change) (Civantos-López-Villalta, 1997, p. 126-127).

The biological nature of the resource used by the oil mills requires the material to be rapidly transformed and, therefore, their installations need to be located close to the suppliers. This means that the number of organizations (or density) in this industry is high (Figure 3).

INSERT FIGURE 3 ABOUT HERE

The density reached its maximum in 1954 with 1091 oil mills, and it remained close to this level until the end of the 1960s; it then declined significantly until it became stable after the 1980s.

By taking the variables used in Figures 1 and 2, we determined the saturation of the niches where these organizations operate. On the one hand, the niche size shows the volume of resources that the environment provides for the oil mills, and on the other, the population mass represents the potential resource demand made by the oil mills in terms of the milling capacities installed.

The difference between this potential demand and the resources available at any given time reflects the saturation or scarcity levels of the niche. If the difference is positive, it means that there are not enough resources in the niche for these organizations to take maximum advantage of their production installations. If, on the other hand, it is negative, there would be a surplus of resources in the niche, and the organizations would have no difficulty in obtaining the resources necessary.

Figure 4 represents the evolution of the saturation level of the niche during the study period and shows a somewhat erratic performance due to the growth in the size of the oil mills and the fluctuations in the size of the annual olive harvest. Nevertheless, we can deduce that the oil mills have developed their activity in a saturated and, therefore, very competitive niche. For most of the years, we can see how the potential to absorb resources is far greater than the resources available in the niche. Only in six years was there a surplus of resources that were not used by the organizations in this population.

INSERT FIGURE 4 ABOUT HERE

To complete the description of this industry and, given the evolution of the number of participants (Figure 3) and their aggregate size (Figure 4), we must also consider the evolution of concentration levels. Figure 5 shows the low concentration level in this industry. Nevertheless, there was a considerable increase in concentration after the 1970s as mills became larger and the total number of mills declined.

INSERT FIGURE 5 ABOUT HERE

Of the organizational forms that make up the olive oil production industry, the one that stands out is the mutual form, where members, who mainly belong to cooperatives, mill their own olives. This form, which predominates on both a national and Andalusian level, is even more predominant in the province of Jaén where it is responsible for 65% of the province's production of olive oil (Mozas-Moral, 1998, p. 93).

However, its importance has evolved over a period. According to the database designed to carry out this research, an average of 8.2% of the oil mills were of the mutual form in the 1950s, whereas, in the 1990s, this percentage rose to 61.67%.

In the oil mills of the mutual form, the supplier and owner are the same person. Given that one role does not exclude the other, the members take on the role of supplier and owner from the moment they form part of the oil mill. The members (the farmers) are

owners, since the running of the oil mill depends on the agreements that they reach and, at the same time, they are suppliers as they provide the main raw material necessary to operate. Nevertheless, of the two roles, the dominant role is that of supplier, given that the income received by farmers comes from the business done with the oil mill as suppliers (Lucas, 1972).

Moreover, according to cooperative principles, members are bound to work exclusively in the organization of which they are members, and are obliged to give over their entire production to this organization.

METHOD

Data

To achieve the objectives set, a database was built containing information on 1298 oil mills; that is, all the oil mills that have operated in the province of Jaén at some time during the period 1944–1998. Of these data, 114 are left-censored data and 487 right-censored data (Lawless, 1982; Cox and Oakes, 1984). The disappearance of an oil mill was considered to have occurred when it stopped operating, but not when its ownership or trade name changed, since, in these cases, there were no justifiable reasons to conclude that the whole organization is transformed. In fact, it could continue to use the same procedures and routines (Baum and Mezias, 1992; Ingram and Inman, 1996). There were 11 mergers taken as disappearances in the years in wich they ocurred. The database has been built from the following sources.

Register of agricultural firms held at the provincial office in Jaén of the Agricultural and Fisheries Department of the Andalusian Regional Government. This register is the main information source for these databases and provided the following variables: date

of birth, date of disbandment (if applicable), milling capacity installed, ownership structure, the type of production ownership and the type of technology employed.

Register of cooperatives held at the provincial office in Jaén of the Trade and Industry Department of the Andalusian Regional Government. The information acquired from this register was used to test the information obtained from the previous register on the date of constitution and, if applicable, the date of the disbandment of oil mill cooperatives.

Agricultural Statistics Yearbooks published from 1946 to 1980 by the Ministry of Agriculture and, after that year, by the Ministry of Agriculture, Fisheries and Food. From these yearbooks, we have taken the annual oil harvests in the province of Jaén.

Bernal, A.M. (1994), Ministerial Orders and Royal Decrees that annually set the price of electricity. From these sources, we calculated the cost of electric power. We obtained the price for the years 1944–1992 from Bernal (1994) and, for 1992 onwards, we used the price from the Ministerial Orders and Royal Decrees published in the Official Gazette by the Ministry of Industry and Energy.

Variables

Saturation level of niche. This variable reflects the level of resources used in the niche at all times. The niche saturation level was determined as the difference between the potential demand of resources that may be made by the oil mills in terms of their milling capacities installed (that is, in terms of the aggregate organizational sizes or population mass) and the annual olive harvests (that is, the size of the niche).

Level of concentration. This variable was measured using the Herfindahl index and was chosen because: 1) it verifies the properties required from the concentration indices

(Hannah and Kay, 1997; Encauoua and Jacquemin, 1980), 2) it has already been used as a measure of concentration in ecological literature (Barnett and Carroll, 1987; Wholey, Christianson and Sanchez, 1992), and 3) it is a suitable indicator of concentration since it gives more importance to the disparity of sizes between organizations than to the number of organizations.

Mutual organizations. To identify the influence of the ownership structure on the probability of failure, we introduced a dummy variable that that was one (value 1) when the oil mill was integrated in the mutual form, and zero (value 0) when that was not the case (Rao and Neilsen, 1992; Barron, West and Hannan, 1998).

The possible existence of effects provoked by variables other than exogenous variables makes observations of the direct influence between the exogenous and endogenous variables more difficult. For this reason, two types of control variables were introduced. One type incorporated specific characteristics of the organizations, which, despite not being analyzed in this paper, affect the probability of organizational failure. The other type covered variables that represented at all times the environmental situation that, without being representative of the most immediate setting or niche, may affect organizational survival.

Organizational age. This variable was defined as the number of years since the date of a oill mill´s founding. It is a necessary control variable to study organizational mortality (Carroll and Hannan, 2000).

Type of production ownership. Given that Boone, Bröcheler and Carroll (2000) discovered that whether production ownership fell on one or various owners affects the probability of organizational failure, a dummy variable was created that tells us, at every moment, if the oil mill is operated by the owner (value 1) or if it is operated under lease (value 0).

Organizational size. We identified the installed milling capacity as a variable representing the size of each oil mill following consideration of the relation between size and capacity (Barron, West and Hannan, 1994, p. 394–395). Within this line of investigation, there have been empirical studies of the storage capacity of wineries (Delacroix, Swaminathan and Solt, 1989; Delacroix and Swaminathan, 1991; Swaminathan, 1995), production capacity of breweries (Carroll and Swaminathan, 1992), license restrictions on the enrollment of day-care centers (Baum and Oliver, 1991) and room-counts of hotels (Baum and Mezias, 1992). We could also consider that the installed production capacity is the best measure of size, given that it takes into account the space of the niche occupied by each organization (Winter, 1990).

Type of technology. Technology influences on the performance of organizations, and signs of such influence are reflected in mortality rates (Barnett, 1990; Suárez and Utterback, 1995; Carroll and Teo, 1996). To control possible variations in the probability of failure according to the type of technology used, we introduced two dummy variables: obsolete and advanced technology. These variables take a value of 1 if the oil mill used either of the two types of technology mentioned, and 0 in the opposite case. Both variables were introduced since both may exist simultaneously in the same organization, although in different production lines.

We introduced the following environment control variables:

Electric energy cost. Electric energy is the power source that supplies the production system of an oil mill. This variable takes into account the cost of this supply in Pesetas per kW/h. It therefore expresses the variable unit cost derived from the consumption of electric power. This variable has been introduced following the approach in other papers of estimating vital rates to monitor the incidence of the main organization cost (Barnett and Carroll, 1987; Mascarenhas, 1996).

Population density. This variable allows to control one additional source of intrapopulation competition. In the density dependence model (Hannan, 1989), the intensity of competition varies according to the number or density of organizations in a population. Population density was measured as the total number of oil mills existing at the start of each year. To allow for a nonmonotonic effect, density was modeled as quadratic by including both population density and population density squared, with squared term divided by 1000 for rescaling (Hannan and Carroll, 1992).

Analysis

To carry out the necessary tests, we modeled oil mill failure using r(t), the instantaneous risk of failing. This hazard rate of failure is defined as the limiting probability of a failure between *t* and *t* + *D*t, given thath the oil mill was operating at t, calculed over *D*t:

$$r(t) = \lim_{\Delta t \to 0} \Pr \frac{(\textit{failure } t, t + \ddot{A}t \,/\, \textit{operating at } t)}{\Delta t}$$

Parametric estimates of the hazard rate require assumptions about the effect of time (in these models, age) on failure. We used the piecewise-exponential model, which is a flexible approach to modeling the influence of age on firm failure. We estimate a piecewise-exponential model of the form:

$$r(t) = e^{bX}$$

where β the associated vector of coefficients and *X* the matrix of exogenous and control variables. If β has a positive sign the organization's failure probability will increase. On the contrary, if the sign is negative this probability will be reduced.

Following the methodology explained, in the *stcox* procedure the statistical package Stata 6.0 (Stata Corporation, 1999) the values of the different variables were

introduced in one-year spells and the β coefficients were estimated by maximum-likelihood.

RESULTS

Table 1 shows the basic statistics and correlations between exogenous and control variables. Table 2 shows the models built to test the influence of the exogenous variables on the probability of organizational failure. The first three show the isolated impact of each of the variables, and the fourth shows the influence of each variable when the incidence of the remaining exogenous variables is controlled.

INSERT TABLE 1 ABOUT HERE

INSERT TABLE 2 ABOUT HERE

In the first model of Table 2, we can see that the saturation of the niche has a positive and significant influence on the probability of death of the oil mills. This result suggests that, as resources of the niche are depleted, competition rises at an increasing rate, which in turn increases risk of failure of the industry's organizations. This result would support the first hypothesis, as suggested in the theoretical background.

Model 2 shows the positive and significant impact that concentration level has on the probability of failure. That is, an increase in concentration seems to increase the probability of organizational death, which is consistent with the dependence resource theory (Pfeffer and Salancik, 1978). Therefore, we would accept the second hypothesis (alternative).

The results achieved in Model 3 suggest that the organizations making up the mutual form benefit from more guarantees of survival. This also suggests that we accept the

third hypothesis. That the duties of an owner and supplier coincide in the same person, together with the exclusive commitment on the part of the members, supposes a guarantee of the supply of the resources that these organizations need for their operations. Likewise, the institutional support received by this organizational form could have contributed to the attainment of these results.

In Model 4, where all the exogenous and control variables are included, practically the same results are achieved as in the three models analyzed individually, in relation to both the value of the coefficients and their degree of significance.

On the other hand, the organizational and environmental control variables significantly influenced mortality rates in the olive oil production industry.

In all the models, we can see that there is a significant negative relationship between the exploitation of the oil mill by the owner and its probability of failure. Also, we can observe how the size of the organization has a highly significant negative impact on its probability of death. This result coincides with previous research, which indicates that the increase in size reduces the risk of organizational failure (Carroll and Hannan, 2000). Another variable that, at the organizational level, has significant influence is the type of technology employed. Oil mills that use the most advanced technology in their production systems suffer lower death rates. This effect is evident in all the models and is due to the reduction in extraction costs and the extraction of more final product because of the use of such technology (Hermoso-Fernández et al., 1994).

Regarding the impact of environmental control variables, it is not possible to deduce the influence of the cost of electric power on the probability of failure, since the sign obtained in the models is both positive and negative. However, density significantly affects mortality rates in this industry, which reveals a U-shaped non-monotonic design in the relationship that links this variable to the aforementioned rates.

DISCUSSION AND CONCLUSION

We believe that, for a set of organizations to survive, two conditions are required: 1) the niche must have resources available, and 2) organizations must be able to obtain them. These two premises coincide with the theoretical reasoning developed by the three main theories relating to this environment: institutional theory (Meyer and Rowan, 1977), resource dependence theory (Pfeffer and Salancik, 1978) and organizational ecology (Hannan and Freeman, 1977). However, we believe that these theories have not been empirically and specifically tested up to now. In this paper, we have developed a new concept, namely saturation, that allows us to measure approximately the scarcity (or abundance) of existing resources in the niche. Subsequently, we also analyzed how saturation can affect organizational survival. However, organizations must also be able to obtain resources, and the capacity to do so will be influenced by several factors. In the theoretical background, two were studied: a population characteristic, concentration, which identifies the degree of aggression and competition of the organizations to secure resources by taking into account their size differences, and an organizational characteristic, the organization's ownership structure, which can make access to certain resources easier.

To test these two lines of thought we used the olive oil production industry since its characteristics allow us to reduce the study of an n-dimensional space of resources or niche to just one particular resource: the quantity of olives.

Our results suggest that the theories mentioned are correct. That is, the scarcity of resources is detrimental to organizational survival and, moreover, those organizations

that, because of their own characteristics or to the characteristics of the population, are unable to obtain these resources, will find it more difficult to survive.

With regard to the variables used, the saturation level can highlight certain situations that may not have been revealed by other variables. In this way, if the potential demand for resources increases at a slower rate than does the size of the niche, the level of competition will be reduced and the probability of survival will be greater. On the other hand, if the potential demand increases faster than the increase in the size of the niche, then competition will be greater and the probability of survival will be reduced. Lastly, if both parameters increase at the same rate, both the level of competition and the probability of survival could remain constant. These different situations could explain the results obtained in other research, which has used only the component mass to specify competition within the population (Barnett and Carroll, 1987; Barnett and Amburgey, 1990; Baum and Mezias, 1992; Carroll and Swaminathan, 1992; Hannan and Carroll, 1992; Barnett, 1997; Ingram and Baum, 1997; Boone, Bröcheler and Carroll, 2000).

Despite what has been mentioned above, our results do not question the validity of the models developed in organizational ecology based exclusively on population size. In fact, the validity of the model based on the influence of density on the competitive environment and, in turn, on the mortality rates of a population (Hannan, 1989; Hannan and Carroll, 1992) is confirmed. This ratifies the importance of density as a key competitive dimension that must not be forgotten when attempting to explain the vital rates of an industry.

Concentration has already been researched in organizational ecology, although the aim and reasoning are of a different nature (Carroll, 1985; Barnett and Carroll, 1987; Wholey, Chrisianson and Sanchez, 1992; Barnett, 1997). However, from our new point

of view, the effects of concentration could be examined from two angles. On one hand, concentration can be taken as a measure of organizational size inequality. In this case, increases in concentration are converted into greater differences in size of the organizations of a population. As the difference in size implies a difference in strategies, organizational structures and combinations of resources, this means a reduction in competition (Hannan and Freeman, 1977). On the other hand, concentration can be taken as the degree of control that organizations have on the environmental resources (Pfeffer and Salancik, 1978). This would imply that an increase in concentration would reduce the control of resources to fewer organizations and, consequently, reduce the possibilities of survival of the rest of the members. The results obtained favor the second approach and reject the reasoning proposed by Hannan and Freeman (1977).

Regarding the particular characteristics of organizations, one of the variables studied in this research is the organization's ownership structure. The results obtained support the reasoning put forward in the resource dependence theory (Pfeffer and Salancik, 1978), institutional theory (Meyer and Rowan, 1977; Meyer and Scott, 1983) and organizational ecology (Hannan and Carroll, 1992). That is, those organizations able to obtain a greater degree of social rather than institutional legitimation, together with the certainty of securing a supply of resources, are more likely to survive than those that have been unable to do so. In this way, according to the particular characteristics of this study, mutual companies seem to be more likely to survive than stock companies.

It is worth drawing attention to the possibilities for those institutions that are able to create or modify the environment. For example, government policy could make resource production, or access to it, easier; it could institutionally favor or penalize certain organizational characteristics; create public opinion that legitimizes or delegitimizes groups of organizations, etc. It would be interesting to analyze how all

these institutional changes affect the saturation of the niche and, in a direct way, the probability of survival.

In any case, and despite the opposing results obtained in the second hypothesis, we believe that the theories mentioned in this paper are not conflicting, but are complementary, and we must not confine ourselves exclusively to one of them. As has been previously mentioned, the initial suppositions coincide totally, and it is only the diversity of nuances that they provide that enhances the analysis, although they, in themselves, are a minor source of conflict.

[1] Concentration has already been researched in organizational ecology, although with a different aim and the reasoning. Carroll (1985) uses the concentration level as a fundamental predictive variable to analyze the relationships between organizations with a different niche width, establishing that concentration allows us to determine whether generalist and specialist organizations compete directly. There are also other organizational ecology papers that use this variable as a control (Barnett and Carroll, 1987; Wholey, Christianson and Sanchez, 1992; Barnett, 1997), but they do not analyze its influence in any great depth.

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Figure 1. Evolution of niche size 1944-1998

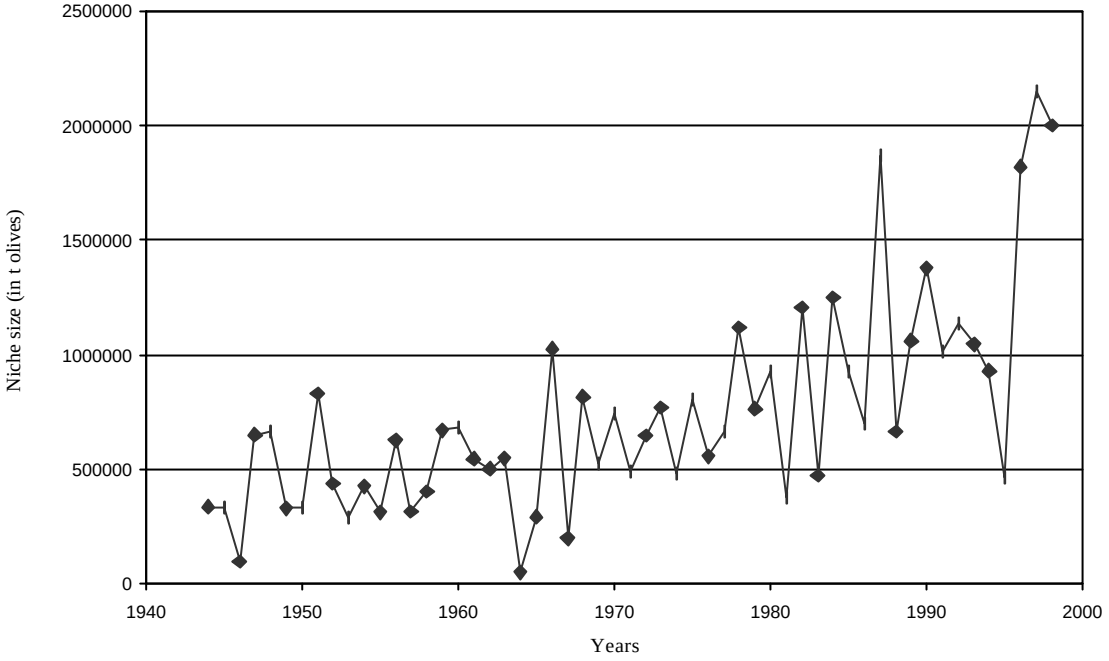

Figure 2. Population mass of Jaen´s olive oil production industry 1944-1998

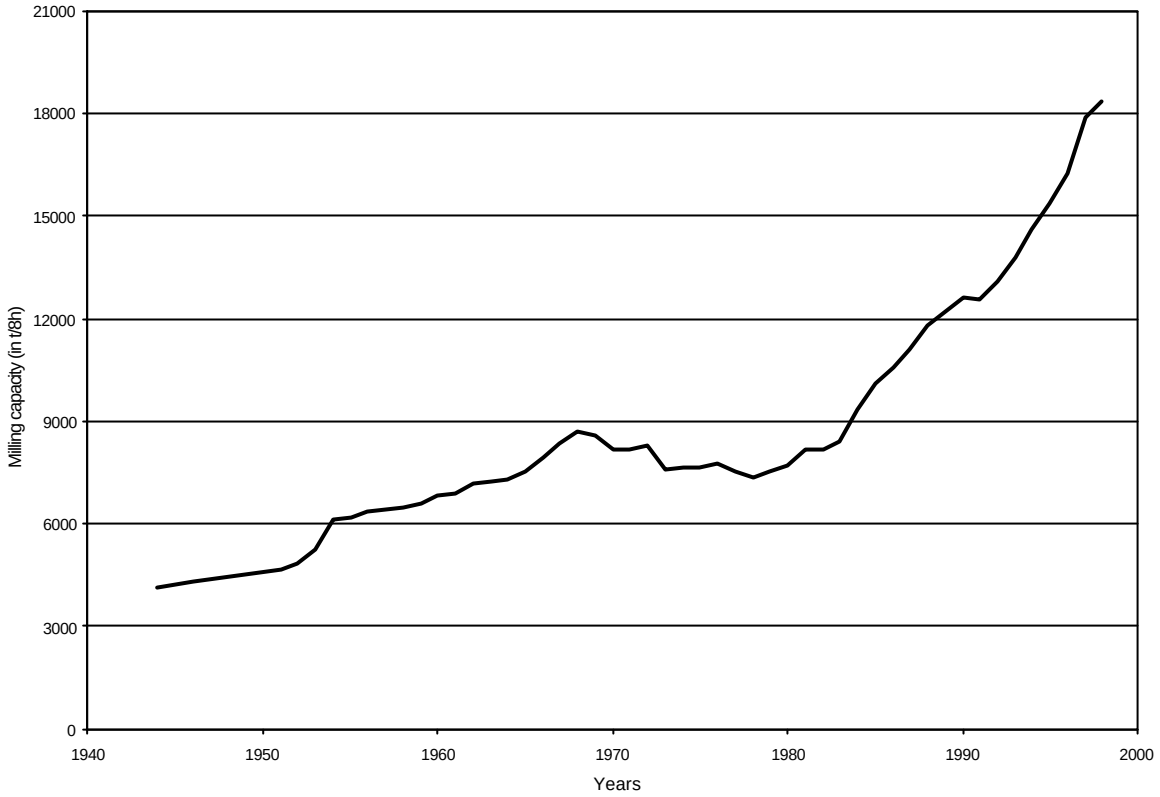

Figure 3. Evolution of number of olive oil mills 1944-1998

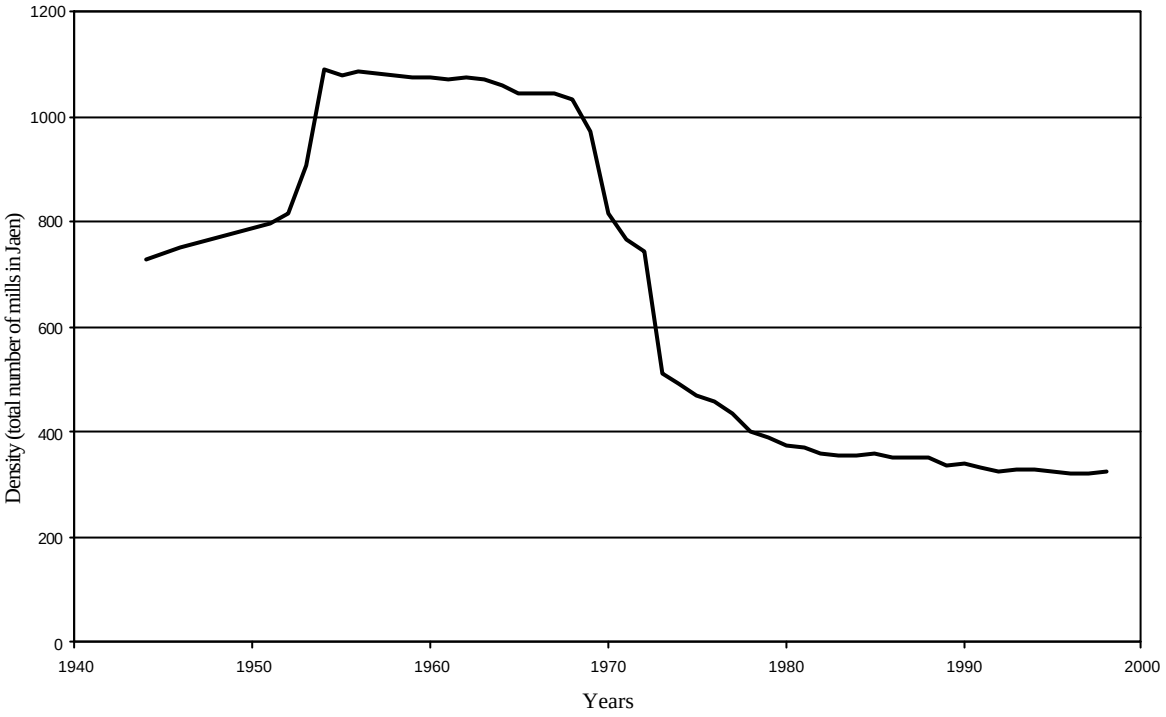

Figure 4. Saturation levels of niche 1944-1998

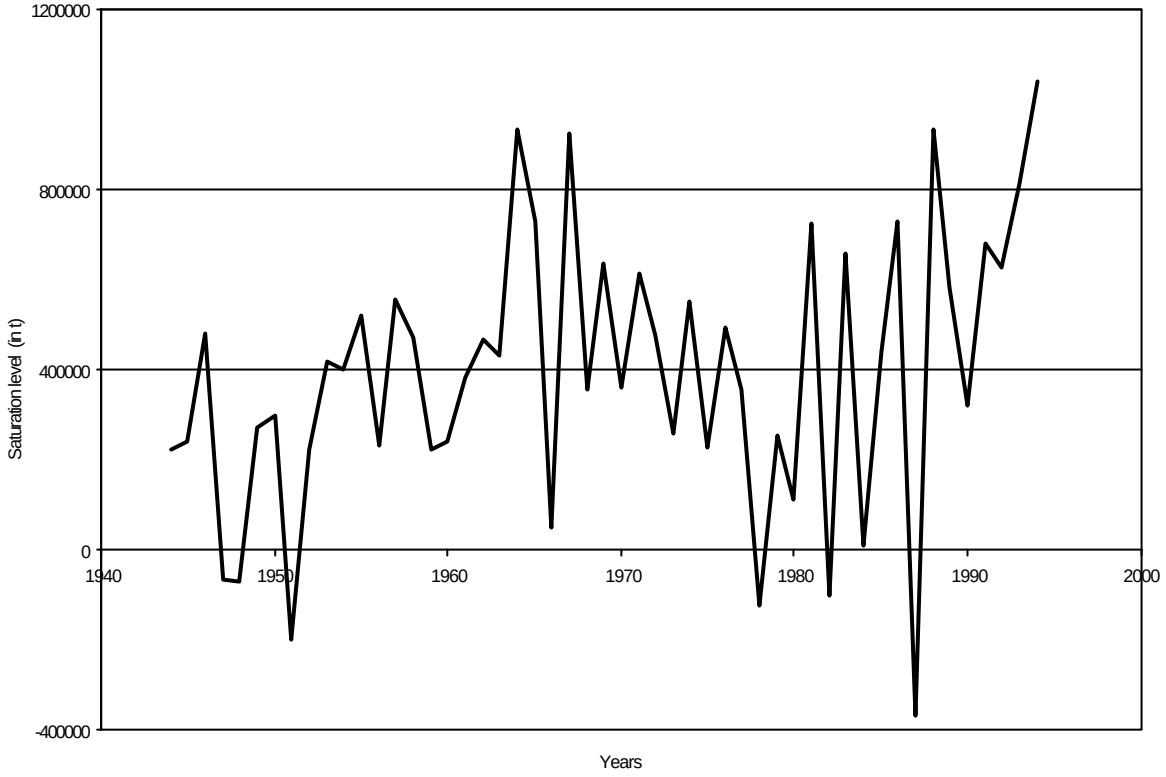

Figure 5. Concentration levels in Jaen's olive oil production industry 1944-1998

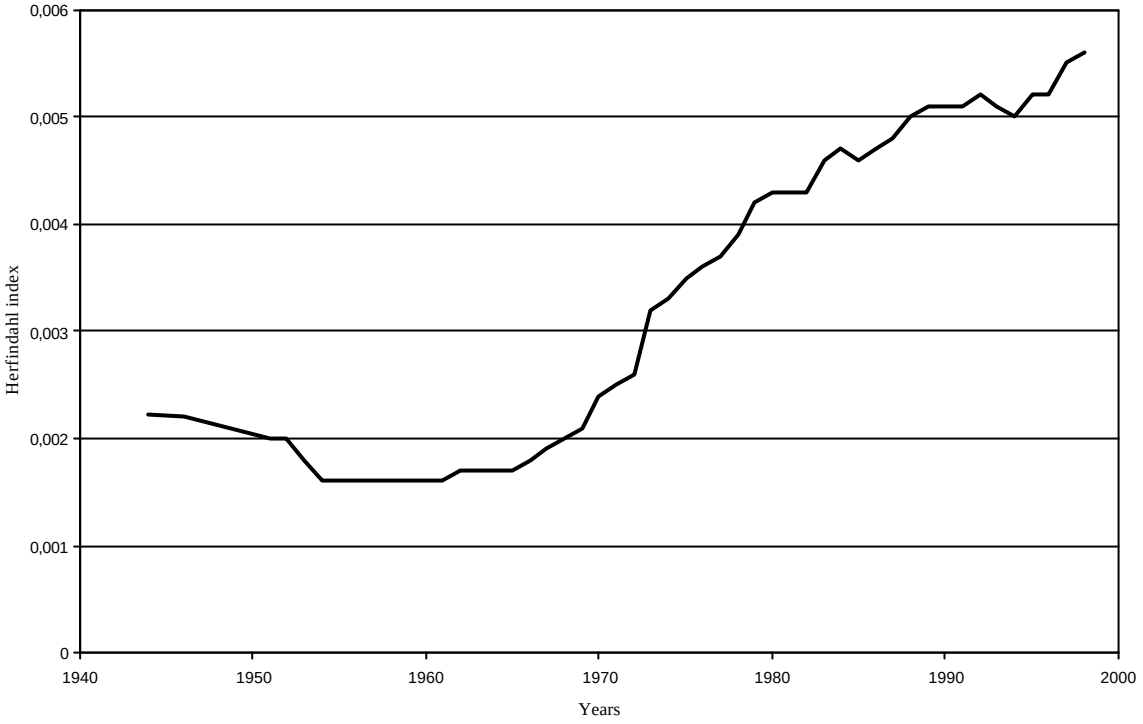

Table 1

Means, Standard Deviations, and Correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Saturation level of niche	405962.5	311026.2										
2. Mutual organization	.3045	.4602	.11									
3. Level of concentration	.0027	.0013	.14	.39								
4. Type of production ownership	.8334	.3725	–.03	.20	.07							
5. Organizational size	15.23	21.12	.16	.40	.55	.10						
6. Organizational age	37.26	23.92	.08	.03	.26	-.05	.06					
7. Obsolete technology	.8750	.3307	–.18	–.28	–.57	–.08	–.53	-.08				
8. Advanced technology	.0900	.2861	.17	.25	.54	.07	.41	-.07	-.83			
9. Energy cost	3.22	4.38	.29	.35	.90	.06	.58	-.25	-.64	.61		
10. Density	754.51	295.74	–.00	–.34	–.94	–.09	–.47	-.23	.47	-.44	-.75	
11. $(\text{Density})^2/1000$	656.75	424.10	.03	-.31	-.90	-.10	-.43	-.21	.43	-.40	-.68	.99

Correlations ≥ |0.01| are significant at $p < 0.00001$

Table 2

Piecewise Exponential Models in the Olive Oil Production Industry, 1944–1998[(a)]

Independent variables	Model 1	Model 2	Model 3	Model 4
Saturation level of niche	1.03E-06**** (2.9E-07)			1.05E-06**** (2.9E-07)
Level of concentration		3263.4**** (509.7)		3252.51**** (501.9)
Mutual organization			-.702**** (.132)	-.708**** (.132)
Organizational age	-.003 (.002)	-.0009 (.002)	-.002 (.002)	-.0001 (.002)
Type of production ownership	-.307** (.101)	-.306** (.101)	-.202* (.102)	-.202* (.102)
Organizational size	-.114**** (.009)	-.115**** (.009)	-.103**** (.009)	-.105**** (.009)
Obsolete technology	-.065 (.386)	-.020 (.387)	-.063 (.386)	-.016 (.388)
Advanced technology	-1.49** (.538)	-1.54** (.539)	-1.38* (.538)	-1.42** (.539)
Energy cost	.025 (.041)	-.239**** (.064)	.087* (.036)	-.294**** (.066)
Density	.017**** (.003)	.038**** (.004)	.021**** (.003)	.034**** (.004)
$(\text{Density})^2/1000$	-.013**** (.002)	-.020**** (.002)	-.015**** (.002)	-.018**** (.002)
Chi-squared (χ^2)	430.41****	452.20****	449.73****	498.22****
Degrees of freedom	9	9	9	11

**** = $p < 0.0001$; *** = $p < 0.001$; ** = $p < 0.01$: * = $p < 0.05$

[(a)] Standard errors are in parentheses.