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Abstract

The population of organization studies that has become known under such names as population ecology and organizational ecology (OE), is entering the stage of maturity. It is argued here that this branch of organization studies can increase the carrying capacity of its niche by seeking cross-fertilization with the century-old field of industrial organization and the economically inspired sub-field of strategic management. Doing so would enrich the study of the long-run evolution of organizational populations by adding a focus on *differences* between and within industries to OE's emphasis on universal similarities. The argument is illustrated by investigating the long-run development of the German and U.S. brewing industries on the one hand and the Dutch audit industry on the other.

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Introduction

The publication of Hannan and Freeman's *Organizational Ecology* in 1989 marks a transition from adolescence to maturity in the development of a 15-year old population of organization studies. Hannan and Freeman co-authored the article 'Population Ecology of Organizations' in the 1977 issue of the *American Journal of Sociology* which gave name to a new research programme in organization theory: organizational ecology (OE). Their book summarizes the progress made to date. OE is inspired by careful analogies from biological population ecology. The perspective of the theory is dynamic: OE focuses on the development of (populations of) organizational forms over time. With its Darwinian perspective, the key issue is selection. What differentiates OE from its companions in the field of organization studies, is the focus on the *population* as the prime level of analysis. It is not so much the (behaviour in and of) an individual organization that matters, but rather the interaction among groups of (adjacent) organizational forms.

By now an evaluation of the contribution and potential of OE is justified. OE has been criticized on a number of fundamental grounds. The

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aim of this paper is not so much to add another critique to the organizational literature, but rather to present a search for potential synergies by identifying issues where cross-fertilization is likely to produce progress. To be precise, this paper argues that OE uses economic concepts such as competition, and is often likened to economic analysis. The economic theories considered are industrial organization and the economically inspired sub-field of strategic management (henceforth referred to as IO). This means that we largely ignore evolutionary economics, as Winter (1990) is the eminent source of a review of the OE — evolutionary economics interface. Moreover, we focus on *economic* theories of organizational behaviour because the close ties between OE on the one hand and non-economic approaches to the study of organizational behaviour on the other are already well-documented [the (co-authored) work of Aldrich is illustrative: *avant la lettre* by Aldrich and Pfeffer 1976; and subsequently by Aldrich et al. 1984; Aldrich and Auster 1986; and Aldrich 1991].

The paper is organized as follows. The next section summarizes the fundamentals of OE, primarily on the basis of Hannan and Freeman (1989) and Hannan and Carroll (1992). The argument proceeds in the following section by summarizing two important criticisms raised by organizational scholars, and the fourth section is an intermezzo which briefly evaluates the current state-of-the-art. Unlike some authors who question the applicability of ecological models to organizations, we argue that considerable progress can be made by adding insights from industrial organization and strategic management to OE. This issue is examined in the fifth section. The final section is an appraisal. We conclude that the potential of OE is impressive, particularly if future work integrates important contributions from IO.

Fundamentals of Organizational Ecology

OE focuses on the dynamics of the world of organizations. The aim of understanding changes in organizational forms is to give an answer to the simple but fundamental question: why are there so many different kinds of organizations? (Hannan and Freeman 1977). OE distinguishes three levels of analysis to explore the sources of organizational diversity. The first level deals with the demography of organizations: rates of change, particularly founding and mortality rates, in organizational populations are the central interest. The next level concerns the population ecology of organizations: vital rates between populations are linked. The third level is the community ecology of organizations: the central issue is how the links between and among populations affect the sustainability of the community as a whole (Hannan and Freeman 1989). It is fair to say that most of the work done so far concerns the first (demographic) level. Although few studies are located at the second level, hardly any could aspire to be a third-level study. In the following

we therefore focus our discussion, with few exceptions, on first-level research.

It is important to mention that the diversity of forms is a property of a population (or a community) of organizations (Hannan and Freeman 1989). At first glance, it may be confusing that studies in the OE tradition use data on *individual* organizations to analyze developments at the *population* level. However, if a particular organizational characteristic affects the vital rates, then, of course, these very processes ultimately determine the prevalence of that characteristic at the population level. In other words, the interest is not so much in explaining the vital rates *per se*, but rather in tracing aggregate rates at the population level and understanding the implications of mortality and founding processes for the distribution of organizational characteristics (i.e. diversity).

How does the long-run diversity of organizational forms come about? Two main perspectives, both based on a biological evolutionary metaphor of organizations (Davis and Stout 1992), can be distinguished: (1) organizations continuously fine-tune their strategies and structures to changing environmental circumstances — which is the Lamarckian view — and (2) old forms die and are replaced by new forms — reflecting the Darwinian perspective (Hannan and Freeman 1989).

The first perspective is not realistic according to OE because OE theory assumes that organizations are characterized by relative inertia: they react rather slowly to changes in the environment (Hannan and Freeman 1984). This is not to say that organizations never change, but rather that, if radical transformation is needed, organizations are hard pressed to implement the necessary changes. The required changes are rare and occur only after considerable delays, so organizations tend to be inert *relative* to environmental changes. The assumption of relative inertia separates OE from many other organizational theories which emphasize adaptability, a case in point being the focus on strategic fine-tuning in standard textbooks on strategic management (such as Johnson and Scholes 1993). An example of an argument in favour of the opposite view is Frederickson and Iaquinto (1989). Furthermore, even if organizations would be relatively flexible, the validity of the Lamarckian view depends upon whether rational and planned organizational changes are possible at all. According to Hannan and Freeman (1989), controlled change is problematic due to the unpredictability of future environmental states, the political nature of organizational decision making and the decoupling of intentions and organizational outcomes. The arguments of relative inertia and/or uncontrollability of organizational change imply that every *match* at a given point in time between the environment and organizational form can be considered, on average, as random (Hannan and Freeman 1989). In other words, the environment *selects* organizational forms. Because of relative inertia, the dynamics of diversity can be understood by looking at the birth and death of organizational forms.

Three arguments are put forward to defend the assumption of relative inertia (Hannan and Freeman 1984). First, organizations need to be *reliable*: organizations can be reliable suppliers of goods and services (for example, in terms of quality and delivery time) because they have developed routines which direct their activities. Routines can be retained within organizations, but not in ad hoc groups of varying composition. Compared to ad hoc groups of skilled workers, organizations will tend to produce with less variance in the quality of performance. Second, organizations can more easily be held *accountable* for their actions and performance. Much (though not all) sociology argues that, in the modern world, decisions and actions must be explained in rational terms. Accountability is also facilitated by stable rules and procedures, which are more easily developed and retained within organizations than within ad hoc collectives. Third, organizational reliability and accountability require that organizational structures are highly *reproducible*. The routines, rules and procedures that determine reliability and accountability must stay in place. That is, the structure of roles, authority and communication must be reproducible from day to day. Selection pressures will work in this direction. Rigid and viable blueprints are selected (Boeker 1988), so selection will favour organizations with highly inert structures: relative inertia is not only a precondition of selection, but also a *consequence*.

The effects of reliability, accountability and reproducibility sum up to the argument that

> '[t]he modern world favors collective actors that can demonstrate or at least reasonably claim a capacity for reliable performance and can account rationally for their actions. So it favors organizations over other kinds of collectives and favors certain kinds of organizations over others, since not all organizations have these properties in equal measure. Selection within organizational populations tends to eliminate organizations with low reliability and accountability. . . . Thus we assume that selection in populations of organizations in modern societies favors forms with high reliability of performance and high levels of accountability.' (Hannan and Freeman 1989: 74)

Until now, most theoretical and empirical work has focused on explaining the striking similarity of the growth trajectories of very (if not radically) different organizational populations, varying from banks and breweries to labour unions and voluntary social-service organizations. The number of organizations in a population typically grows slowly initially, and then increases rapidly to a peak. Once the peak is reached, there is usually a sharp decline and occasionally stabilization (Carroll and Hannan 1989).

(The development of) the number of organizations within a population depends on various factors. First of all, the *niche* in which the population resides is crucial. A niche expresses the population's role and function in a community. An important feature of a niche is its *carrying capacity* (that is, its maximum size). Social and material restrictions

limit the extent to which particular roles and functions are needed. The carrying capacity of a niche only represents an upper bound on aggregate activity performed by a particular organizational form. Exogenous factors determine the carrying capacity of populations. The striking similarity of growth trajectories of populations, however, suggests that there is an intrinsic dynamic of contraction and expansion (Carroll 1984). This growth pattern can be explained by two forces: *competition* and *legitimation*. It is assumed that both forces depend on the density of the population. Broadly speaking, density expresses the degree to which the carrying capacity of the niche is 'filled'. OE studies usually take the number of organizations as the measure of density.

Competition is a core concept in economics. Competition within a population or among populations occurs if resources within the niche are scarce. Legitimation is primarily a sociological concept. Basically, legitimation refers to the social acceptance of the organizational form, new forms having low legitimacy. As they perform reliably and accountably over time, they may acquire higher legitimacy. Shifts in the relative importance of competition and legitimation induce dynamics in the constellation of a population: the number of organizations in a population changes over time. More specifically, OE assumes that both competition and legitimation increase with the aging of the organizational form. On the one hand, a new form has to acquire legitimacy over time. Hence, the expectation is that the founding rates increase with age. On the other hand, as more organizations come to inhabit the niche, competition within the population will increase, leading to the expectation that this rivalry will be negatively associated with founding rates. Analogous reasoning predicts that the mortality rate is high at first (liability of newness and insufficient legitimacy), then falls with increasing density up to a point (in the neighbourhood of the carrying capacity) and then rises with increasing density (due to intensified competition). In the language of OE: competition and legitimation cause nonmonotonic density dependence in the vital rates. That is, the relationship between density and the founding rate has the form of an inverted U. The relationship between density and the mortality rate, however, has a U-shape (Hannan and Carroll 1992).

The nonmonotonic density dependence in vital rates has been confirmed by an ever increasing number of empirical studies in a diversity of populations, for example, breweries, labour unions, newspapers, semiconductor producers, life-insurance companies and banks (Carroll 1988; Hannan and Carroll 1992). However, some studies show discrepant findings (Delacroix et al. 1989; Barnett and Amburgey 1990). More specifically, a review by Singh and Lumsden (1990) suggests that findings concerning founding rates are more consistent with nonmonotonic density dependence than those concerning mortality rates. Singh and Lumsden (1990) argue that more research is necessary to reconciliate these divergent findings. We agree with these authors, who suggest that

(1990: 179) '[t]here may be systematic differences across populations in patterns of density dependence of mortality areas'.

To explain the apparent drop in the density of populations after reaching a peak, OE introduces another mechanism: density delay. That is, density at the time of founding has a persistent positive effect on mortality rates (Carroll and Hannan 1989). Density delay causes mortality rates to be particularly high after a population has reached its peak: so the number of organizations then starts to drop. Empirical research indeed shows that building a new organization in tightly-packed niches results in the so-called 'liability of resource scarcity'. It should be mentioned that contemporaneous density, and density at founding, are not the only independent variables used by OE to explain the vital rates. Other variables that are normally incorporated into the empirical models are exogenous factors reflecting economic conditions, institutional changes, political turmoils, organization size (liability of smallness), organization age (liability of newness), etc. Important is that the effects of density remain significant after controlling for those covariates. Furthermore, the mortality rates are higher for smaller and younger, as opposed to larger and older, organizations, as expected (for a review see Singh and Lumsden 1990).

Key Recurrent Criticisms of Organizational Ecology

Before identifying issues where cross-fertilization with industrial organization and the economically-inspired branch of strategic management is likely to produce progress, we shortly discuss two recurrent points of criticism: definition problems and the issue of determinism versus voluntarism. This discussion allows us to take position in an ongoing debate, and to clarify a number of, as we see it, misunderstandings concerning the assumptions of OE.

Definition Problems

Analyzing the dynamics of organizational populations requires a definition of populations and a procedure for separating one population from the other. OE makes the assumption that populations can be defined in such a way that they have a unitary character. According to Hannan and Freeman (1989: 45), '[t]he most salient kind of unitary character for our concerns is common dependence on the material and social environment'. The concept of organizational form (or species) is introduced to provide this unitary character to a population. Form (or species) is defined as 'a blueprint for organizational action, for transforming inputs into outputs' (Hannan and Freeman 1977: 935), which is akin to the concept of routines in behavioural theory (Cyert and March 1963) and evolutionary economics (Nelson and Winter 1982). This leads to the following definition of populations: 'a population of

organizations consists of all the organizations within a particular boundary that have a common form' (Hannan and Freeman 1977: 936). Unfortunately, the main criterion to discriminate species in biology, interbreeding, is of no use for organizational analysis. For instance, mergers and joint ventures between all sorts of firms are observable in the real world, not to speak of the increasing incidence of networking (Powell 1990). How can conglomerate firms be fitted into a classification of populations? In fact, the absence of a clear-cut criterion has led to considerable confusion (Betton and Dess 1985). Consider, for example, the study of Freeman and Hannan (1983), in which two types of restaurants are distinguished: specialists and generalists. Should specialists be regarded as a species different from generalists, or should those restaurants be viewed as one population consisting of two manifestations of the same form? Theoretically, these issues are very difficult to solve (Hannan and Freeman 1989). It is therefore not surprising that, in practice, OE studies generally focus on populations which are readily acceptable as distinct (for example, breweries, labour unions and newspapers).

Carroll (1984) argues that Freeman and Hannan (1983) are inclined to equate differences in organizational forms with differences in organizational strategies, such as specialism versus generalism. According to Carroll, this is unwarranted because there is no reason to assume that forms, which represent structures, and strategies are tightly coupled. Hannan and Freeman (1989: 64) acknowledge this and stress that 'it is important to retain the distinction between forms of concrete entities whose boundaries are created and retained by technological factors, collective action, and institutional processes, and higher-order abstractions characterizing one or another dimension of a set of forms'. In our view, this implies that organizations with different strategies belong to the same population, as long as they exhibit the same environmental dependencies.

We agree with Hannan and Freeman (1989) that these definition issues have to be dealt with in future research in order to be able to extend the research programme beyond the dynamics of populations with non-controversial boundaries. However, we should not be too optimistic in this respect. The problem is extremely complicated because boundaries of populations can change over time. However, we do not agree with the critique of Young (1988) that OE is not a useful paradigm because of, among other things, difficulties in unequivocally adapting biological concepts to organizations. Such definition problems are not idiosyncratic to OE. On the contrary: for instance, a very similar discussion — lasting several decades — has taken place in the industrial organization and strategic management literatures concerning the definition of markets and/or industries (for a summary see Jegers 1987; and Abell 1980, respectively). The issue of market definition — in both IO theory and antitrust practice — has been settled by agreeing upon a number of pragmatic rules-of-thumb such as threshold values of cross-elasticities

(if measurable) and well-established SIC categories (Scherer and Ross 1990). The bottom line is, in our view, that this debate has not generated new scientific insights. As another example, Hatten and Hatten (1987: 329) define strategic groups as follows: 'A strategic group is a grouping of organizations which pursue similar strategies with similar resources. Note the word "grouping": groups do not exist . . . it is merely an analytical convenience'. The point is that there would be no organization theory left if evaluations were mainly based on too demanding conceptual rigour.

Determinism versus Voluntarism

OE has frequently been criticized by strategic management scholars for being overly deterministic and neglecting the free will of managers (see, e.g., Astley and Van de Ven 1983; Bourgeois 1984). However, Hannan and Freeman (1989) argue that determinism is not at all the opposite of voluntarism. Indeed, it is not because OE assumes that natural selection causes diversity in organizational forms that managers do not make choices, change strategies and even try to adapt their organizations to changing environmental conditions. As Hannan and Freeman (1989: 22) put it, '[e]ven when actors strive to cope with their environments, action may be random with respect to adaptation as long as the environments are highly uncertain or the connections between means and ends are not well understood. It is the match between action and environmental outcomes that must be random on average for selection models to apply'. OE is only 'deterministic', therefore, in the sense that long-run organizational survival is mainly determined by environmental conditions.[1] This implies that OE questions the 'great man' theories of organizational history.

A more fundamental issue is which assumption is more valid: relative inertia (OE), which is a prerequisite for Darwinian selection to occur, or relative flexibility (strategic management), reflecting the Lamarckian view. We agree with Young (1988) that the OE assumption of relative inertia has not, as yet, been seriously verified. However, this is also the case for relative flexibility, which has been taken for granted by many strategic management scholars (Johnson and Scholes 1993). More specifically, it is assumed that managers scan the environment, being able to continuously fine-tune the strategy and structure of their organizations in accordance with environmental changes. The latter implies that organizational diversity is mainly the consequence of organizational change. Although the views of both 'camps' differ substantially at first glance, considerable overlap can be observed when looking at the behavioural theory of strategic decision-making processes. A recent article by Miller (1993) suggests that even 'excellent' organizations are not immune to environmental selection.

Miller argues that successful organizations become increasingly 'simple' over time, which may ultimately lead to organizational failure.

Miller (1993: 119) offers three reasons for this dangerous simplicity. More specifically:

> 'First, individual managerial, cultural, structural, and process factors provoke simplicity. Such factors include organizational learning; the "natural selection" of values, heroes, and skills; and confining programs and routines. Second, these factors tend to interact, generating increasingly pure and simple corporate configurations — constellations that become ever more aligned with a single dominant theme and less tolerant of deviation or variation. Third, a troublesome paradox exists: the sources of dangerous simplicity may underlie initial success and, thus, may be doubly difficult to combat. Indeed, it is very hard to distinguish between the concentration and passionate dedication so necessary for success and competitive advantage and the simplistic fixations and extremes that lead to failure.'

Obviously, the theory of the dynamics of strategic decision-making processes offered by Miller (1993) is perfectly compatible with the assumptions of OE.

In our view, however, a frequently neglected possibility is that inertia and flexibility are not necessarily the opposites on a continuum. In an insightful paper, Burgelman (1991) argues that organizations can consistently remain successful by a carefully balanced strategy-making approach consisting of inertia *and* flexibility. Burgelman (1991) uses an intra-organizational ecological perspective on strategy making. He distinguishes two kinds of strategic processes: induced and autonomous. Induced strategic initiatives fit within the current strategy, routines and goals of the organization and are compatible with the current distinctive competence. The internal selection of such initiatives by top managers reflects current external selection pressures. This process, however, only allows an organization to adapt to incremental environmental change and is therefore tantamount to relative inertia. Burgelman (1991) argues that induced processes are necessary to build on past success and to exploit the opportunities associated with the current domain. To achieve long-run survival, however, induced processes should be balanced with autonomous strategic processes. The latter refer to the internal selection of strategic initiatives outside the scope of the current strategy. An important task of top management is to nurture such operational-level strategic initiatives. Autonomous processes, when funded and supported by top management, allow continuous strategic renewal and offer organizations possibilities for anticipatory adaptation. The point is that the long-run survival of firms is enhanced by the 'balancing of variation-reduction and variation-increasing mechanisms. It suggests that one process leads to relative inertia and incremental adjustments, while the other expands the firm's domain and renews the organization's distinctive competence base, countering inertia and serving some of the functions of reorientation' (Burgelman 1991: 257). The fact that several organizations start-up new, decentralized plants to allow the internal development of products outside their current domain is a clear example

of such anticipated renewal behaviour. That is, some organizations seem to be able to develop *routines* for change.

The recent contribution by Burgelman (1991) is an interesting example of a theory of organizational change that nicely develops the OE argument beyond the simple assumption of relative inertia. 'Mainstream' OE predicts that organizational change, if it is possible at all, will increase the failure rate. The reason is that adaptation by changing the core features of an organization can be considered as creating a new organization. As a consequence, organizational changes '[t]end to ''reset the clock'', exposing the organization once again to the ''liability of newness'' ' (Swaminathan and Delacroix 1991: 681). Several findings, however, suggest that change does not increase failure rates (Kelly and Amburgey 1991) or even enhance survival in the long run (Amburgey et al. 1990; Swaminathan and Delacroix 1991; Haveman 1992). Particularly important is the conclusion of Kelly and Amburgey (1991: 609), studying cumulative change, that 'as organizations gain experience with change, they may develop routines to handle it so that change itself becomes routinized'.

These interesting findings suggest that organizational change, as a driving force of organizational diversity, needs more attention (see also Singh and Lumsden 1990) and that some organizations are better able to change than others. Note that a similar paradox — labelled commitment versus flexibility — *is* well-known in industrial organization (Ghemawat 1991). What matters is which features characterize adaptive organizations (Kelly and Amburgey 1991), and which environmental conditions enhance successful adaptation (Haveman 1992). We think that the first step towards bringing both 'camps' together is incorporating other individual characteristics of organizations, besides size and age, in OE models. That is, it should be recognized that populations are not very homogeneous. It is here where IO has something to offer OE. This issue will be taken up in the fifth section, particularly in the second subsection.

An Intermediate Evaluation of Organizational Ecology

Hannan and Freeman started an ambitious and impressive research programme in 1977 with the purpose of finding answers to fundamental questions such as 'why are there so many different kinds of organizations?' (Hannan and Freeman 1977) and 'what are the dynamics of modern economies, states, and societies?' (Hannan and Carroll 1992). Initially, the research strategy of mainstream OE has logically been one of searching for 'general laws'. For instance, concerning density dependence and its resources, Hannan and Carroll (1992: 18) argue that '[o]ur primary argument . . . is intended to apply to all kinds of organizational populations. That is, the theory applies to populations of all types, in any time period, and in any society'. The same stance can

be witnessed for other aspects of the theory such as the 'liability of smallness' and 'liability of newness' hypotheses. This search for generality implies that very little attention has been given to *differences between* and *within* populations or industries. This observation relates, of course, to the criticism raised in the strategic management literature discussed in the previous section. In our view, OE can therefore be classified as a general theory of *similarities*.

We would like to stress that there is nothing wrong with such a research strategy. Moreover, despite some inconsistent findings mentioned in the second section, the research findings of OE are impressive indeed. However, OE only represents one side of the coin. We agree with Carroll (1984: 90) that '[t]he future development of organizational theory depends not on the dominance of one perspective, but on the welding of the most important insights from various perspectives'. It is in this respect that we think that both industrial organization and the economically inspired sub-field of strategic management (e.g. game theory and competitor analysis, respectively) are important candidates for cross-fertilization. The reason is twofold. First, understanding the dynamics of industrial evolution is an important topic on the research agenda of both IO and OE. Therefore, they have a common interest. Second, IO — as opposed to OE — focuses on *differences between* and *within* industries (populations). Those differences seem to be as important as the similarities (i.e. density dependence) stressed by OE, as will be discussed below.

The Potential Contribution of Industrial Organization

We stress in advance that the purpose of this paper is not to develop a general theory of industrial evolution, but rather to illustrate important areas for cross-fertilization between IO and OE. It will be argued that IO and OE are complementary. As a result, insights from both theories are needed to understand the dynamics of populations. Given the immense IO literature on this subject, we will take the path-breaking book of John Sutton (1991), *Sunk Costs and Market Structure*, as the benchmark case. Sutton's book is, in a way, a summary of the current state-of-the-art in modern IO. Our arguments are divided in two parts. First, differences *between* populations are explored. Then attention is focused on differences *within* industries.

Industrial Organization and Differences Between Industries

IO and a Number of Striking Regularities

The nonmonotonic density dependence in the vital rates can explain the striking similarity of the growth trajectories of different organizational populations. IO scholars, however, have also discovered a number of striking regularities. More specifically, they observed that '[t]he ranking

of industries by concentration level tends to be closely similar from one country to another: an industry that is dominated by a handful of firms in one country is likely to be dominated by a handful of firms elsewhere too' (Sutton 1991: 3). Dunne et al. (1988) — studying entry, growth and exist in 387 four-digit U.S. manufacturing industries over the period 1963–1982 — report another, related regularity. It appears that entry and exit patterns differ substantially across industries. In addition, they observe a high degree of correlation between entry and exit rates across those industries. The differences in industry entry and exit patterns even persist over time. Taken together, these findings clearly demonstrate that substantial, *systematic* heterogeneity exists between organizational populations and that some underlying characteristics of industries strongly constrain equilibrium structures (Sutton 1991; see also Klepper and Graddy 1990).

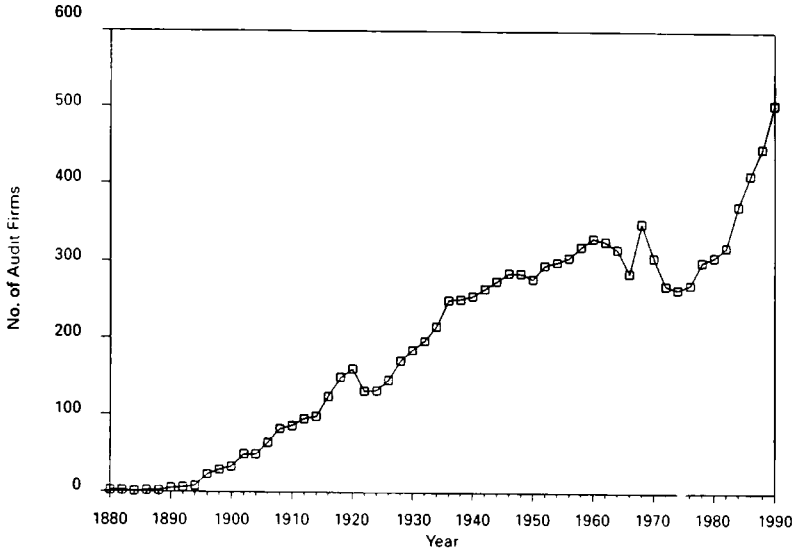
While OE can explain the typical growth trajectory of populations, it has no answer to important questions such as why certain industries remain fragmented while others become highly concentrated.[2] Moreover, some industries seem to evolve towards a dual structure (Sutton 1991), whereas others do not. That is, in some industries an expansion of the number of firms can occur simultaneously with increases in concentration. The evolution of the Dutch audit market is a clear example of the latter pattern. Maijoor et al. (1993) collected historical data of the (nearly) complete Dutch audit market from its inception, in the late nineteenth century, to the present day. The evolution of the total number of Dutch audit firms and of the four-firm concentration ratio (C_4) — which correlates almost perfectly with the Herfindahl–Hirschman index over the whole period — are depicted in Figures 1 and 2, respectively. An important observation is that the steady growth of the number of audit firms goes hand in hand with a rapid increase in the level of concentration. A number of explanations for this peculiar evolution in the Dutch audit industry will be offered in the fourth subsection (pp. 284–286).

Our point is that mainstream OE cannot account for these differences in the evolution of populations. The main reason is that the theory of OE is solely based on numbers (i.e. density), and thus neglects an important aspect of the size distribution of firms, namely market concentration.[3] To be sure, this argument can be reversed with respect to IO, which tends to emphasize (but not to exclusively focus on) the properties of one tail of the size distribution — for instance, the market share held by the largest four or eight firms (Hannan and Carroll 1992). A theory of industry dynamics should therefore incorporate *both* density and concentration. We will now address the question of why such differences in the evolution of industries (or populations) can be observed.

Sutton (1991) on Differences Between Populations

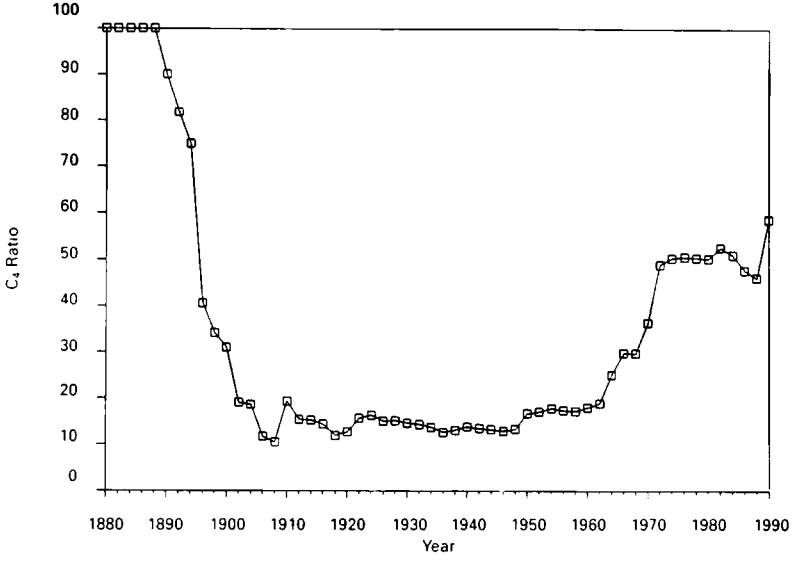
The literature on IO has been dominated in past decades by the application of game theory to competing firms in oligopolistic markets (Tirole

Figure 1
Density
Evolution of the
Dutch Audit
Industry: 1880–
1990



Source: Maijoor, Buijink, Van Witteloostuijn and Zinken (1993).

Figure 2
Concentration
(C_4) Evolution of
the Dutch Audit
Industry: 1880–
1990



Source: Maijoor, Buijink, Van Witteloostuijn and Zinken (1993).

1988). However, the results of those applications tend to depend delicately upon the assumptions underlying the game design (Sutton 1991; see for a defence, Shapiro 1989a). Hannan and Carroll (1992: 22) comment that '[t]he analytic results apparently lack robustness'. IO scholars have therefore focused their attention on specific markets. This allows for adaptation of the oligopoly models to the requirements of the spe-

cific situation. Of course, this 'ultra-micro work' (Sutton 1991: 6) impedes understanding of the observed statistical regularities between industries. This observed lack of robustness is one of the main reasons why cross-fertilization between IO and OE has not yet occurred (Hannan and Carroll 1992). The above characterization is, however, partly beside the mark. For example, a number of contributions to the *Handbook of Industrial Organization* (Schmalensee and Willig 1989) reports theoretical and empirical regularities such as the monopoly enhancing impact of commitments (Gilbert 1989) and the thirty 'stylized facts' (empirical regularities) from industry studies (Schmalensee 1989). The work of Sutton (1991) is another strong case in point.

Sutton (1991) shows in his thought-provoking book that game theory can be used to develop *robust* predictions concerning the level of industry concentration, which hold across a wide class of reasonable models (and thus allow application to a broad set of different industries). Sutton's work is the *pièce de resistance* of a long tradition in IO that studies the sunk investment–market competition nexus (Van Witteloostuijn 1992). To achieve robustness, some precision of prediction has to be sacrificed for the breath of application. As a result, Sutton (1991) analyzes the *lower bound* to the equilibrium level of concentration as a function of market size (S). Notice that the IO concept of market size is similar to the concept of carrying capacity in OE.

As opposed to OE, Sutton (1991) develops a general theory of *differences* between industries. More specifically, he makes a distinction between what Schmalensee (1992) calls Type I and Type II industries. In the case of Type I markets, sunk costs are exogenous. That is, setup costs (σ) have to be incurred by all entrants to start a business of minimum efficient scale. In other words, they refer to the presence or absence of economies of scale. An example of exogenous sunk costs is investment in building a plant. Type II markets are characterized by endogenous sunk costs. Endogenous sunk costs are choice variables to firms, and refer to advertising or R&D outlays which are incurred to 'enhance consumers' willingness-to-pay for the firm's product(s)' (Sutton 1991: 8). According to Sutton (1991), the theory can be applied to any form of sunk outlays that increase consumers' willingness-to-pay. However, he focuses attention to advertising and not to R&D outlays for the sake of simplicity.[4] Therefore, Type II industries are characterized by high advertising outlays relative to sales. The predictions following from the theory are confronted with an in-depth investigation of twenty food and drink product industries in six countries.

Type I markets can be divided into two subcases: the homogeneous goods industries and the horizontal product differentiation markets. The former case reflects the standard Bertrand and Cournot theory of competition with product homogeneity (Shapiro 1989b). The latter case stresses the fact that, even in the absence of strategic advertising and R&D, most goods are not very homogeneous — as emphasized by, for

instance, location models of competition (Hotelling 1929; Eaton and Lipsey 1989). This type of product differentiation can, for instance, be the result of transportation costs, depending on the geographical location of suppliers, or some physical difference between the products offered by rivals. In both cases the theory predicts that (*ceteris paribus*) the lower bound of concentration declines indefinitely, as the ratio of market size to setup costs increases. What unifies both cases of Type I markets is that sunk cost is exogenous, be it in the form of investment in production technology (homogeneous goods) or geographical location (horizontal product differentiation).

The main difference between the Type I markets with homogeneous goods and the Type I markets with product differentiation is that the latter case, contrary to the former, is associated with multiple equilibria. The game theory of market structure with free entry, product homogeneity and exogenous scale economies (embodied in a cost function that is associated with a fixed production technology) proves that, *ceteris paribus*, the level of scale economies (or the size of the minimum efficient scale of operation) determines for each level of market demand a unique number of firms that can viably operate in equilibrium (Baumol 1982). With exogenous product differentiation, game-theoretic modelling reveals that a plethora of equilibria can be calculated. The reason is that, in a Hotelling-type of setting, any equilibrium outcome between multi-product monopoly and single-product fragmented competition can occur (Eaton and Lipsey 1989: 741). Therefore, in this case, the theory's prediction is limited to the proposition that the *lower bound* on concentration (which is the equilibrium with single-product firms) declines to zero as market size increases (Schmalensee 1992: 126).

The *ceteris paribus* clause is important, as in any game-theoretic model. Two examples may illustrate this point. First, equilibrium values of concentration depend upon the toughness of price competition. Sutton (1991) notes that as price competition is tougher, the equilibrium number of firms will be correspondingly *lower*. The intuition underlying this phenomenon is that the anticipation of a tougher regime makes entry less attractive, thus raising equilibrium concentration levels. Second, with horizontal product differentiation, the equilibrium level of concentration will depend upon industry-specific influences, especially when the ratio S/σ is high. Although the theory is less informative for high S/σ ratios, regression analysis shows that, as expected, the four-firm concentration ratio of Type I industries is negatively related with S/σ. The regression coefficient of S/σ is statistically significant at the 5 percent level (for 32 Type I industries). Sutton (1991: 121) reports that '[a] doubling in S/σ implies a fall of 13 percentage points in C_4; the corresponding equation for the logit formulation indicates that a doubling of S/σ implies a fall of 19 percentage points in C_4'. This confirms the theory that industries characterized by high setup costs (scale economies) relative to market size will evolve towards a concentrated structure with a small number of firms.

The relation between the size of the market relative to setup costs (S/σ) on the one hand and the degree of concentration on the other, as described above, breaks down in Type II markets. This prediction is based upon the game-theoretic modelling of product differentiation with endogenous sunk cost, particularly advertising modelling (Eaton and Lipsey 1989). More specifically, concentration remains bounded away from zero as market size increases. The reason offered by Sutton (1991: 11) is that the competitive escalation of advertising outlays in such industries '[r]aises the equilibrium level of sunk costs incurred by incumbent firms in step with increases in the size of the market — thus offsetting the tendency towards fragmentation'. Regression analysis indeed shows that there is no significant relationship between the size of the market relative to setup costs (S/σ) and the four-firm concentration ratio for 58 Type II industries, as expected. It should be emphasized that product differentiation in Type I markets and advertising intensity in Type II markets really describe different cases. Although advertising intensity is frequently related to highly differentiated products, differentiation can occur without advertising. Sutton (1991: 78) gives the example of the engineering industry, '[w]here many highly differentiated products are sold primarily to industrial buyers and for which advertising levels are usually extremely low'.

The difference between the lower bound of concentration as a function of market size in homogeneous goods, product differentiation and advertising intensive industries is summarized in Figure 3. Note that industry-specific influences (such as the toughness of price competition) may move the curves up or down, and that only the homogeneous-goods case is associated with a set of *unique* equilibria (one for each value of S). Figure 3 illustrates two observations (Sutton 1991: 78): '(1) The higher degree of product differentiation *per se* will facilitate entry insofar as it provides new niches for potential entrants. This is captured by the leftward shift of the lower bound for small values of market size. (2) Insofar as product

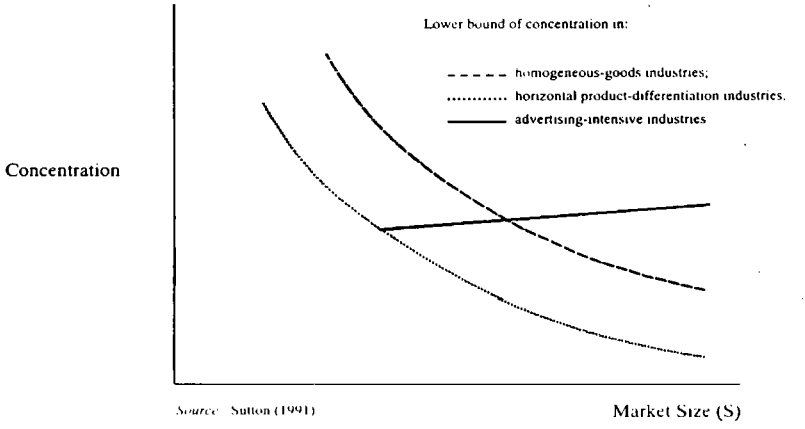


Figure 3
Sutton's Market Types

Source: Sutton (1991)

differentiation renders advertising more effective, this will tend to raise concentration levels. This is captured by the upward shift in the lower bound at high values of S.' It should be mentioned that an increase in setup costs (σ) also leads to an increase in the lower bound of concentration in the case of endogenous sunk costs (Sutton 1991).

An important point is that Sutton's theory is able to account for the regular emergence of a dual structure in Type II industries. Such a dual structure is likely to occur when customers differ in their responsiveness to advertising outlays. This process is clearly illustrated by the evolution of the frozen-food industry in the United States, which has a high advertising to sales ratio and low setup costs (σ). In a detailed historical account, Sutton (1991) shows that the initially fragmented structure collapsed due to the escalating advertising outlays of a small number of leading firms. (Note that Geroski and Vlassopoulos (1991) offer a similar account of the history of the U.K. frozen-food industry.) Furthermore, a dual structure evolved because the retail sector is highly responsive to those advertising outlays, whereas the nonretail part of the market primarily buys on price. The competitive escalation of advertising necessarily led to the survival of only a small number of relatively large firms in the retail sector. In the nonretail part of the market, such concentration could not be observed. Instead, the nonretail sector remained relatively fragmented, consisting of small, specialized and nonadvertising firms. It is important to mention that the maximum number of such 'fringe' firms generally depends on the size of the nonretail (or nonadvertising) market and on the magnitude of the setup costs. As the frozen-food industry is characterized by low setup costs and a relatively large nonretail segment, a considerable number of such 'fringe' firms can be sustained (Sutton 1991).

It is interesting to note that firms which were stuck between those two segments faced declining profitability until the split was achieved. Sutton (1991: 182) also observes that '[t]he smaller firms specializing in the nonretail sales remained relatively profitable compared to those firms of similar size that faced severe competition from the majors in the retail segment, where profit rates were strongly and positively related to firm size'. The bottom line is that Sutton shows, both empirically and theoretically, that a dual market structure — with a small number of large market leaders and a large number of small fringe firms — is a sustainable outcome. This result goes back to the theories of Stackelberg competition (Dowrick 1986), where one firm takes the lead in setting quantities or prices and models of dynamic entry accommodation (Gelman and Salop 1983), where large firms profitably and purposely tolerate small-firm entry.

A Case of Comparison: The German and U.S. Brewing Industries

Sutton (1991) also analyzes a more complex case where both exogenous and endogenous sunk costs are high: the U.S. brewing industry. The brewing industry became highly concentrated during the post-war dec-

ades. In 1934, more than 700 breweries were in operation. By 1985, 97.7 percent of industry sales was realized by seven firms. The top two, Anheuser-Bush and Miller, alone accounted for a combined market share of 60 percent (Sutton 1991: 289). According to Sutton, this evolution cannot be explained by increases in the minimum efficient scale of operation (scale economies) alone. It is the result of the complex interaction of exogenous sunk costs and the escalation of advertising outlays of the leading breweries (endogenous sunk costs). In this respect, it is interesting to note that the German brewing industry remained rather fragmented compared with the U.S. brewing industry. Carroll et al. (1993: 158) report that 123 brewers were operating in the United States in 1988, whereas in Germany the number of producers amounted to 1,192. Sutton argues (1991: 301) that only the U.S. brewing industry satisfies the two assumptions of his analysis, as '[t]he evolution of structure was left to market forces, and the effectiveness of advertising was not blunted by the presence of ties between producers and outlets'. Sutton (1991: 300) comments as follows: 'In Germany, as in the United Kingdom, the tying of retail outlets to particular brewers again blunts the effectiveness of advertising. Long-term contracts between the brewer and the retail outlets guarantee the brewer exclusive supply rights. In addition to the existence of the tie, heavy restrictions on television advertising further increase the difficulties in establishing national brands'.

Two possible outcomes are associated with such escalating advertising outlays as in the U.S. brewing industry: exit of second-tier firms or the eventual development of a dual structure (as in the frozen-food industry) (Sutton 1991). These processes, suggested by Sutton, are consistent with recent empirical findings in the OE tradition. First, Boeker (1991) analyzes the growth in sales volume of national, regional and local brewers at the U.S. state level for the period 1962–1979. He finds that growth in national brewers induced declines in regional and local brewers. This competition effect is especially pronounced for the regional brewers. The latter result suggests that medium-sized regional brewers are more vulnerable to the escalation of advertising outlays of leading (national) companies. Second, recent developments in the U.S. brewing industry seem to reveal an evolution towards a dual structure. More specifically, in the last 15 years, two new types of brewers have emerged in the United States: 'The first of these, the so-called microbrewery, produces ale and beer by traditional methods for a small but upscale niche in the market. The second form, commonly referred to as the brewpub, sells malt beverages directly to the consumer for immediate consumption at the site of production' (Hannan and Carroll 1992: 156). The density of both types grew rapidly. It is clear that those brewers focus on the nonadvertising segment of the market, which is precisely what the endogenous sunk cost model of Sutton predicts. Whether this emergent dual structure can be sustained in the long run remains to be seen, and depends upon, among other things, the size (or carrying capacity) of this nonadvertising segment. Note that the mixed case — with both exogenous and endogenous sunk cost — is

associated with a dual structure revealing a Type I market niche *and* a Type II market segment.

There is an exciting similarity between the dual structure theory of Sutton (1991) and an OE theory, namely the resource partitioning model of Carroll (1985). The model of Carroll applies to industries with strong economies of scale (i.e. high σ in the terminology of Sutton) (Hannan and Carroll 1992). The theory makes a distinction between generalists and specialists: 'Populations that depend on a wide range of environmental resources for survival are known as generalists . . . . In contrast, populations that survive in a specific environmental condition (or within a narrow range of environmental resources) are called specialists' (Carroll 1985: 1266). Examples of generalists are large daily newspaper organizations and national breweries. Small newspaper organizations focusing on a specific segment of the market, microbreweries and brewpubs are typical specialists.

When scale economies dominate, large generalists in a population compete to occupy the centre of the market. This competitive process causes concentration in the 'mass market', which opens up small pockets of resources that are likely to be used by small specialists. The resource partitioning theory therefore predicts that increased concentration among generalists increases the failure rate of large generalists and decreases the failure rate of small specialists (Carroll 1985; Baum and Mezias 1992). Baum and Mezias (1992: 583) argue that the '[r]esource partitioning model suggests one possible basis for Hannan and Freeman's specification of size-localized competition: Large organizations capture the advantages of generalism, small organizations the advantages of specialism, and middle-sized organizations the liabilities of both'.[5] The evidence, although scarce, supports the resource partitioning model in the U.S. newspaper market (Carroll 1985) and the U.S. brewing industry (Hannan and Carroll 1992). In the latter case, the four-firm concentration ratio has a positive effect on the founding rates of microbreweries and brewpubs, and a negative effect on the mortality rate of microbreweries (not enough mortality data were available for brewpubs) (Hannan and Carroll 1992).

Notice that both theories are similar to the description of competitive social processes by Hawley (1950): 'Following Durkheim, Hawley argued that finite environmental resources set the conditions for competition. As competition proceeds, selective pressures push less fit competitors out of the market. When these competitors exit from their previous niches, they become differentiated through either territorial or functional transformation. As Hawley emphasizes, the final outcome of competition is a more complex division of labour, characterized by primarily symbiotic relations between social units' (Carroll 1985: 1278). In other words, competition leads to heterogeneity instead of homogeneity within populations, due to lateral migrations into a neighbouring market niche (for an economic account on differentiation due to competition see Lippman et al. 1991). There is, however, a subtle difference between the above-

mentioned theories concerning the fundamental nature of competitive processes. More specifically, Carroll (1985) rejects the process suggested by Hawley that differentiation is mainly the result of the transformation of losing competitors. Instead, Carroll (1985) assumes that the replacement of losing (failing) competitors by differentiated units coming from new sources (i.e. entry) causes differentiation. Sutton's theory allows for both mechanisms to operate. That is, a dual structure can be the result of both exit (and replacement) and lateral migration towards the 'fringe' of the market.

The main difference between the theory of Sutton (1991) and the resource partitioning model of Carroll (1985) is that, in our view, the former is more informative than the latter as to the specification of conditions in which resource partitioning is likely to occur. The applicability of the model of Carroll is limited to the standard case of exogenous sunk costs (scale economies). Resource partitioning is likely to occur in Type I markets — more specifically, the horizontal product differentiation subcase. The latter condition is necessary, because partitioning cannot be observed without some heterogeneity of resource bases (e.g. different tastes of customers). Sutton's theory, however, extends this prediction by showing that such a dual structure regularly appears in advertising-intensive industries (i.e. Type II industries), even in the absence of scale economies (an example being the frozen-food industry). In any case, both theories can account for the fact that in some industries the levels of concentration and density rise simultaneously.

A Second Case in Point: The Dutch Audit Industry

There remains, however, a problem in explaining the evolution of the Dutch audit industry (Figures 1 and 2). This industry is neither characterized by the existence of scale economies (high S/σ ratio) nor by a high advertising to sales ratio. One possibility is that the evolution of the Dutch audit industry is caused by industry-specific factors (such as government regulation). Another possibility is that a mechanism, not captured by Sutton's or Carroll's theory, has induced this pattern: i.e. increasing concentration at the demand side. Below, both possibilities, which will appear to be closely related, are briefly discussed.

A first determinant of the Dutch audit industry structure is government regulation that stimulates demand for audit services. A number of laws enforced audit requirements upon large parts of Dutch business life. By way of illustration, two post-1970 regulatory measures are worth mentioning (Maijoor and Van Witteloostuijn 1993). A first regulation imposed mandatory audit requirements and detailed disclosure rules on *large* firms in 1971, implying that all public companies, large private firms and large cooperatives had to disclose audited annual accounts. A second regulatory measure was introduced in 1983. Under this new legislation *all* public companies, private firms and cooperatives, whatever their size, are obliged to disclose (abridged) annual accounts.

The second explanatory variable is client concentration. DeAngelo

(1981) and Benston (1985) argue that large company clients can only be served (efficiently) by large audit firms. Dutch industry concentration was relatively stable up until the 1960s. Then, a number of acquisition and merger waves induced a substantial increase of the concentration level (De Jong 1988). Hence, as the 1971 regulation forced an increased demand for the services of *large* audit firms, audit market concentration started to rise in the 1970s (Figure 2: from a C_4 of 0.36 in 1970 to a C_4 of 0.53 in 1982) *without* a significant increase of density (Figure 1: the number of audit firms is 306 in 1970 and 320 in 1982). The effect of the 1983 regulation is the opposite: audit market concentration remained relatively stable (the C_4 falling from 0.53 in 1983 to 0.46 in 1988, and rising again to 0.59 in 1990) with substantially increased density (from a total of 320 audit firms in 1982 to 505 in 1990). The explanation is that the 1983 regulation generated a massive increase of demand from small and medium-sized clients for the audit services of relatively small audit firms. To sum up: the 1971 regulation increased the carrying capacity of the large audit-firm niche, whereas the 1983 measure did so for the small audit-firm segment. The end result is, again, a dual market structure. This pattern supports the predictions of Carroll's (1985) and Sutton's (1991) theories. The underlying mechanism is, however, different. The long-run evolution of the Dutch audit industry suggests that the structure of the supply side of the market may be (partly) determined by the demand-side structure of the market.

This said, the result comes as no surprise. OE scholars have an open eye for the influence of government regulation on density (Hannan and Carroll 1992), which is clear from their interest to integrate institutional theory into their argument (Zucker 1989; Baum and Oliver 1991). However, the case of the Dutch audit industry indicates that the impact on concentration cannot be ignored either. An account of the history of the underlying political decision-making processes reveals a second point: much regulation is (at least partly) *endogenous* rather than exogenous to the industry. Both regulatory measures have been prepared by government-installed commissions with important representatives of the audit profession (Maijoor and Van Witteloostuijn 1993). In the case of the Dutch audit industry, effective *lobbying* has been an important determinant of government intervention. This observation is in line with the economic theory of rent seeking (Lindahl 1987). The Dutch audit industry has a long history of institutionalized interest promotion, including lobbying activities (De Vries 1985). An illustrative quote from the minutes of a large professional association of Dutch auditors is that 'the organization will act in the interest of its members and assistants . . . striving for legal regulation of the profession'.

In fact, the case of the Dutch audit industry can be seen as an additional illustration — next to advertising and R&D — of Sutton's claim that *any* type of sunk investment that enhances the consumers' willingness, to pay for the firm's product(s) can be captured in his Type II market setting. In the Dutch audit industry, the clients' willingness-to-pay is

increased as a result of demand regulations that came into being after the industry invested (and still does invest) sunk costs in decade-long lobbying activities. However, an additional subtlety must be mentioned. The enforced audit requirements stimulate demand at the *industry* level. Hence, this increase of the population's carrying capacity may induce entry and so *decrease* concentration. However, this is not what happened in the Dutch audit industry for two reasons (Maijoor and Van Witteloostuijn 1993). First, the dual structure at the demand side is reflected in the dominance of large firms at the supply side (see the argument above). Second, the demand regulations have been backed by a monopolized licensing regime which regulates the supply side. That is, by law, only the professional body NIvRA (*Nederlands Instituut van Register-Accountants*), which has held the monopoly since 1967, has the jurisdiction to license new auditors. Hence, the profession is able to regulate the entry process so as to protect the rents that follow from the law-enforced demand increase.

Implications for Organizational Ecology

A number of implications follows from the arguments made above. By way of illustration, we discuss five below.

Implication 1: density and concentration. Hannan and Carroll (1992: 48) observe '[t]hat trends in density often coincide at least roughly with those of concentration. When the number of firms declines, the market share held by the largest few firms often increases'. The discussion presented in this paper makes clear that the word *roughly* should be stressed, and that many counter-examples can be found. Therefore, a theory of population dynamics must take into account *both* density and concentration. The resource partitioning model of Carroll (1985, 1987) is a rare exception. Integrating IO and OE offers the possibility of analyzing competition beyond the one-dimensional numbers (density) or concentration perspective of OE and IO, respectively.

Implication 2: industry heterogeneity. We believe OE can make considerable progress by taking into account systematic differences *between* industries. In this respect, IO can be very informative, as the theory of Sutton (1991) shows. Several OE scholars have argued that the development of the field requires a science of organizational classification and taxonomy (see Carroll 1984, for a discussion). McKelvey and Aldrich (1983: 125) argue that '[a] theoretically grounded empirical taxonomy would provide a conceptual framework for describing and understanding the diversity of organizational populations, and would identify populations useful for research on other substantive concerns about organizations'. In our view, the work of Sutton — stressing *inter alia* the importance of advertising — is an important step forward in the development of a useful categorization of organizational populations. Such work allows OE researchers to (1) reconciliate discrepant findings, (2) explain differences in the strength of effects, and (3)

identify the limits of generalization and therefore to increase the precision of prediction.

To illustrate points 1 and 2, we focus our attention on the findings of Carroll et al. (1993), who compared the dynamics of the U.S.- with the German brewing industry. Recall that escalation of advertising outlays occurred in the U.S. brewing industry but not in Germany (Sutton 1991). Carroll et al. (1993) find '[t]hat the same environmental forces sometimes produced different effects in these contexts' (*point 1*). A very peculiar finding, not dealt with by Carroll et al. (1993), is the divergent effect of the carrying capacity (measured as the size of the residential population) on both the founding and mortality rates in the U.S.- and German brewing industry. More specifically, in the German brewing industry the founding rate significantly increases and the mortality rate significantly decreases with an increase in the carrying capacity. This result, of course, is as expected. However, in the U.S. brewing industry the findings are precisely the opposite. That is, an increase in carrying capacity is significantly associated with a decrease in founding rates and an increase in mortality rates. It is likely that the latter pattern is the result of the escalation of advertising outlays of the leading U.S. brewing companies. If the benefits of an increasing demand only accrue to advertising firms, it can be understood that second-tier breweries are pushed out of the market, and therefore the mortality rate rises. As the escalation of advertising increases the endogenous sunk costs, the founding rate is also depressed.

Carroll et al. (1993) also report that the vital rates of both the U.S. and German brewing industry are nonmonotonically related to population density, as expected. However, they observe large variations in the strength of the density-dependent evolution in the American and German brewery industries (*point 2*). The authors report, for instance, that '[t]hough the estimate of density dependency in the age-specific mortality rate of German breweries is nonmonotonic, the mortality rate continues to decline with density over the entire range, suggesting the dominance of the density-dependent legitimation process' (Carroll et al. 1993: 181). This is not the case for the U.S. brewing industry, where the mortality rate increases rapidly after a density of 1,526 has been reached (the maximum observed density being 2,550). These findings clearly show that the competition effect has been more pronounced in the U.S. brewing industry. We speculate that this difference in the strength of effects can be ascribed, at least in part, to differences in the escalation of advertising outlays.

In our view, IO has high potential in helping to determine the limits of generalization of OE predictions (*point 3*). As a result, more precise predictions can be made concerning the dynamics of populations. In the previous section we already discussed the contribution of the work of Sutton (1991) relating to the applicability of the resource partitioning model. Similarly, the theory of Sutton allows one to make differential predictions concerning the 'liability of smallness'.[6] It can be expected that the mono-

tonically declining relationship between size and failure rate will be most pronounced in Type I industries characterized by scale economies and homogeneous products. However, it is likely that, at the onset of the escalation of advertising outlays, the relationship between size and failure becomes nonmonotonic: i.e., the failure rate of medium-sized firms is higher than the failure rate of large and small firms. In other words, we expect size-localized competition to be more pronounced in Type II industries. As another example, we hypothesize that industry concentration is positively related with the mortality rates of small firms in Type I industries (selling homogeneous goods), but not in Type II industries. The frozen-food industry is a potential candidate to test these predictions, as its development is very well-documented (Sutton 1991). Note, finally, that a differentiated perspective on the 'liability of smallness' hypothesis is supported by game-theoretic models of exit (Ghemawat and Nalebuff 1985, 1990; Whinston 1988).

Implication 3: endogenous carrying capacity. The endogenous sunk-costs model implies that the carrying capacity itself is endogenously determined — rather than being exogenous to the theory, as postulated by OE. This is what differentiates Type II markets from Type I markets: strategic sunk-investment stimulates the consumers' willingness-to-pay for the firm's product(s). A well-established result in IO is that advertising is both a private and public good (Comanor and Wilson 1979). The public good nature of advertising implies that the promotion efforts of individual firms may well raise industry demand (Roberts and Samuelson 1988). Another case in point are advertising campaigns that are organized by industrial associations. Two recent examples in The Netherlands are national television ads for milk and notaries, and in Belgium for cheese and textiles — in all cases without any reference to brand or office names. Note that such stimulation of industry demand may *decrease* rather than increase concentration if the increased carrying capacity induces entry. The case of the Dutch audit industry (pp. 284–286) offers a second mechanism that endogenizes carrying capacity: lobbying practices for demand-enhancing government regulation. Moreover, the events in the Dutch audit industry reveal that industry lobbying for demand regulation may *increase* concentration if backed by supply-restricting measures (in this case a monopolized licensing regulation).

Implication 4: advertising, lobbying and legitimation. The fourth implication for OE, closely related to the third implication, concerns the importance of advertising and lobbying as ways to obtain legitimacy. According to Hannan and Carroll (1992: 21), '[l]egitimation has no recognizable counterpart within economic theory'. As Implication 3 reveals, this observation is clearly beside the mark. Apart from industry legitimation, IO stresses the fact that legitimation processes also occur *at the firm level.* In other words, firms try to increase consumers' willingness-to-pay for *their* product(s) by advertising outlays. Therefore,

legitimation processes at both the population and firm level should be considered simultaneously. Similarly, the economic theory of lobbying describes a legitimation mechanism.

Implication 5: time dependence. A final, and related, implication concerns the generality of OE theory over different time periods. Recall that the theory according to Hannan and Carroll (1992) is intended to apply to any time period. We seriously doubt this general postulate. Hitherto the majority of OE findings were based on organizational populations existing at least 100 years. The work of Sutton (1991), however, more than suggests that in several populations the competitive situation changed dramatically after the Second World War, due to the rapid diffusion of television with the accompanying escalation of advertising campaigns. This evolution has two implications for the dynamics of Type II industries.

First, it is likely that within 'old' Type II markets, the dynamics of industry evolution changed dramatically after the Second World War. Some indirect evidence can be found in Hannan and Carroll (1992). They studied the effect of left-truncated observation schemes on non-monotonic density dependence in the vital rates of the U.S. brewing industry. Left-truncation occurs when the early history of a population is not included in the data set — as in the study of Delacroix et al. (1989), for instance. Hannan and Carroll (1992) find the expected density-dependent effects for the full history of the population (1633–1988). However, for the left-truncated period (1940–1988), they report that '[t]he effects of density on the founding rate now run opposite the predictions of the theory and differ greatly from those of the entire period. So do the effects of density on the mortality rate' (Hannan and Carroll 1992: 165). Of course, it is not surprising that the density-dependent legitimacy effect, which occurs in the early history of a population, cannot be observed in a left-truncated observation scheme. However, it remains odd that the competition effects of density on the founding and mortality rates change so dramatically. The competition effect on the founding rate even has the opposite sign. In any case, OE scholars should incorporate the post-war period as a covariate in models of Type II industries.

The second implication of the 'television era' is that data are needed on Type II industries with an early history starting approximately *after* the Second World War (e.g. the frozen-food industry). It is not unlikely that, in such industries, legitimation processes at the firm level will be more important than those at the population level. That is, the density-dependent legitimation effect may have been replaced by the escalation of endogenous sunk (advertising) costs.

Industrial Organization and Differences Within Industries

Mainstream OE has been inclined to treat all organizations within a population as equivalent. The fitness set theory of Hannan and Freeman (1977)

concerning the survival chances of generalists versus specialists in different environments is of course an exception. However, this aspect of OE theory has not been researched enough according to Singh and Lumsden (1990), who report only two studies in which the fitness set theory is empirically verified. Furthermore, it should be mentioned that OE models do account for differences in size and age. In IO, the notion of firm heterogeneity is firmly embedded in the literature, as the studies on leader–follower oligopolies and dominant firms show (Caves et al. 1984).

From the discussion in the previous sections, it immediately follows that organizations within populations differ in many respects, besides size and age — for instance, in terms of the level of advertising and R&D outlays. Incorporating such differences in OE studies is important for two reasons. First, recall that the main interest of OE is not so much in explaining the vital rates *per se*, but rather in understanding the implications of mortality and founding processes for the distribution of organizational characteristics (i.e. diversity, see pp. 266–270). Therefore, the understanding of organizational diversity can be enhanced by gaining insight into the effects of organizational characteristics on the vital rates. Second, such an approach has the potential to bridge the gap between OE scholars and strategic management researchers who focus on organizational-level analysis (Baum and Mezias 1992).

Recently, several scholars have made insightful contributions to the literature by analyzing the consequences of intrapopulation variation (Boeker 1988, 1991; Barnett 1990; Swaminathan and Delacroix 1991; Baum and Mezias 1992). In this respect, the study of Baum and Mezias (1992) is path-breaking. These authors study the impact of localized competition on rates of failure in the Manhattan hotel industry from 1898 to 1990. They argue that '[a]ll organizations in a population may not compete for the same scarce resources or contribute to and experience competition equally. If all organizations in a population are not equal competitors, then population density may not provide the most precise measure of the competition faced by different organizations in a population. Considering organizational differences more explicitly may therefore facilitate understanding the competitive dynamics within organizational populations' (Baum and Mezias 1992: 580). The 'strategic' variables incorporated in their analysis are organizational size, geographic location and price. The main finding of their study is that hotels located in densely-populated regions of the distributions of size, location and price have significantly higher failure rates. These findings clearly show the importance of identifying 'strategic groups' within populations (see also Boeker 1991).

The potential for cross-fertilization between OE and the economically inspired sub-field of strategic management has already been thoroughly explored by Baum and Mezias (1992) and Boeker (1991), as the above discussion reveals. Therefore, the following discussion will be limited to a brief summary of a number of additional areas of cross-fertilization with IO.

First, the above mentioned concept of strategic groups has received considerable attention in the IO literature. Strategic group research is of course closely related with the development of strategic typologies. In our view, the IO typologies are somewhat richer than the simple OE distinction between specialism and generalism.[7] For instance, Porter's (1980) well-known taxonomy distinguishes three strategies: cost leadership, differentiation and focus. It is clear that focus is similar to the OE concept of specialism. However, there is no OE counterpart for cost leadership and differentiation. Two examples of other interesting IO typologies are presented by Fudenberg and Tirole (1984) and Bulow et al. (1985).

It is important to stress that focusing attention on organizational strategy does not imply that organizations are relatively flexible. Strategic group scholars emphasize the existence of mobility barriers between strategic groups (Caves and Porter 1977). This is consistent with the OE assumption of relative inertia. For instance, in a recent study of the U.S. insurance industry from 1970 to 1984 Fiegenbaum and Thomas (1993: 69) find that '[a] low level of firm mobility ... exists between strategic groups consistent with the presence of inertia and mobility barriers'. A second case in point is the commitment notion, which is crucial in the game-theoretic models in IO on strategic competition (Dixit 1982; Ghemawat 1991): only irreversible investment — which by the definition of commitment implies reduced flexibility — can operate as a credible strategic move.

Second, the 'stuck in the middle' theory of Porter (1980) is highly consistent with the concept of localized competition, and therefore also with resource partitioning and dual structure theory (Baum and Mezias 1992). Porter (1980: 42) speculates that '[i]n some industries, the problem of getting caught in the middle may mean that the smaller (focused or differentiated) firms and the largest (cost leadership) firms are more profitable, and the medium-sized firms are the less profitable. This implies a U-shaped relationship between profitability and market share'. The industry conditions in which such a relationship is likely to hold, have been discussed earlier in this section. Note, again, that a universal law is unlikely to prevail, as under particular circumstances a 'stuck in the middle' strategy may well be sustainable (Miller and Friesen 1986a, 1986b).

Third, and finally, more attention should be given to 'first-mover advantages'. The reason is that first-mover advantages may have an important impact on the dynamics of industry evolution. This issue has a long tradition in IO (Gilbert 1989). Sutton (1991) explores the influence of such a strategic asymmetry between early entrants and firms that enter later on the industry equilibrium structure. A qualitative and exploratory analysis of three Type II industries (soup, margarine and soft drinks) suggests that the presence or absence of first-mover advantages may explain, at least in part, the divergence of industry structure from one country to another. Consider, for instance, the margarine

market. Sutton (1991) argues that Unilever had a first-mover advantage in the European market but not in the U.S. market. This difference may explain why the U.S. market became much more fragmented than the European market. More generally, this illustrates how path-dependent idiosyncracies early in the history of otherwise equal industries can explain diverging concentration patterns. An important type of these idiosyncracies are the early strategies pursued (which are IO's first-mover advantages) by major players in an industry.

Appraisal

The current state-of-the-art in OE is impressive indeed. Study after study confirms the predicted regularities across organizational populations and over time periods. The still increasing number of studies is increasingly seeking input from adjacent traditions in organization studies, notably institutional theory (Baum and Oliver 1991) and strategy research (Boeker 1991). The paper of Baum and Mezias (1992) is a path-breaking contribution to OE because this study is largely inspired by IO theory. In our view, this type of cross-fertilization holds the key to the future by combining OE's emphasis on long-run data analysis with the analytical rigour of IO. The above argument has hopefully succeeded in communicating this message. A particularly interesting line of investigation is to integrate OE's focus on *similarities* with IO's concentration on *differences*. A full-fletched theory of the behaviour of (populations of) organizations needs both perspectives.

This potential for cross-fertilization is not restricted to first-level studies, focusing on the dynamics of, and within, one particular organizational population only. Carroll's (1985, 1987) resource partitioning model and Boeker's (1991) study of intra-population competition among strategic groups point the way to second-level contributions to OE. Here, again, much can be learned from a long tradition in IO. Worth mentioning are the studies on diversification strategies (Hamilton 1992; Nayyar 1992) and multimarket competition (Van Wegberg and Van Witteloostuijn 1992; Van Witteloostuijn and Van Wegberg 1992). Anyway, whether the study is one of intra- or interpopulation evolution, cross-fertilization is likely to increase the survival rate of OE theory.

Notes

* We gratefully acknowledge the comments of Hans Pennings and two referees. The usual disclaimer applies. Parts of the first three sections are based upon Schreuder and Van Witteloostuijn (1990), which was presented at the 10th E.G.O.S. Conference in Vienna (1991).

1. If determinism is interpreted in this way, then every sociological theory of organizations is deterministic (Hannan and Freeman 1989). Singh and Lumsden (1990: 185) observe that 'if anything, pre-ecological organizational research has tended to take the deterministic view of organizational evolution (for example, the contingency theory of the 1960s and 1970s), and the ecological research has attended more to its probabilistic and dynamic nature'.

2. Hannan and Carroll (1992) and Hannan and Freeman (1989) argue that IO is primarily interested in *equilibrium* outcomes, whereas OE addresses the *dynamics* of populations. Their characterization of IO is beside the mark, however, as they attack a self-created strawman. First, there is much disequilibrium and dynamic work in IO — as is clear from, for example, the studies of innovation and technology (Dosi 1988) and dynamic game theory (Fudenberg and Tirole 1991). Second, they misunderstand the nature of equilibrium theory, which only proxies reality by focusing on a series of *temporary* equilibria that may well generate *intertemporal* disequilibrium (Van Witteloostuijn and Maks 1990). Third, and related to the second remark, even if their observation would be correct, we think that a dynamic theory cannot neglect the empirical fact that the 'mode of competition' differs substantially between industries (Sutton 1991).

3. There are several notable exceptions to this observation. More specifically, Carroll (1985, 1987) develops a theory of resource partitioning within populations, which can account for the evolution of a dual industry structure (see pp. 281–284 for a discussion). It should be stressed, however, that these studies are highly exceptional within mainstream OE.

4. For the sake of space limitation, we will do so as well. Dosi (1988) and Cohen and Levin (1989) are two revealing reviews of the R&D-innovation-technology literature in economics.

5. Hannan and Freeman's (1977) size-localized competition model states that competition within populations is localized along the organizational size axis. More specifically, similarly-sized organizations compete most intensely because large and small organizations depend on different resource mixes: 'As a result, large organizations will pose a threat to medium-sized but not small organizations and vice versa. Therefore, the emergence of large organizations should be accompanied by a decline in the number of medium-sized organizations, while small ones flourish as their most intense competitors are removed from the environment' (Baum and Mezias 1992: 582).

6. Although the 'liability of smallness' seems to hold in several populations, some findings are inconclusive (Singh and Lumsden 1990). Wholey et al. (1992: 829), for instance, find among U.S. Health Maintenance Organizations that '[c]ontrary to the typical monotonically declining relationship between organization size and failure rates found in ecology research, we show that this relationship varies by type of organization'. The general pattern in IO studies on the size of failing firms supports OE's claims on the liabilities of size and age (Dunne et al. 1989), though again exceptions have been reported (Lieberman 1990). Note that the 'liability of newness' hypothesis has been modified by the introduction of the 'liability of adolescence' argument (Brüderl and Schüssler 1990; Fichman and Levinthal 1991).

7. We acknowledge that OE also introduces a third strategy type, namely polymorphists (Freeman and Hannan 1983). Polymorphists combine multiple specialist units. However, we are not aware of any study in which the latter type has been studied empirically. Note that the very nature of the polymorphist points to the interface with the diversification literature in IO. We refer to this issue in the last section.

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