Organizational Form Emergence: A Meta-Analysis of the Ecological Theory of Legitimation
Sandy Bogaert, Christophe Boone, Giacomo Negro and Arjen van Witteloostuijn

*Journal of Management* published online 25 March 2014
DOI: 10.1177/0149206314527129

The online version of this article can be found at:
http://jom.sagepub.com/content/early/2014/03/24/0149206314527129

Published by:
http://www.sagepublications.com

On behalf of:
Southern Management Association

Additional services and information for *Journal of Management* can be found at:

**Email Alerts:** http://jom.sagepub.com/cgi/alerts

**Subscriptions:** http://jom.sagepub.com/subscriptions

**Reprints:** http://www.sagepub.com/journalsReprints.nav

**Permissions:** http://www.sagepub.com/journalsPermissions.nav

>> OnlineFirst Version of Record - Mar 25, 2014

What is This?
In this study, the authors provide an assessment of the ecological theory of organizational form emergence and focus on the positive density effect associated with legitimation. The argument comes in two steps. First, organizational ecology seeks to understand cross-population similarities in search of general patterns in form emergence processes. Using summative meta-analysis, the authors show that the average effect of density dependence on population-level legitimation is positive, but this average effect hides large variation across different populations. Second, in the spirit of recent revisions of this theory, the authors introduce two concepts that can be linked to industries or populations to explain this unaccounted-for variation: perceived simplicity of organizational goals and tangibility of offerings. Using formative meta-analysis, the study reveals that both population-level characteristics increase legitimation. Density effects on organizational founding rates tend to be stronger in manufacturing and for-profit industries, which are arguably settings featuring higher simplicity of goals and larger tangibility of offerings, respectively. On the basis of this set of findings, the authors conclude with a plea for a population-level theory of ecological differences, developing a comparative research strategy that is distinct from the current emphasis on single-population studies.

Acknowledgments: This project was financially supported through an Odysseus grant from the Flemish Science Foundation. The authors would like to thank Marshall Schminke (the associate editor), two anonymous reviewers, Glenn Carroll, Michael Hannan, and the participants to the 2009 Nagymaros Workshop for useful comments and advice. Errors and omissions remain the authors’ responsibility.

Corresponding author: Giacomo Negro, Goizueta Business School, Emory University, 1300 Clifton Road NE, Atlanta, GA 30322, USA.

E-mail: giacomo.negro@emory.edu
Organizational Form Emergence

Schumpeter (1943) coined the expression “creative destruction” to argue that new industries and organizations bring novel products and technologies to the marketplace, replacing old industries and organizations with outdated products and technologies. A related question, which triggered interest especially in organization studies, is how these new industries and the associated organizational forms emerge (Fiol & Romanelli, 2012; Romanelli, 1991). Such emergence processes are complex. Many attempts to create a new industry fail, and those that succeed often experience long periods of hurdles and struggles (Carroll & Hannan, 2000; Rao, Morrill, & Zald, 2000).

Entrepreneurial ventures that seek to introduce novelty must engage in market-making activities, which involve not only identifying new business opportunities but also realizing them successfully (Shane, 2003). This requires, first, that the internal stakeholders agree on what the novelty is that they offer to external audiences (Fiol & Romanelli, 2012). Second, real novelty, however appealing it may be from the pioneers’ perspective, is seldom easily accepted by the outside world (Zuckerman, 1999). For instance, it took years before society understood what automobile manufacturers, day care centers, labor unions, or telephone companies do (Hannan & Freeman, 1989). Key constituents, such as potential customers, suppliers, employees, volunteers, investors, and regulators, first must have to make sense of the novelty—what does an organization offer, how does a product or service differ from what is already available, and so forth? Developing consensus and appeal about a new organizational form can fail to happen, with organizational demise as a consequence. A systematic analysis of the processes linked to the emergence of organizational forms is, therefore, crucial to successful entry with a new product or technology.

A prominent theory focused on organizational form emergence is organizational ecology, particularly the density dependence model (Hannan, 1986; Hannan & Freeman, 1989). Organizational ecology shares the evolutionary focus with Schumpeter’s conception of economic dynamics. This paradigm argues that new industries and forms flourish when they possess constitutive legitimation, which means that they become understood and taken for granted by their constituents or audiences (Hannan & Freeman, 1977; Meyer & Rowan, 1977). Density dependence theory’s key claim is that the mere number of organizations, here coined classic density, is an accurate proxy for the degree of constitutive legitimation of an organizational form: The greater the number of organizations in operation in a certain population, the higher the level of social acceptance of their form. Hence, organizational form emergence benefits from what is referred to as the positive density effect: Higher density stimulates entries and depresses exits.

The classical density dependence theory is probably the most widely known and tested ecological model of organizational evolution (Dobrev, Ozdemir, & Teo, 2006). Empirical tests of the theory are typically based on comprehensive longitudinal data of single organizational populations. The empirical evidence shows that classic density shapes vital rates as predicted by the theory, particularly by increasing founding and decreasing mortality in the
form emergence stage of populations (Carroll & Hannan, 2000; Hannan & Carroll, 1992). Classic density dependence is an ecological theory of cross-population similarities. The central argument is that the positive density effect on population-level legitimation characterizes the process of organizational form emergence across time and space and for a wide variety of different forms. Evidence of the positive density effect has been reported for 19th century automobile producers (Rao, 1994) and telephone companies (Barnett, 1990), early 20th century loan providers (Barron, 1998) and hospitals (Ruef & Scott, 1998), and late 20th century disk array manufacturers (McKendrick & Carroll, 2001) and microprocessor producers (Wade, 1995) and for accounting firms in the Netherlands (Pennings, Lee, & van Witteloostuijn, 1998), investment ventures in Egypt (Messellam, 1998), trade unions in Sweden (Hedstrom, 1994), jewelers in Italy (Lazzeretti, 2006), and workers’ cooperatives in Israel (Ingram & Simons, 2000). The forms vary from manufacturing and services industries, such as motorcycle producers (Wezel, 2005) and insurance companies (Ranger-Moore, 1997), to women’s colleges (Studerellis, 1995) and gay and lesbian rights groups (Nownes, 2004).

However, such a focus on cross-population similarities overlooks the large differences that emerge across populations in history, location, and nature. A recent formulation (Hannan, Pólos, & Carroll, 2007) revisits density dependence theory and introduces the notion of fuzzy density to replace classic density in the model. As we explain below in detail, this shift contributes to developing a theory of cross-population differences. This shift fits well with other organizational theories that explicitly argue for a focus on cross-population differences, such as the literatures on institutional logics (Greenwood, Magán Díaz, Li, & Céspedes Lorente, 2010) and form identity (Fiol & Romanelli, 2012). We refer to the recent version of the theory as revised density dependence.

The difference between classic and fuzzy density is essential. Classic density measures the mere number of organizations operating in an industry/population. The theory based on classic density is premised on the notion that every organization contributes equally to the legitimation of the new organizational form. This implies an assumption of organizational homogeneity that was later criticized (Baum & Powell, 1995). The revised theory of density dependence incorporates in the density measure the notion of fuzziness to respond to this kind of critique. Fuzzy density takes into account the perceptual ambiguity surrounding an organizational form, so that if the identity of organizations is not well understood by audiences, then high density will have a weaker impact on legitimation. Theoretically, this implies that the revised theory integrates insights from cognitive psychology into an otherwise ecological framework, arguing that organizational form emergence is inextricably bound up with sociocognitive processes of identity formation. Fiol and Romanelli (2012) add that not only external audiences must engage in such sociocognitive processes but that internal audiences are also involved in a process of collective identity formation.

The approach implied by the revised theory, however, presents methodological and theoretical challenges. We would like to emphasize two such challenges. Theoretically, one cannot fully understand the processes shaping the evolution of a certain organizational population by examining that population only, because these processes may well depend on the characteristics of the institutional environment, such as how well understood an industry is compared to other industries. The revised theory argues that (a) fuzziness reduces constitutive legitimation and (b) the degree of fuzziness can differ widely across settings. Empirically, we
do not know whether fuzziness plays any systematic role in the dynamics of density dependence processes. So far, only two empirical studies have started to apply insights from the revised density dependence model (Bogaert, Boone, & Carroll, 2010; Kuilman & Li, 2009). Even these studies follow the single-population approach. Hence, the question as to whether perceptual ambiguity among stakeholders generally influences the evolution of new industries and organizational forms is receiving increasing attention but remains unanswered (Negro, Hsu, & Koçak, 2010).

Second, and related to the above, finding historical data measuring the microlevel socio-cognitive processes associated with organizational form emergence presents problems. As Fiol and Romanelli observe,

Our theory will present no small challenge for us as researchers. Although we have limited our theorizing . . . to the poorly understood before identity microprocesses that underlie better-understood macrolevel phenomena, the most robust test of our theory entails the integration of the two. The integration of such distinct research traditions demands similar integration of the diverse approaches for empirical data collection and testing. (2012: 608)

The key argument in the current study is threefold, in response to these two challenges. First, we need comparative cross-population studies to explore a theory of organizational form emergence differences. Second, meta-analysis can be applied to the large stock of evidence accumulated through single-population studies. Third, to be able to do this, we reformulate the revised density dependence theory to search for observable proxies of the underlying sociocognitive processes.

Organizational ecologists have accumulated evidence on a wide range of populations, from automobile manufacturers and newspaper companies to breweries and labor unions, but there has been no systematic use of this knowledge. Comparative research can help to gain deeper insight into organizational form evolution (Boone, Meuwissen, & van Witteloostuijn, 2009). In this study, we argue that a better understanding of organizational processes, such as legitimation, requires the “study of differences.” We conduct a meta-analysis examining the classic density effect in published studies of organizational founding and survival rates. Furthermore, we consider two features of an organizational category—the perceived simplicity of goals and tangibility of offerings—and propose that these characteristics will moderate, as proxies of fuzziness, the effect of classic density on organizational vital rates.

The contribution of the current study is fourfold. First, we review the model of density dependence legitimation and discuss how the revised version differs from the original theory, linking these arguments to recent insights from other literatures. We focus on the key notion of perceptual ambiguity or fuzziness. Second, we reconceptualize the revised density dependence theory to facilitate new empirical work. We introduce two constructs that can be used as proxies for the degree of fuzziness surrounding organizational forms: simplicity of goals and tangibility of offerings. Third, using published studies, we apply meta-analysis to test the general hypothesis about the positive effect of classic density in the original theory and three new hypotheses that lead to and follow from our reconceptualization. Fourth and finally, we conduct the type of comparative multipopulation work we believe is key to advancing our understanding of organizational form emergence processes in particular and organizational ecology research in general.
In advance, we would like to emphasize that our application of meta-analysis serves two purposes. One is to estimate the classic density effect on founding and survival across prior studies. This is the established summative function of meta-analysis. The other is to explore how prior work can be reanalyzed from the perspective of the revised theory. In so doing, we test new hypotheses with a novel conceptualization of fuzziness and reanalyze prior evidence collected using the classic density model.

Density Dependence Theory

The Original Theory

Organizational ecology explains the evolutionary dynamics of industries by focusing on the emergence, growth, and decline of populations of organizations (Carroll & Hannan, 2000). As a research paradigm within organizational studies, organizational ecology assumes a selection model of organizational evolution and argues that change in a domain occurs through the replacement of some forms of organizations with others, rather than successful adaptation by individual organizations. In selection imagery, the environment acts as a sieve that causes forms and organizations less attuned to current conditions to falter in favor of better attuned ones. This Darwinian logic comes with a theory of relative and structural inertia (Hannan & Freeman, 1984), arguing that (a) organizations tend to change more slowly than the environment and (b) being relatively inert offers a selection advantage (Péli, Pólos, & Hannan, 2000).

In recent years, scholarship in this area took up the challenge to examine more directly when and where new organizational forms emerge (Hannan et al., 2007; McKendrick & Carroll, 2001; McKendrick, Jaffée, Carroll, & Kheissina, 2003; Pólos, Hannan, & Carroll, 2002). It did so for two reasons. First, insight in this process is important because new forms are the engines of organizational diversity and change in markets and societies (Romanelli, 1991). Second, as mentioned above, the structural inertia logic implies that alterations in the mix of organizations are argued to be mainly driven by population-level selection processes (Hannan & Freeman, 1977, 1984; Hsu & Hannan, 2005). This comes with a shift of the level of analysis from individual organizations to sets of organizations, which makes the issues of the definition of boundaries of populations and the emergence of forms especially salient.

In this context, density dependence theory is a very established model in organizational ecology. The theory centers on the role played by two processes: constitutive legitimation and diffuse competition. In the current study, we focus on legitimation, as this is critical in the organizational form emergence stage of population evolution. Constitutive legitimation defines the process by which stakeholders perceive and support a certain organizational form as a natural, taken-for-granted way to perform a certain kind of action, where being taken for granted defines the factors that “establish an organization as appropriate, rational and modern” (Meyer & Rowan, 1977: 349).

By form, we mean the abstract representation of a population of organizations (Carroll & Hannan, 2000). For instance, “newspapers” represents an organizational form, while “newspapers in Argentina in the 1900s” defines the instantiation of this form in a particular place and time. Legitimation indicates the degree of social and institutional acceptance of a particular organizational form. The effect of legitimation is expected to dominate when density is low, typically when the new organizational form is in its early stages. The theory proposes
that the number of organizations in operation at any point in time in a population will have a positive effect on the emergence of an organizational form. The argument of density dependence is that the simple occurrence of a type of organization enhances legitimacy. When the number of organizations is low, those who attempt to establish an organization struggle to gain social acceptance. For example, capital providers may not see the market potential of the new product or service, and entrepreneurs may face difficulties in mobilizing resources for new ventures.

The repeated occurrence of organizations of the same kind increases the collective acceptance of that form, similar to the psychological phenomenon by which people come to prefer things with which they become more familiar through repeated exposure (Zajonc, 1968). Once the number of instances of the form increases, the need for social justification diminishes and the costs of organizing are reduced. This increases the founding rate of the population of organizations, as well as the survival rate of individual organizations in that population (Hannan & Freeman, 1989).

In essence, the original theory argues that the mere number of organizations operating in a population—what we labeled above as classic density—is an accurate proxy measure for constitutive legitimation of the form (Hannan, 1986). That is, increasing classic density enhances an organizational form’s legitimation. When agents who control resources take an organizational form as the default solution to perform a specific kind of activity, organizations increase their capacity to mobilize these resources. These positive returns of the form emergence process result in higher rates of founding and enhanced life chances for organizations in the population (McKendrick et al., 2003). Baum (1996), Carroll and Hannan (2000), and Núñez-Nickel and Moyano-Fuentes (2004) document the many organizational settings in which full or partial empirical support has been found for a positive first-order classic density effect as predicted by density dependence theory. No prior study, however, has provided a comprehensive evaluation of the empirical evidence supporting or rejecting the theory.

**Hypothesis 1:** Classic density has, on average and across populations, a positive first-order effect on organizational founding and survival.

Hypothesis 1 is the baseline prediction for our summative meta-analysis. This hypothesis mirrors the focus on similarities across populations, as is typical for traditional density dependence work. However, as argued in the introduction, this average effect across populations may well hide large variation from one population to the other, depending on specific features of those populations, which vary in space, time, and nature. To examine the validity of this claim, we formulate a second summative hypothesis that focuses on cross-population differences.

**Hypothesis 2:** The positive first-order effect on organizational founding and survival shows significant variation across populations.

If Hypothesis 2 is supported, we have empirical evidence suggesting that an organizational form emergence theory of ecological differences is needed. It is to this that we now turn, as we believe that the revised theory of density dependence offers a platform for developing such a “study of differences.”
The Revised Theory

Of the two key ecological processes, legitimation received more attention in the revised formulation, with a clear application to the issue of organizational form emergence (Carroll & Hannan, 2000; Hannan et al., 2007). Recent ecological research emphasizes a sociocognitive approach to organizational form emergence. It stresses the importance of sensemaking processes among constituents—or audiences—such as (potential) customers, suppliers, intermediaries, employees, and investors (McKendrick et al., 2003; Pólos et al., 2002). Audiences cluster, label, and categorize organizations in order to understand and simplify the complexity that they face in their roles of (potential) customers, employees, intermediaries, investors, or suppliers.

A central question is how categories come to be taken for granted, in other words, how audience members develop labels and schemas (i.e., classification rules) and apply them to organizations. The revised theory starts from the perceptions of similarity of organizational characteristics. Audience members consider sets of organizations, and they cluster together those they view as similar based on some observable features—for example, prospective students consider similar the universities offering the same academic programs. The features used to define similarity often involve technical aspects, such as technology and equipment, but they can also include elements such as values, ideology, and provenance (Carroll & Swaminathan, 2000).

Fiol and Romanelli (2012) examine the distinct social processes that might lead to the formation of a similarity cluster, as recognized by audiences, in greater detail. First, producers become involved in a new community of practice but continue to identify with existing communities of which they are already members. Through repeated interaction, the participants in the new community of practice share information, develop common knowledge, and jointly create a series of consistent narratives. Finally, when their involvement in the emerging community increases, the participants see themselves more and more as members of a common new domain. At this stage, the emerging community takes greater structure and is observable by outsiders.

When audience members recognize clusters, they assign labels to such clusters—“cooperative banks,” “microbreweries,” and so forth. Categories emerge if the audience develops shared understandings about the labels and their collective representations, or schemas. Then broad agreement exists about what features an organization ought to exhibit in order to be included in a certain category. Conversely, when audience members lack consensus about the meaning of labels, social acceptance is problematic. Categories for which audiences reach limited agreement are said to have higher fuzziness, and organizations are perceived to have partial membership in them (Hannan et al., 2007).

One key implication of the theory is that the legitimation of an organizational form decreases when audiences have limited consensus about the category schema or, in the terminology of Hannan et al. (2007), when the fuzziness of the category is high. Perceptual ambiguity precludes the development of clear identities for organizations and is thus expected to slow down or even block the legitimation process of the organizational form (Bogaert et al., 2010; Hannan et al.; Hsu & Hannan, 2005). In the revised theory of density dependence, classic density is only expected to increase legitimation if the category has low fuzziness (i.e., when organizations have high grades of membership in the category). In contrast, the positive impact of classic density on legitimation weakens with high fuzziness.
McKendrick and Carroll (2001) and McKendrick et al. (2003) argue that disk array producers did not emerge as a distinct organizational form because of their diverse industry origins. This factor increased the lack of focus associated with their identity—“Are disk array producers different from computer manufacturers, or integrators, or storage firms?” Their analysis indeed suggests that such ambiguity reduces the legitimation effect of classic density on organizational founding and exit rates. In revising density dependence theory, Hannan et al. (2007) introduce the concept of fuzzy density, which is different from classic density in that each organization’s contribution to legitimation is weighed by its grade of membership in the category. Greater grades of membership of organizations in a category imply lower fuzziness, and legitimation grows as the average grade of membership increases.

The emphasis on sociocognitive processes offers ample opportunities to seek further cross-fertilization with related literatures, particularly in the large domain of identity theories. For instance, Fiol and Romanelli (2012) develop a framework that links insights from microlevel identity formation theories, such as those involving storytelling (Gabriel & Connell, 2010) and communities of practice (Wenger, McDermott, & Snyder, 2002), to macrolevel similarity clustering arguments as developed in the revised ecology theory. In the context of the current study, we would like to emphasize two important and related implications that follow from this “sociocognitive turn.” First, such processes, as operating at different levels of analysis and across different audiences, might evolve differently across organizational forms and their populations. Second, as many of the cognitive constructs central to the revised theory and related literatures are not directly observable in the context of the longitudinal research designs, we suggest a reconceptualization of the revised theory.

A Reconceptualization

The revised density dependence theory focuses on sensemaking by audiences at both the individual and the collective level. This is summarized in Figure 3.1 in Hannan et al. (2007: 75). Audiences, such as potential customers and investors, observe and assess the extent to which organizations display salient features. When these attributes cohere into a schema, they can be treated like a “code”—observing the attributes implies the meaning associated with the schema. In this case, categories of organizations have low fuzziness. But, in some domains, the audience’s sensemaking processes can be fraught with disagreement or conflict (Rao et al., 2000). When this occurs, fuzziness is high.

The Hannan et al. (2007) description of this multilevel process of sensemaking is associated with a series of constructs that are not easily observable. At the level of the individual audience member, this involves activities such as identifying similarity clusters and labeling, and schematization of a category of organizations. At the collective level, multiple audience members must communicate with one another. The legitimation process presupposes that these members agree on which organizations are denoted by the label and on the schema to apply to the organizations that carry the label. When audiences apply the same schema, this enhances constitutive legitimation and the emergence of the organizational form. In the practice of empirical work, researchers need proxies for these hard-to-observe constructs. The few empirical studies that apply insights from the revised theory of density dependence develop context-specific measures of fuzzy density, using a firms’ nationality (Kuilman & Li, 2009) and the type of professional association of the firm’s employees (Bogaert et al., 2010) to weigh an organization’s membership in the population.
The starting point of our reconceptualization remains the key claim by Hannan et al. (2007) that the development of constitutive legitimation will be hampered by fuzziness, defined as the perceptual ambiguity among audiences about the identity of a category of organizations. However, assessing whether fuzziness generally affects the legitimation process requires that we can rely on indicators measurable by a common standard in multiple contexts. We argue that two features of an organizational category can be used to assess the degree of fuzziness: simplicity of goals and tangibility of offerings. Figure 1 summarizes our framework.

Simplicity of goals. The first feature we consider deals with organizational goals as viewed by the audience. When organizational goals are perceived as simpler, for example, producing pins for profit, a new domain of activity is easier to understand, to communicate, and to remember for customers, clients, suppliers, investors, and other resource providers. This first feature is referred to as simplicity of goals. If the primary goals of a set of organizations are viewed as relatively straightforward, audiences will perceive lower ambiguity about the overall identity of these organizations. Simplicity of goals is further reinforced by market processes within the organizational population that drive organizations toward the adoption of similar strategies to reach their goals. When audiences view organizational goals as simpler, their schemas tend to be clearer. In contrast, if the goals of organizations are viewed as more complex, one can expect more disagreement and conflict among audience members in comprehending their mission and evaluating strategies and outcomes.

Hypothesis 3: Classic density has a larger positive first-order effect on organizational founding and survival in organizational populations characterized by simplicity of goals.

To measure simplicity of goals, we focus on the distinction between organizations in for-profit vis-à-vis nonprofit industries. DiMaggio (2006: 446) takes the example of arts organizations and argues that the goal of for-profit cultural producers is perceived as quite clear: to maximize profits. By contrast, the functions of nonprofit arts organizations are more varied
and include maximizing not only artistic excellence but also audience size and growth. Additionally, DiMaggio notes that nonprofit arts organizations often assume weakly institutionalized forms with unclear boundaries. In the arts, common examples of what he calls a “problem of enumeration” are (a) small programs embedded in organizations considered producers or distributors of nonprofit services, (b) community-based organizations, and (c) minimalist organizations that are unincorporated and intermittent. These organizations are difficult to categorize. In fact, blurred boundaries may even make them difficult to notice in the first place.

Alexander further argues that the nonprofit sector is inherently beset by goal complexity, with their constituents pulling nonprofit organizations in different directions:

[Nonprofits] pursue very general, social good goals. . . . Nonprofits also face a variety of laws and regulations from different levels of government as well as a fragmented and sometimes difficult or reluctant set of funders. Further, nonprofits are often the site of contention between professionals and administrators who hold disparate views, each believing that their view embodies what is right and proper for the organization. Finally, nonprofit organizations are often located in the intersection of competing institutional spheres, as nonprofits, traditionally steeped in the rhetoric of charity, religion, or democracy, are increasingly governed by the rhetoric of business. (1998: 273)

Multiple external (and internal) constituents hold different expectations as to what nonprofit organizations are supposed to deliver and how they are expected to do so—for instance, whether funding through ticket sales makes a cultural organization a business or not (DiMaggio, 2006). As a result of the multidimensional and multiaudience objectives of nonprofit organizations, their performance is also hard to evaluate (Andrews, Boyne, & Walker, 2011). Even though, in recent years, they have started to explicitly state their missions and strategies (Steinberg & Powell, 2006), nonprofit organizations continue to face diverse, conflicting demands to which they have to attend simultaneously. Therefore, legitimation in this sector is hampered by the different conceptions of which actions are appropriate and acceptable (Scott & Meyer, 1983).

**Tangibility of offerings.** A second feature associated with the degree of fuzziness of an organizational category is tangibility of offerings. Tangibility of offerings is defined as goods or outputs having actual physical presence. We expect that the development of a clearer category schema is more likely for organizations producing tangibles, such as automobiles, than for organizations producing intangibles, such as accounting services. Tangible offerings are easier for audiences to recognize, compare, and classify than intangible offerings. They are clearly observable, which facilitates communication with and among audiences. Research in cognitive science suggests that categorization tasks are simpler for objects with concrete properties (Alba & Hutchinson, 1987). Audiences thus form and communicate similar beliefs more simply based on consuming a physical product.

In line with this, management theories in strategy and consumer research (e.g., Dunning, 1988; Porter, 1985; Zeithaml, Bitner, & Gremler, 2005) suggest that the delivery and experience of intangibles is more heterogeneous. Hence, the markets that develop around intangibles arguably show greater variance; for instance, the human element has more importance, which
introduces greater variability in perceived quality. Information and knowledge about intangibles are more difficult to interpret. Intangibles are also “intensive” in the sense that they require customized technologies (Thompson, 1967). These factors make experiences resulting from the production and consumption of intangibles more idiosyncratic, hampering the legitimation of the organizational form.

Hypothesis 4: Classic density has a larger positive first-order effect on organizational founding and survival in organizational populations characterized by tangibility of offerings.

In measurement terms, we expect to find variation of the classic density effect between manufacturing and services. As manufacturing involves tangible outputs, by and large, we expect fuzziness to be lower in such populations compared to services industries. Ruef (2000) argues that emerging organizational forms can gain social acceptance by drawing on existing technologies. Manufacturing firms generally use previously codified technologies to produce their “tangible” goods, while services involve technical tasks that are less easy to codify. This suggests that legitimation in the manufacturing industry operates not only through the observability of the goods produced by firms but also through a more common understanding of the technologies used to produce these outputs, as the automobile example illustrates.

In a study of the automobile industry in five European countries, Hannan, Carroll, Dundon, and Torres (1995: 512) suggest that the codification of technological developments and the physical display of vehicles of pioneer producers like Carl Benz represented key mechanisms for the rapid diffusion of automobile production in the late 19th century. Cultural images about manufacturers and their products were disseminated in the engineering journals, bicycle periodicals, automobile trade journals, daily newspapers, and popular magazines of the day. These conditions not only facilitated the diffusion of information about the industry but also promulgated a certain conception of the organizational form (see also Rosa, Porac, Runser-Spanjol, & Saxon, 1999).

In service industries, in contrast, organizational practices and codes tend to be more fragmented. In a study of the Dutch accounting industry, Bogaert et al. (2010) document how multiple associations formed to devise alternative solutions for membership and quality certification. The members of these associations disagreed about key features of the accounting schema, including exams and selection criteria, particularly the kind of knowledge required to be a competent accountant (some associations claimed that mathematical skills were the most important, while others demanded more experience and practice); advertising (young accountants considered this an inappropriate practice, but older accountants advocated advertising in order to become more similar to other professions like doctors); and the function and codes of conduct of accountants (some associations supported extensive declarations following the audit of financial statements, while others claimed that a signature would suffice). Contention among associations raised uncertainty in the mind of the public: “People did not understand what accounting was all about, and accounting and bookkeeping were often confused” (Bogaert et al., 2010: 125). This industry, which emerged in the late 19th century, was not institutionalized until the beginning of World War II in the Netherlands. The impetus for the social acceptance of the profession was the merging of the different associations, which resolved the long-standing fragmentation.
Methodology

Studies in organizational ecology typically examine single organizational populations. This approach, which covers the life histories of all—active as well as defunct—organizations in a certain domain, offers some clear inferential advantages. For example, it prevents survivor bias. However, it also presents some challenges. Methodologically, the single-population approach can limit external validity and the generalizability of research findings to other settings. Internal validity can be affected too—for instance, due to left censoring, a bias from observing organizational populations after their inception. Replication and comparative research can help tackle these challenges (Boone et al., 2009). In the present study, we do so by conducting a summative meta-analysis of the first-order effect of classic density on organizational vital rates (Hypotheses 1 and 2). Moreover, we explore novel insights from the revised theory by introducing two moderating variables—simplicity of goals and tangibility of offerings—in our meta-analysis (Hypotheses 3 and 4).

Meta-analysis refers to a family of quantitative methods used to bring together evidence from different studies on the same topic (Rosenthal & DiMatteo, 2001). It summarizes estimates of effect sizes of different studies into an overarching pattern of findings that reveal the “landscape” or distribution of results in the domain. It is particularly important to examine the heterogeneity of effect sizes among studies. Such heterogeneity suggests the critical role of moderator variables that can be detected through a systematic search. By correlating moderators with effect sizes, theoretical propositions can be tested (see, e.g., Balkundi & Harrison, 2006). In our study, simplicity of goals and tangibility of offerings define the moderators.

Data

The unit of analysis in meta-analysis is the individual study. To identify the studies to include in our sample, we used literature retrieval procedures examining three academic databases: ABI/INFORM Global, EBSCO, and JSTOR. All studies of density dependence mention the label name of the theory. To conduct our search, we utilized the keywords “densit*dependen*” in articles in the disciplines of business/management, sociology, and political science published from 1986 to 2008. We selected 1986 as our starting point because this is the year in which Michael T. Hannan’s technical report was published, which first articulated density dependence theory. Second, we used the published articles found in our databases to trace other published work included in monographs and edited volumes of original material, such as Carroll and Hannan (1995). Finally, we compared our list of publications with Baum (1996), Carroll and Hannan (2000), and Núñez-Nickel and Moyano-Fuentes (2004), the most comprehensive reviews of research in organizational ecology available.

For inclusion in the meta-analysis, a study needed to report at least one relationship between classic density and vital rates (i.e., founding and survival; Hunter & Schmidt, 2004). In all, our search generated a database of 52 distinct studies that include analyses of organizational founding and 45 that involve analyses of organizational survival. A study can examine more than one population or contain measurements of multiple focal effects, implying that the total number of effect sizes exceeds the number of studies. The studies in our sample generated information on 101 effect sizes for the founding analysis and 87 for the survival analysis. As we explain below, to avoid violating statistical independence, our main estimates include only one effect size for each of these populations for a total of 68 and 53.
observations for founding and survival, respectively. The appendix contains an overview of the studies included.

**Dependent variable.** Social scientists often rely on nonexperimental data and most frequently use correlation coefficients as dependent variables in meta-analyses (Rosenthal & DiMatteo, 2001). However, correlation coefficients are seldom reported in organizational ecology research, particularly density dependence studies. Researchers test the theory by including classic density and its squared term simultaneously in complex multivariate models. Zero-order correlations thus are not informative for our purpose. Therefore, we use as our dependent variables the beta coefficients of the linear classic density coefficients reported in each study in our sample in regression models of organizational founding and survival, which we refer to as first-order classic density, to distinguish this from squared or second-order classic density (see also below and Note 2). The appropriateness of using beta coefficients in meta-analysis has been discussed thoroughly in the literature (Becker & Wu, 2007; Hunter & Schmidt, 2004).

However, the use of beta coefficients has some restrictions. First, it requires that the variables of interest be measured in the same way in each study; otherwise, the beta values cannot be compared across studies (Hunter & Schmidt, 2004). To our advantage, researchers in organizational ecology have adopted a standard approach to analyzing density dependence. *Founding* is operationalized as a count variable, while *survival* is estimated as an instantaneous hazard rate. Classic density is measured as the yearly number of organizations in operation in a population. In the next subsection, we detail how a few exceptions were addressed in our analyses.

Second, one has to be aware that beta coefficients reflect the relation between the focal independent variable and the dependent variable, controlled for a number of other variables (Becker & Wu, 2007; Rosenthal & DiMatteo, 2001). Research in organizational ecology uses similar modeling strategies, including the same classes of control variables, which make studies directly comparable (Carroll & Hannan, 2000). In particular, all published studies testing density dependence include variables controlling for the carrying capacity of the population, implying that our beta coefficients also control for carrying capacity. Yet, the number and nature of these control variables vary to some extent across studies. To gauge the comparability of effects between studies, we include the number of independent variables in the estimated models into our metaregression analyses (see below). In so doing, the beta coefficient becomes an appropriate dependent variable in meta-analysis (Hunter & Schmidt, 2004).

Unless only one single baseline model was reported, our meta-analysis uses the most comprehensive models reported in each study. Finally, the models testing density dependence are nonlinear and estimate effects of both first-order and second-order classic density. Then, the values of the coefficients do not fully reflect the marginal effects. To address this issue, we include the coefficient for second-order classic density (i.e., the effect of classic density squared), also retrieved from the individual studies, as a control variable in our models. This makes it possible to obtain a direct estimation of the impact of first-order classic density on founding and survival.

**Independent variables.** Our metaregression models include two independent, or *moderator, variables*. These two dichotomous variables represent distinct proxies for the degree of fuzziness of the emerging organizational form. The first variable measures *simplicity of
goals. This variable takes the value of 1 for populations in the for-profit sector—for example, microprocessor producers (Wade, 1995, 1996). The 0 values define populations of nonprofit organizations for which goals tend to be more diverse—for example, women’s groups and racial minority organizations (Minkoff, 1997, 1999). The second variable measures tangibility of offerings. The variable takes the value of 1 for populations in the manufacturing sector—for example, automobile production (Carroll, Bigelow, Seidel, & Tsai, 1996; Dobrev, Kim, & Carroll, 2002; Hannan, Carroll, Dobrev, & Han, 1998; Hannan, Carroll, Dobrev, Han, & Torres, 1998; Hannan et al., 1995). It takes the value of 0 in the remaining cases corresponding to populations in the service sector—for example, day care centers (Baum & Oliver, 1991, 1992; Baum & Singh, 1994). Three independent raters classified the two variables for each population in the sample.

Control variables. Study descriptors serve as control variables. The legitimation process might not be fully effectuated in studies with a shorter observation window. Therefore, we include observation period, which measures the duration in number of years of the analysis period covered in each study. To ensure a meaningful interpretation of the estimates across different kinds of populations, we include two additional variables, as mentioned above. One is the number of variables included in the focal model in each study. The other is the effect size of second-order classic density, which captures the competition effect of classic density, as explained extensively in the original theory.

Study artifacts. Study artifacts are characteristics related to the methodology used in each study. In our analyses, we include a dichotomous variable for left censoring. Left censoring means that the population is not observed from its inception. As explained above, this characteristic is known to bias positive first-order classic density effects downward because the early processes of legitimation are outside the scope of the observation window (Carroll & Hannan, 2000). This implies that the positive first-order classic density effect on organizational founding and survival will be smaller for left-censored populations, which are already proliferating before the start of the study’s observation window.

Estimation Procedure

The first step in meta-analysis is to study the distribution of individual effect sizes—correlations, odds ratios, and beta coefficients—and to estimate the population mean (Lipsey & Wilson, 2001). The mean effect size reveals the overall pattern of relations between the variables of interest—in our case, first-order classic density and founding and survival. If the distribution of individual effect sizes is wide, the mean effect size cannot be expected to be representative for the entire population of effect sizes. A homogeneity test (Q statistic) can reveal whether the variability of the individual effect sizes is greater than what would be expected from sampling error alone. If the effect sizes are not found to be homogeneous, metaregression is appropriate because this will allow for the detection of “moderator variables” (i.e., the independent variables that explain the variance in effect sizes).

Metaregression can be estimated using two kinds of techniques: fixed-effects or random-effects models. Fixed-effects metaregression assumes that effect size heterogeneity, or the
between-study variance, can be fully explained by a number of independent variables or study descriptors. Random-effects metaregression (or mixed-effects metaregression) instead assumes that besides systematic differences, some residual heterogeneity remains that cannot be explained by the covariates (Harbord & Higgins, 2008). As fixed-effects metaregression assumes that all between-study differences can be explained by the covariates, it leads to an excessive Type I error when indeed some residual or unexplained heterogeneity does exist. Therefore, random-effects metaregression is generally preferred over its fixed-effects counterpart. We estimate random-effects metaregression written as follows:

\[ y_i = x_i \beta + u_i + e_i, \]

where \( y_i \) is the effect size coming from study \( i \), \( x_i \) the vector of covariates, \( \beta \) the vector of coefficients, \( e_i \) the error term related to sampling error, and \( u_i \) the random-effects variance component, which is the between-study variance that cannot be explained by the covariates or, in other words, “a remaining unmeasured (or unmeasurable) random effect in the effect size distribution in addition to sampling error” (Lipsey & Wilson, 2001: 124). With random-effects metaregression, the between-study variance of \( u_i \) (i.e., \( \tau^2 \)) is estimated first. Afterwards, the \( \beta \) coefficients are estimated using weighted least squares with weights \( 1 / (\sigma_i^2 + \tau^2) \), where \( \sigma_i^2 \) refers to the standard error of the effect size estimated in study \( i \) (Harbord & Higgins, 2008: 75).

Finally, studies included in a meta-analysis can use the same data yielding multiple estimates of the effect sizes in the same setting. Then, the analysis can violate the statistical independence assumption and incur Type I and/or Type II errors. We address this issue as follows. We consider observations in the sample as clustered—and thus not statistically independent—when they come from the same population. We define “population” narrowly: For example, brewpubs and microbreweries represent distinct independent populations, even though they are part of the same, broader industry of beer producers (Carroll & Swaminathan, 2000). In addition, we treat different geographical instantiations of the same industry as distinct populations: For instance, beer producers in Germany belong to a distinct population from beer producers in the United States. Nonoverlapping observation periods are also seen as independent. If the observation period of studies on the same population at the same location shows period overlap, our meta-analysis only includes the study with the longest period of observation.

Two options are available to deal with the remaining clustered cases—observations coming from the same population, the same geographical setting, and the same study period. The first is to randomly select one observation out of each set of clustered observations, and the other consists of averaging the “statistically dependent” effect sizes so that, again, only one value will be included in the meta-analysis (Lipsey & Wilson, 2001: 125). As a random selection is arbitrary, we use the mean beta coefficients. Although this solution implies loss of information and therefore a loss in the variance in the effect sizes that might have been reported, it also makes our tests more conservative. Our main analyses include 68 observations for founding and 53 for survival.

**Results**

Descriptive statistics for the founding and survival analyses are shown in Tables 1 and 2, respectively.
As the first step of the summative meta-analysis, we estimate the mean effect size, or the overall pattern of relations between first-order classic density, on the one hand, and founding and survival, on the other hand. Consistent with the theory of density dependence, we find a fixed-effects mean effect size of 0.002 with confidence interval [0.002, 0.002] for founding and 0.00 with confidence interval [0.00, 0.00] for survival. The Q statistic, which represents an estimate of heterogeneity, is significant for founding (1422.527, \( p < .001 \)) as well as survival (498.485, \( p < .001 \)), meaning that the individual effect sizes do not represent a common population mean. This, in turn, implies that a random-effects estimate of the mean effect size is appropriate. While fixed-effects meta-analysis assumes a single true effect size, random-effects meta-analysis allows for variation between studies in the true effects. Using random-effects meta-analysis, we find again a mean effect size of 0.022 with confidence interval [0.019, 0.025] for founding and 0.003 for survival with confidence interval [0.002, 0.004]. These estimates support Hypothesis 1.

The highly significant Q statistic offers strong support for Hypothesis 2: The average effect hides large variation across populations. This clearly indicates that further metaregression is useful. Such analysis will provide insight into the factors causing first-order classic density to have strong or weak effects on founding and survival, depending on moderator variables. Tables 3 and 4 report the results of formative metaregressions for founding and for survival, respectively.

### Table 1
Summary Statistics for Founding Analysis (pairwise correlations, means, and standard deviations)

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Beta coefficient</td>
<td>0.17</td>
<td>0.56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Left censoring</td>
<td>0.50</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Number of variables</td>
<td>9.90</td>
<td>3.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Observation period</td>
<td>91.65</td>
<td>66.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Second-order classic density</td>
<td>-0.14</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Simplicity of goals</td>
<td>0.84</td>
<td>0.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Tangibility of offerings</td>
<td>0.66</td>
<td>0.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: \( n = 68 \).

### Table 2
Summary Statistics for Survival Analysis (pairwise correlations, means, and standard deviations)

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Beta coefficient</td>
<td>0.08</td>
<td>0.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Left censoring</td>
<td>0.59</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Number of variables</td>
<td>13.49</td>
<td>6.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Observation period</td>
<td>112.72</td>
<td>61.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Second-order classic density</td>
<td>-0.002</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Simplicity of goals</td>
<td>0.89</td>
<td>0.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Tangibility of offerings</td>
<td>0.73</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: \( n = 53 \).
In Models 2 and 3 in Table 3, we examine the impact of our moderator variables on the relation between first-order classic density and founding rates. In Model 2, we find a significantly positive effect of the simplicity of goals variable (p = .014, one-tailed). We also find some evidence for an association of the covariates with the effect size: The Knapp-Hartung joint test, which assesses the null hypothesis that the coefficients of all covariates are 0, is statistically significant (F = 2.66, p = .031). In Model 3, we see a significantly positive effect of the tangibility of offerings variable (p = .045, one-tailed). The Knapp-Hartung joint test also reaches statistical significance (F = 2.18, p = .068). These results indicate that the first-order classic density is larger for organizational populations in the for-profit as compared to...
the nonprofit sector and in manufacturing as compared to services. This pattern is consistent with our proposition that the fuzziness of an organizational category is lower in for-profit and manufacturing sectors and supports Hypotheses 3 and 4, respectively. Note that all manufacturing organizations are for-profit firms in our sample, so we cannot include both proxy variables simultaneously.

In Models 2 and 3 in Table 4, we estimate the impact of our two moderator variables on the relation between first-order classic density and survival. For ease of interpretation, for studies of mortality rates we multiplied coefficients by −1 so that large positive first-order classic density effects measure the beneficial effect of classic density on survival. In general, we find much weaker effects than in the founding models. The simplicity of goals variable is nonsignificant \((p = .256)\). The variable measuring tangibility of offerings reaches weak statistical significance \((p = .063, \text{ one-tailed})\). The coefficient has a negative sign, suggesting that in manufacturing industries, classic density-based legitimation has a weaker effect. These estimates do not support our Hypotheses 3 and 4 for organizational survival. One important caveat is that the Knapp-Hartung joint test of association is never statistically significant in these survival analyses. The test statistics (and \(p\) values) for the Models 1 through 3 in Table 4 are, respectively, 1.54 \((p = .207)\), 1.31 \((p = .277)\), and 1.69 \((p = .157)\). In sum, we do not find evidence for an association of any of the covariates with the first-order classic density effect in the survival analyses.

**Study Artifacts**

Returning to the baseline Model 1 in Table 3, we observe a negative effect of left censoring in the founding analyses, although the coefficient has weak significance. This finding suggests that researchers find weaker first-order classic density effects in populations not observed from their inception—that is, during the period when gaining legitimation has particular value. This finding is consistent with previous research arguing that lack of support for density-dependent legitimation can be due to left-truncated observation schemes (Baum & Oliver, 1992). The results for left censoring in the survival analysis support a similar interpretation. Model 1 in Table 4 shows a negative sign for left censoring, but the coefficient does not reach statistical significance.

**Control Variables**

In the founding models, we find weakly significant negative effects for the number of variables included in the studies and the second-order classic density term. Even when carrying capacity was adequately controlled for in the original studies, the inclusion of additional covariates can eliminate confounding effects otherwise captured by classic density. The duration of the period covered by each study—the variable observation period—also does not have a significant impact on the effect size. Worthy of note is that we find a negative—but only weakly significant—effect of second-order classic density. Increasing competition not only drives organizations out of an organizational population but also reduces the legitimation effect of classic density on organizational founding. The results for the survival analysis are somewhat similar although again weaker compared to the founding analysis. Observation period and second-order classic density do not have significant effects. The
number of variables included in a study reduces the size of the classic density effect but has only weak statistical significance.

In additional analyses, not reported for brevity, we examined the potential effect of additional biases. Given the significance bias in published work, one can expect that results related to a study’s core theme are more likely to be significant. We included a dummy for whether density dependence was the focus of the study (i.e., whether the search keywords appeared in the title of the publication). Density dependence theory was originally developed in the United States, and we examined whether this could generate selection bias by including a dummy for studies in U.S. publications. Finally, a study’s methodology may influence its results. Survival analyses of density dependence theory all use event history analysis and do not show variance in methodology. Founding analyses typically use Poisson or negative binomial regression, but in some cases, researchers employ event history analysis. So, we examined whether using a count method affected the founding models. None of these variables showed statistically significant effects in our estimates. They did worsen the joint test of association of the covariates, however. Hence, we did not include them in the final model specifications reported here.

**Discussion**

The maturity of management studies offers an opportunity to evaluate the systematic support for existing theories. Examples of meta-analytic studies in management include Kirca, Hult, Deligonul, Perry, and Cavusgil (2012) on international expansion; Dulebohn, Bommer, Liden, Brouer, and Ferris (2012) on leadership; Rosenbusch, Rauch, and Bausch (2013) on external task environments; and van Essen, Otten, and Carberry (in press) on CEO compensation. Organizational ecology also appears to be a good candidate for such an assessment, given its long history of cumulative empirical work (Carroll, 1993; Dobrev, van Witteloostuijn, & Baum, 2006). In the current study, we consider a core organizational ecology theory: the density dependence theory of legitimation. In so doing, we contribute to the larger literature on organizational form emergence (Fiol & Romanelli, 2012). In other scientific fields, such as medicine, meta-analytic reviews have developed into the standard tool to generate comparative knowledge by statistically analyzing the evidence built up through a series of published studies on a specific issue. This offers a way to compensate, at least in part, for well-known biases in published work, including selective sampling, difficulty in publishing replications, and the tendency to publish significant findings (Ioannidis, 2005). We perform summative meta-analyses in order to estimate the average effect size of first-order density across populations. Subsequently, we run formative meta-analyses to explain effect size variation across populations. With our formative meta-analyses, we reformulate the organizational ecology theory of similarities as a first step toward a study of cross-population differences.

Density dependence theory has emerged in a period of about two decades as a very productive and successful research model to explain processes and outcomes of organizational evolution at the population level (Carroll & Hannan, 2000; Hannan & Carroll, 1992). The theory builds on the two complementary processes of legitimation and competition, which jointly drive the evolution of organizational populations in connection with the utilization of resources in an organizational environment. The vital rates of founding and mortality of a
population are argued to be nonmonotonically related to the number of organizations operating in the population. Population density is the key variable in the model. The first-order classic density effect is claimed to measure constitutive legitimation, while the second-order classic density effect is said to capture diffuse competition.

In this study, we focus on legitimation, the process by which key constituents interpret a certain organizational form as a natural, taken-for-granted way to perform a certain kind of action in a specific domain, from producing an automobile to organizing voluntary groups. The original theory posits that mere population classic density reflects legitimation. Increasing initial classic density enhances an organizational form’s social acceptance. So, the founding and survival rates are proportional to the level of constitutive legitimation (Carroll & Hannan, 2000). The great returns to legitimation for organizational forms decline as classic density continues to increase, since competition then sets in. Despite significant refinements (Barnett, 1997; Barnett & Amburgey, 1990; Carroll & Hannan, 1989a; Hannan, 1997; Sorenson, 2000), density dependence theory received criticism for the implicit assumption that each organization in a population contributes to legitimation or competition equally and that classic density can capture these underlying processes (e.g., Baum & Powell, 1995; Delacroix & Rao, 1994; Petersen & Koput, 1991; Zucker, 1989). To address such criticisms, recent work examines legitimation more closely and favors the measurement of being taken for granted via collective assessments of “what fraction of relevant individuals take a particular organizational form for granted” (Hannan & Carroll, 1992: 38-39; see also Hannan et al., 2007).

Our study uses meta-analysis to evaluate the published work on classic density dependence theory through summative meta-analyses. Moreover, we add the moderating role of perceptual ambiguity in formative metaregressions, after reconceptualizing revised density dependence theory. We hypothesize that greater ambiguity in the perceptions by audiences, which Hannan et al. (2007) refer to as fuzziness, will weaken legitimation and, hence, reduce the effects of first-order classic density on founding and survival rates. In this way, we refocus density dependence from a theory of cross-population similarities (as in the summative meta-analyses) to a lens to study cross-population differences (as in the formative metaregressions). We focus on two features of organizational categories that we expect to be associated with perceptual ambiguity and that can be empirically coded: simplicity of goals and tangibility of offerings. Our metaregressions find evidence supporting our hypotheses for organizational founding rates, suggesting that our reconceptualization of revised density dependence can indeed explain differences across populations in the organizational form emergence process.

Our meta-analysis leads to an important conclusion: There is an urgent need to begin work on the further development of a macro–organization theory of cross-population ecological differences. The mean effect of classic density is as expected, supporting the original theory’s density dependence logic. However, large Q statistics for both founding and survival rates show quite heterogeneous effect sizes, indicating that we need additional theory to explain cross-population variation. Our results are in line with the recent formalization of legitimation as a process where increases in classic density combine with other mechanisms, such as individual entrepreneurial decision making (Lomi, Larsen, & Wezel, 2010) and social categorization (Hannan et al., 2007) in shaping the evolution of organizational forms. This shift in focus to underlying sociocognitive processes of organizational form emergence is in line...
with related work on identity formation and communities of practice (Fiol & Romanelli, 2012). Our findings highlight the importance for future work in this area to develop more comprehensive theories of organizational evolution that incorporate classic density counts as well as measures of the underlying sociocognitive processes, such as boundary fuzziness and identity formation. Recent empirical studies on Chinese banks (Kuilman & Li, 2009), Dutch audit firms (Bogaert et al., 2010), and global disk array manufacturers (McKendrick et al., 2003) move in this direction.

In this sense, our study underscores the need for organizational ecology to study systematic heterogeneity and engaging in comparative work (Boone & van Witteloostuijn, 1995). As exogenous characteristics of organizational populations codetermine their vital rates, more research across populations is needed to define the boundary conditions of theories (Boone et al., 2009; van Witteloostuijn & Boone, 2006). In the current study, we show that easily observable population features (i.e., for profit versus not for profit and manufacturing versus services) already explain part of the variance in organizational form emergence processes across populations. For studies of organizational evolution, of which form emergence is just one example, this is a very promising finding indeed, as we need measurable proxies for hard-to-observe constructs. In future research, a key focus will be to further theoretically plausible and empirically valid proxies for cognitive unobservables in the context of longitudinal ecological work.

In this study, the focus is on legitimation. With our formative metaregressions, we explored differences in organizational form emergence processes across populations that vary in terms of the simplicity of goals and tangibility of offerings, both negatively related to the degree of population-level fuzziness. Our results suggest that the speed of new organizational form emergence is negatively affected by population-level fuzziness (Hannan et al., 2007). In line with this finding, we could expect that in the preemergence stage of new form development, the likelihood of successful new form formation is lower when fuzziness is higher (Fiol & Romanelli, 2012). To examine this, future research should include cases of failed form emergence. Again, this implies the need for comparative research, exploring differences across successful and unsuccessful form emergence processes.

More broadly, an ecological theory of cross-population differences could be extended to all aspects of population-level evolution. Another example is the other ecological process that operates alongside legitimation: competition. In a way, organizational ecology’s theory of resource partitioning already implies a focus on cross-population differences, arguing that resource partitioning will only occur under a set of specific population-level conditions (Carroll, 1985). Resource partitioning will only materialize in populations featuring resource heterogeneity, scale economies, and scope diseconomies (Boone, Carroll, & van Witteloostuijn, 2002). Indeed, Boone et al. (2009) adopt a comparative research design to test the validity of this set of conditions: They compare the accounting industries in Belgium and the Netherlands, arguing and finding evidence that resource partitioning did not evolve in the latter but did so in the former, in line with differences in the underlying industry conditions. This type of comparative cross-population work is needed to explore many other differences in competitive processes across populations (van Witteloostuijn & Boone, 2006). For instance, at the other end of the ecological spectrum, we have only very limited understanding of cross-population differences in organizational form decline processes (Ruef, 2004).
Although the mean density effect reveals a positive impact both on founding and survival rates, the legitimation-enhancing effect of classic density is greater for founding than for survival. Our metaregression models show that our focal moderators have predictive power in explaining differences in first-order classic density effects on founding rates but not on survival rates. This reminds us that founding and survival define two distinct processes and that the revised theory may apply more successfully to the former. Legitimation operates at the level of the organizational form. Then, aggregate indicators seem better predictors of founding processes. For example, entrepreneurial action strongly relies on signals of sharp identities (McKendrick et al., 2003). Survival, in contrast, measures an organizational-level outcome that has fewer immediate links to legitimation. In line with this reasoning, Barron (1999) shows that organizational size moderates the impact of the effect of classic density on mortality, and Bogaert et al. (2010) find that the effect of first-order fuzzy density on organizational survival is more significant for low-status than for high-status organizations.

Of course, our study has limitations. One is that we used only crude proxy variables as a first step to operationalize our concepts. By doing so, at least two issues deserve consideration. First, although we believe that perceptual ambiguity tends to be lower for tangible offerings, this may not always apply. In some manufacturing industries, firms produce highly specialized products that require complex sensemaking processes from buyers, intermediaries, and other constituents. Moreover, processes of business diversification and conglomerate can actually blur the distinction between some kinds of manufacturing and services. To our knowledge, such “problematic” cases are not part of our sample. Second, organizations operating in for-profit and not-for-profit populations may well differ along more dimensions than simplicity of goals alone. For instance, not-for-profit organizations may employ a different type of worker and may have more difficulty in attracting funding than for-profit organizations. Further work is needed to explore these and other alternative explanations of our findings. More broadly, all this suggests that the revised theory’s emphasis on processes of sensemaking rightly points to the need for developing theories of micro-level behaviors that drive macrolevel ecological processes (see Schelling, 1978).

Our study has other limitations. A well-known problem with meta-analysis is publication bias. Studies that report statistically significant results are easier to publish than those presenting nonsignificant findings. Such bias, of course, favors the findings of a meta-analysis toward a specific theory (Sterne, 2009). Therefore, the sampling of studies to include in the analyses is extremely important. We conducted a comprehensive search for studies, including articles published in top journals but also journals not listed in the Web of Science as well as book chapters. Even then, meta-analysis can be criticized for combining different types of studies, which vary with respect to the question investigated or the methodology used (Lipsey & Wilson, 2001). The clear focus on first-order classic density effects helped to limit the risk of including noncomparable studies in the metaregressions. In additional analyses described in the previous section, we controlled for differences in the study method or the core aim of each study and found patterns of findings equivalent to those reported in Tables 3 and 4. These efforts reduce, but cannot completely eliminate, the potential publication bias in meta-analysis (Ioannidis, 2005). All in all, this limitation not only affects research in organizational ecology but also extends to academic publishing in any scientific field.
## Appendix

### List of Studies Included in the Meta-Analysis

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Publication</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnett, W. P.</td>
<td>1990</td>
<td>ASQ</td>
<td>S</td>
</tr>
<tr>
<td>Barnett, W. P.</td>
<td>1997</td>
<td>ASQ</td>
<td>F, S</td>
</tr>
<tr>
<td>Barron, D. N.</td>
<td>1998</td>
<td>OST</td>
<td>F</td>
</tr>
<tr>
<td>Barron, D. N.</td>
<td>1999</td>
<td>ASR</td>
<td>F, S</td>
</tr>
<tr>
<td>Barron, D. N., West, E., &amp; Hannan, M. T.</td>
<td>1994</td>
<td>AJS</td>
<td>S</td>
</tr>
<tr>
<td>Baum, J. A. C.</td>
<td>1995</td>
<td>SF</td>
<td>S</td>
</tr>
<tr>
<td>Baum, J. A. C., Korn, H. J., &amp; Kotha, S.</td>
<td>1995</td>
<td>SSR</td>
<td>F, S</td>
</tr>
<tr>
<td>Baum, J. A. C., &amp; Mezias, S. J.</td>
<td>1992</td>
<td>ASQ</td>
<td>S</td>
</tr>
<tr>
<td>Baum, J. A. C., &amp; Oliver, C.</td>
<td>1991</td>
<td>ASQ</td>
<td>S</td>
</tr>
<tr>
<td>Baum, J. A. C., &amp; Oliver, C.</td>
<td>1992</td>
<td>ASR</td>
<td>F, S</td>
</tr>
<tr>
<td>Baum, J. A. C., &amp; Singh, J. V.</td>
<td>1994</td>
<td>AJS</td>
<td>S</td>
</tr>
<tr>
<td>Blau, J. R., &amp; Elman, C.</td>
<td>2002</td>
<td>SI</td>
<td>F</td>
</tr>
<tr>
<td>Boone, C., Brockeler, V., &amp; Carroll, G. R.</td>
<td>2000</td>
<td>OST</td>
<td>S</td>
</tr>
<tr>
<td>Budros, A.</td>
<td>1992</td>
<td>SF</td>
<td>F</td>
</tr>
<tr>
<td>Budros, A.</td>
<td>1993</td>
<td>SF</td>
<td>F</td>
</tr>
<tr>
<td>Budros, A.</td>
<td>1994</td>
<td>OS</td>
<td>F</td>
</tr>
<tr>
<td>Carroll, G. R., Bigelow, L. S., Seidel, M. D. L., &amp; Tsai, L. B.</td>
<td>1996</td>
<td>SMJ</td>
<td>S</td>
</tr>
<tr>
<td>Carroll, G. R., &amp; Hannan, M. T.</td>
<td>1989a</td>
<td>ASQ</td>
<td>S</td>
</tr>
<tr>
<td>Carroll, G. R., &amp; Hannan, M. T.</td>
<td>1989b</td>
<td>ASR</td>
<td>F, S</td>
</tr>
<tr>
<td>Carroll, G. R., &amp; Swaminathan, A.</td>
<td>1991</td>
<td>AS</td>
<td>F, S</td>
</tr>
<tr>
<td>Carroll, G. R., &amp; Swaminathan, A.</td>
<td>1992</td>
<td>ICC</td>
<td>F, S</td>
</tr>
<tr>
<td>Carroll, G. R., &amp; Swaminathan, A.</td>
<td>2000</td>
<td>AJS</td>
<td>S</td>
</tr>
<tr>
<td>Carroll, G. R., &amp; Wade, J. B.</td>
<td>1991</td>
<td>SSR</td>
<td>F, S</td>
</tr>
<tr>
<td>Cattani, G., Pennings, J. M., &amp; Wezel, F. C.</td>
<td>2003</td>
<td>OS</td>
<td>F</td>
</tr>
<tr>
<td>Delacroix, J., Swaminathan, A., &amp; Solt, M. E.</td>
<td>1989</td>
<td>ASR</td>
<td>S</td>
</tr>
<tr>
<td>Dobrev, S. D.</td>
<td>2000</td>
<td>OST</td>
<td>F</td>
</tr>
<tr>
<td>Dobrev, S. D.</td>
<td>2001</td>
<td>OST</td>
<td>F</td>
</tr>
<tr>
<td>Dobrev, S. D., Ozdemir, S. Z., &amp; Teo, A. C.</td>
<td>2006</td>
<td>OS</td>
<td>S</td>
</tr>
<tr>
<td>Freeman, J.</td>
<td>1990</td>
<td>OEND</td>
<td>S</td>
</tr>
<tr>
<td>Greve, H. R.</td>
<td>2000</td>
<td>AMJ</td>
<td>F</td>
</tr>
<tr>
<td>Greve, H. R.</td>
<td>2002</td>
<td>SF</td>
<td>F</td>
</tr>
<tr>
<td>Hannan, M. T.</td>
<td>1991</td>
<td>SM</td>
<td>F</td>
</tr>
<tr>
<td>Hannan, M. T.</td>
<td>1997</td>
<td>OST</td>
<td>F</td>
</tr>
<tr>
<td>Hannan, M. T., Carroll, G. R., Dobrev, S. D., &amp; Han, J.</td>
<td>1998</td>
<td>ESR</td>
<td>S</td>
</tr>
<tr>
<td>Hannan, M. T., Carroll, G. R., Dobrev, S. D., Han, J., &amp; Torres, J. C.</td>
<td>1998</td>
<td>ESR</td>
<td>S</td>
</tr>
<tr>
<td>Hannan, M. T., Carroll, G. R., Dundon, E. A., &amp; Torres, J. C.</td>
<td>1995</td>
<td>ASR</td>
<td>F</td>
</tr>
<tr>
<td>Hannan, M. T., &amp; Freeman, J.</td>
<td>1988</td>
<td>AJS</td>
<td>S</td>
</tr>
<tr>
<td>Hedstrom, P.</td>
<td>1994</td>
<td>AJS</td>
<td>F</td>
</tr>
<tr>
<td>Ingram, P.</td>
<td>1996</td>
<td>SMJ</td>
<td>S</td>
</tr>
</tbody>
</table>

(continued)
## Appendix (continued)

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Publication</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingram, P., &amp; Baum, J. A. C.</td>
<td>1997</td>
<td>SMJ</td>
<td>S</td>
</tr>
<tr>
<td>Ingram, P., &amp; Inman, C.</td>
<td>1996</td>
<td>ASQ</td>
<td>F, S</td>
</tr>
<tr>
<td>Ingram, P., &amp; Simons, T.</td>
<td>2000</td>
<td>ASQ</td>
<td>S</td>
</tr>
<tr>
<td>Lazzeretti, L.</td>
<td>2006</td>
<td>EPS</td>
<td>F</td>
</tr>
<tr>
<td>Lomi, A.</td>
<td>1993</td>
<td>QQ</td>
<td>F</td>
</tr>
<tr>
<td>Lomi, A.</td>
<td>1995a</td>
<td>ESR</td>
<td>F</td>
</tr>
<tr>
<td>Lomi, A.</td>
<td>1995b</td>
<td>ASQ</td>
<td>F</td>
</tr>
<tr>
<td>Lomi, A.</td>
<td>2000</td>
<td>OST</td>
<td>F</td>
</tr>
<tr>
<td>Mascarenhas, B.</td>
<td>1996</td>
<td>JIBS</td>
<td>F</td>
</tr>
<tr>
<td>Messallam, A. A.</td>
<td>1998</td>
<td>OST</td>
<td>F</td>
</tr>
<tr>
<td>Miner, A. S., Amburgey, T. L., &amp; Stearns, T. M.</td>
<td>1990</td>
<td>ASQ</td>
<td>S</td>
</tr>
<tr>
<td>Minkoff, D. C.</td>
<td>1997</td>
<td>ASR</td>
<td>F</td>
</tr>
<tr>
<td>Nownes, A. J.</td>
<td>2004</td>
<td>BJPS</td>
<td>F</td>
</tr>
<tr>
<td>Núñez-Nickel, M., &amp; Moyano-Fuentes, J.</td>
<td>2004</td>
<td>JMS</td>
<td>S</td>
</tr>
<tr>
<td>Olsomer, A., &amp; Cavusgil, S. T.</td>
<td>1999</td>
<td>EJM</td>
<td>F</td>
</tr>
<tr>
<td>Ranger-Moore, J.</td>
<td>1997</td>
<td>ASR</td>
<td>S</td>
</tr>
<tr>
<td>Rao, H.</td>
<td>1994</td>
<td>SMJ</td>
<td>S</td>
</tr>
<tr>
<td>Ruef, M., &amp; Scott, W. R.</td>
<td>1998</td>
<td>ASQ</td>
<td>S</td>
</tr>
<tr>
<td>Russo, M. V.</td>
<td>2003</td>
<td>SMJ</td>
<td>F</td>
</tr>
<tr>
<td>Schulz, M.</td>
<td>1998</td>
<td>ASQ</td>
<td>F</td>
</tr>
<tr>
<td>Simons, T., &amp; Ingram, P.</td>
<td>2003</td>
<td>ASQ</td>
<td>F</td>
</tr>
<tr>
<td>Sorensen, O.</td>
<td>2000</td>
<td>SSR</td>
<td>F</td>
</tr>
<tr>
<td>Sorensen, O., &amp; Audia, P. G.</td>
<td>2000</td>
<td>AJS</td>
<td>F, S</td>
</tr>
<tr>
<td>Staber, U.</td>
<td>1989</td>
<td>OST</td>
<td>F</td>
</tr>
<tr>
<td>Staber, U.</td>
<td>1993</td>
<td>AJES</td>
<td>F, S</td>
</tr>
<tr>
<td>Studerellis, E. M.</td>
<td>1995</td>
<td>SF</td>
<td>F</td>
</tr>
<tr>
<td>Swaminathan, A.</td>
<td>1995</td>
<td>ASQ</td>
<td>F</td>
</tr>
<tr>
<td>Swaminathan, A.</td>
<td>2001</td>
<td>AMJ</td>
<td>F, S</td>
</tr>
<tr>
<td>Swaminathan, A., &amp; Wiedenmayer, G.</td>
<td>1991</td>
<td>SSR</td>
<td>S</td>
</tr>
<tr>
<td>Tucker, D. J., Singh, J. V., &amp; Meinhard, A. G.</td>
<td>1990</td>
<td>AMJ</td>
<td>F</td>
</tr>
<tr>
<td>Wade, J. B.</td>
<td>1995</td>
<td>SMJ</td>
<td>F</td>
</tr>
<tr>
<td>Wade, J. B.</td>
<td>1996</td>
<td>AMJ</td>
<td>F</td>
</tr>
<tr>
<td>Wade, J. B., Swaminathan, A., &amp; Saxon, M. S.</td>
<td>1998</td>
<td>ASQ</td>
<td>F</td>
</tr>
<tr>
<td>West, E.</td>
<td>1995</td>
<td>SF</td>
<td>F</td>
</tr>
<tr>
<td>Wezel, F. C.</td>
<td>2005</td>
<td>OST</td>
<td>F</td>
</tr>
</tbody>
</table>

Notes

1. In empirical work, organizational ecology often refers to organizational mortality instead of survival. To avoid confusion, we frame the arguments in terms of survival. By doing so, the expression “positive (first-order) classic density effect” denotes the legitimation-enhancing effect of classic density on both founding and survival rates.

2. Models testing density dependence theory also include a second-order (i.e., squared) effect of density. The latter captures the competitive effect of density, which generally decreases founding and survival when density approaches the population’s carrying capacity. As suggested above, in this study, we focus on the first-order density effect.

3. To test Hypotheses 3 and 4, we use directional, one-tailed significance tests, which have more statistical power than two-sided tests. This is warranted because, theoretically, one predicts simplicity of goals and tangibility of offerings to increase the positive effect of density-dependent legitimation.

4. The Knapp-Hartung test is an omnibus test to assess if there is evidence for an association of any of the covariates with the outcome. It is a conservative test designed to control for the risk of false-positive findings when applying metaregression with multiple covariates (Harbord & Higgins, 2008). As a result, the $p$ values of these tests are slightly larger than those of the individual coefficients of our focal variables. These differences, however, appear to be very small, supporting our findings.

References


