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# Inter-firm Co-operation and Competition in Industrial Districts

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## Abstract

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The relationship between the presence of numerous firms in an industrial district and district flexibility may be more complicated than current conceptualizations imply, as these are dominated almost exclusively by the argument that district firms are embedded in local social structures and that integration encourages innovation. On the basis of arguments from neo-institutional and ecological theory, I distinguish between Third Italian districts which change mainly through collective learning in a relatively stable population of firms and Marshallian districts which change mainly through the competitive replacement of relatively inert firms. I explore this distinction empirically with data on the relationship between district size and firm mortality rates in a textile district in Baden-Württemberg, Germany, from 1946 to 1993.

**Descriptors:** interfirm networks, co-operation, neo-institutional theory, ecological theory

## Introduction

Over the past two decades, social scientists have rediscovered industrial districts, defined as local clusters of numerous, mostly small enterprises which alternately compete and cooperate with one another and specialize in particular aspects and phases of production (Brusco 1982; Pyke et al. 1990; Harrison 1994). For some district researchers, the principal question is to assess the nature of interfirm networks through which information is circulated and innovations are diffused. Supported by regional institutions that balance co-operation and competition, flexible networks are said to help firms survive and prosper in volatile market environments. Innovation is possible, so the argument goes, because the actors live in an historically bounded area and share a common culture; because they share a common culture and live near to each other, they have 'frequent direct face-to-face relations which allow them to get to know and recognise each other' (Dei Ottati 1994a: 530); and as actors relate to one another 'by interpenetrating one another's formal organizational boundaries' (Harrison 1992: 478), they build a basis for sustained trust on which they can draw when engaging in risky ventures.

This view of network integration in districts is theoretically indeterminate, because it leaves open the possibilities of both inertia and change.

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Integration may retard or encourage innovation. Theorists' use of concepts such as social embeddedness, sense of belonging, and collective identity conjures up images of order and cohesiveness. However, the assertion that enterprises have common interests and recognize that each firm's 'success and even its survival are linked to the collective efforts of the group to which it belongs' (Piore and Sabel 1983: 401) seems problematic in systems that include a mix of cooperative and competitive processes (Dei Ottati 1994b; You and Wilkinson 1994). A realistic analysis of district flexibility must not over-emphasize the level of cohesiveness, but must recognize the possibility of conflict and disintegration. The conclusion that, as a result of specialization, district firms 'become increasingly mutually dependent and therefore necessarily co-operative' (You and Wilkinson 1994: 261) should be the result of empirical analysis, not an assumption with which analysis begins.

Researchers have tended to treat the social embeddedness of firms and networks as a defining characteristic of districts. However, social embeddedness is a variable, and its causes and consequences are contingent on circumstances which may be highly place specific. Case studies have shown that different districts often have a different mix of co-operation and competition and use different approaches to sustain that mix. The observed variety is so great that one wonders if a canonical model of network flexibility in districts is possible at all (Amin and Robins 1990; Zeitlin 1992) and whether assertions of an 'optimal balance between competition and co-operation' (Hardill et al. 1995: 170) are falsifiable. With contradictory reports concerning the performance of industrial districts (Bianchi 1994; Harrison 1994), there is a need for greater conceptual clarity to better understand the contingent nature of network integration and change.

In this paper, I show how the neo-institutional and ecological perspectives in organizational analysis can be combined to shed light on the relationship between district size and district change. Descriptions of successful districts occasionally refer to business failures (and foundings) as an aspect of dynamism (Bull et al. 1991; Bigarelli and Crestanello 1994; Dei Ottati 1994b), but provide little theoretical guidance for interpreting failure rates. It is not clear whether a particular level of failures, relative to the number of firms at risk, should be viewed as an indicator of district success or decline. It is also not clear if successful districts should be seen as stable populations of firms which adapt to changing circumstances, or as dynamic populations which change through the replacement of firms with an outdated organizational form by another, more appropriate form. Interfirm networks may be dynamic either because their composition changes, as members come and go, or because existing members adjust their interrelationships.

I propose two types of industrial districts, based on distinct change processes. In Marshallian districts, interfirm relations are mostly competitive and change occurs mainly through the substitution of individual firms in the organizational population, consistent with the ecological perspective. In Third Italian districts, relations are socially integrated and change is more a function of collective learning and social control, consistent with the insti-

tutional perspective. Following the argument that network size has governance implications (Jones et al. 1997), I suggest that the number of firms can be used as a metric for assessing the mode of district change. I formulate hypotheses relating district size to firm mortality and test these hypotheses with data on mortality rates in a textile district in Baden-Württemberg, Germany, for the period from 1946 to 1993.

### **Theoretical Perspectives on Network Dynamics and Firm Mortality**

Network governance is often discussed in the district literature as a question of minimizing transaction costs (Storper and Christopherson 1987; Lazerson 1988). However, other issues are at work as well: the visibility of organizational models, collective learning, the cultural backdrop of the network, the power of institutional actors, and so forth. I draw on arguments from the neo-institutional and ecological perspectives in organizational analysis to interpret district change processes, with implications for the viability of individual firms.

#### **Neo-institutional Theory**

The neo-institutional perspective in organizational analysis focuses on the social aspects of organizational behaviour, including interorganizational relations, which give meaning to individual choices (DiMaggio and Powell 1991). Institutions may be defined as 'cognitive, normative, and regulative structures and activities that provide stability and meaning to social behavior' (Scott 1995: 33). The cognitive elements describe actors' frames of reference, which enable shared understandings of the situation. The normative view is evaluative and defines what is to be considered appropriate. Normative conceptions may have little to do with technical or economic efficiency, but may function as 'myths' to which actors conform in exchange for social and political legitimacy. They specify how networks should be structured and the kinds of network behaviours to be considered appropriate. The regulative elements of institutions describe the rules which both constrain and enable behaviour.

Organizations situated in well-defined and mature organizational communities tend to adopt similar structures and behaviours that conform to the mandate of the institutional environment; that is, they become isomorphic with respect to institutional demands. Cognitively, organizations seek legitimacy by adopting a common frame of reference. Normatively, they imitate others in the community, and regulatively, they obtain legitimacy by conforming to the prevailing rules set by the most influential actors. Organizations conforming to institutional rules are seen as increasing their ability to obtain critical resources and survive.

Viewed from the neo-institutional perspective, an industrial district represents a fairly stable community of firms and support organizations.

Successful districts are seen as tightly integrated systems, although the mechanisms of integration (such as kinship ties, professional relations, religion, and formal regulatory bodies) may vary widely across places. Dense networks provide opportunities for co-operation through cognitive sharing, imitation, and regulation. Successful co-operation results from effective learning, both individually and collectively, and enhances the long-term viability of individual firms and the district as a whole. To the extent that all firms in the district draw on network-level resources, depending upon their particular position within the network and their connections to others, one would expect failure rates in the district to be relatively low. This, for example, is the characterization of a successful textile district in Denmark, where failure rates have been low and existing firms have been able to innovate through the use of collective services provided by local organizations. Most co-operation occurs inside the district, 'where everybody knows what everybody else can do, so the search costs are minimized' (Illeris 1992: 79). When employees depart to create their own firms, they tend to be supported by their former employer as a competent partner. By contrast, in the Leicester textile district in England, mortality rates are high. The neo-institutional explanation is that most firms in Leicester make little use of local networks because they lack the 'close-knit family structures that have contributed to the creation and survival of small firms in Italy' (Hardill et al. 1995: 172).

### **Organizational Ecology**

In contrast to the neo-institutionalist focus on the social quality of inter-firm relations, and the micro-processes linking environments and organizations, the ecological model emphasizes resource competition and focuses on external selection forces fuelling the competitive struggle (Hannan and Freeman 1989). The 'natural' outcome of selection pressures is that the less effective organizations are eventually driven out of the population. Inertial forces within organizations are seen as limiting the capacity to change quickly enough to keep pace with environmental changes (Hannan and Freeman 1984). Change is often too marginal or slow to have a strong impact on organizational survival. When organizations do change in their core features, and later in their life cycles, they experience an increased risk of failure. Thus, most change occurs at the population level, as organizations with outdated forms are replaced by organizations introducing new forms.

Viewed from the ecological perspective, an industrial district represents a competitive response on the part of a business population, or group of populations, to the problems of adaptation to changes in the environment. Networks are an organizational form linking firms with their environments. If networks are dynamic it is not because existing firms adjust their external relations, by changing the strength of ties, the administrative form of relations, or the content of connections, but because the weakest network members are weeded out by competitive forces and new firms enter the

network. Routines based on investments in the network and external dependencies constrain organizational change and lock firms into their network positions. Strong network embeddedness is therefore a liability, limiting firms' adaptability in volatile environments. High firm mortality rates would be interpreted from this perspective as a sign of district vitality only if founding rates are high as well, and if foundings introduce new competencies which permit a better fit to existing environmental conditions. High mortality rates would then raise the likelihood of district renewal, as firms with outdated competencies fail and make room for new firms. Conversely, in the absence of innovative foundings, high mortality rates indicate district decline. This is the characterization of the textile district in Leicester, where 'new firms continually come and go' and where new firms do 'not offer something new' and 'engage in free-for-all competition' (Bull et al. 1991: 90–91).

The neo-institutional and ecological perspectives thus offer different interpretations of the purported dynamism and flexibility of industrial districts. From the neo-institutional perspective, district flexibility is the outcome of existing firms continuously learning, through networks, new competencies and adjusting old ones. Successful interfirm networks are socially dense and evolve through collective learning. I refer to such districts as Third Italian, consistent with the emphasis, in studies of districts in the Third Italy, on the social quality of interfirm relations (Brusco 1982; Harrison 1992; Lazerson 1995). From the ecological perspective, district flexibility reflects the continuous recomposition of networks with a different mix of specialized firms. Network relations are competitive and change mainly through the differential selection of firms. I refer to such districts as Marshallian, in reference to Marshall's (1947: Chapt.8) use of ideas from Darwinian evolutionary theory.

At first glance, these are conflicting perspectives, with one emphasizing co-operation and learning, and the other competition and natural selection. The difference is mainly one of focus and level of analysis. There are also complementarities which have led to some convergence in the use of neo-institutional and ecological arguments, as is evident in recent research on the evolution of organizational populations. Institutional and selection processes may be seen as fundamentally interrelated. Several studies have shown that institutional processes can enhance an organization's legitimacy and access to vital resources, thus reducing mortality rates (Miner et al. 1990; Baum and Oliver 1992). Institutionally guided learning processes may also be an important element in the evolution of organizational networks, affecting the way actors acquire information about environments with which they then imitate others either as partners or rivals (Mezias and Lant 1994; Porac et al. 1995). Depending on what practices are considered appropriate, institutional forces may either retard or encourage change. When they enhance inertia, they may accelerate the process of selection in a volatile environment, thus raising mortality rates (Levinthal 1991). Conversely, external selection forces may determine which organizations inherit the social traits — including the ability to learn through networks — necessary to survive the evolutionary race (Bruderer and Singh 1996).

Although it is well understood that institutional processes, including network processes, are building blocks of ecological communities and therefore affect selection (Fombrun 1988; Hannan and Freeman 1989), the direction of the effect is difficult to specify *a priori*. In industrial districts which combine cooperative and competitive processes, social integration can either lead to change and innovation, or to inertia and path dependence. Both outcomes have been observed in studies of districts (Harrison 1994), but the mechanisms and conditions which lead to one or the other outcome have not been well specified. In particular, no attention has been paid to the number of firms in the district as an important structural condition affecting district flexibility. I propose that, if institutional conditions are considered in conjunction with the number of actors in the system, their impact becomes more determinate. Below, I formulate several hypotheses concerning the effect of district size on firm mortality, and describe the empirical context in which I will test these hypotheses.

## **Empirical Context and Hypotheses**

### **District Size**

The importance of network size is well established in several fields of inquiry. The number of actors is said to pose problems of coordination and safeguarding in interfirm networks (Jones et al. 1997), to promote upward mobility within organizations (Podolny and Baron 1997), to reduce the value of social capital of people doing similar work (Burt 1997), and to increase the availability of resources to entrepreneurs (Aldrich et al. 1987). In some instances, network size is a limiting, in other cases an enabling factor. Research on organizational hierarchies has demonstrated how large size increases complexity, induces complacency, and creates problems of control. If integration in large corporate hierarchies is problematic, surely it is even more uncertain in the context of relations among legally autonomous yet functionally interdependent firms, as in industrial districts. Managing external relations requires special competencies, ongoing attention, and administrative resources, of which firms have only limited amounts.

In industrial districts, the number of firms is important in that the expansion or contraction of the population provides important contextual information for business owners who need to know what kinds of firms and strategies are flourishing and what kinds are failing. From the neo-institutional perspective, district size may be positively related to reputation, visibility, and learning. Pressure on firms to demonstrate that they are conforming to the institutional rules of the district leads them to copy practices from each other. The larger the population of firms, the more visible are the ideas and strategies practiced in the district and the greater are the opportunities for learning about them. In large districts, investors and partner firms will find it relatively easy to assess reputations and to hold firms

accountable for deviations from agreed-upon rules. For example, in a study of the Sassuolo ceramic-tile district in Italy, Porter (1990: 219) describes the involvement of numerous firms in networks through which 'news of product and process innovation spread rapidly'. However, high visibility can also have negative consequences, depending on the nature of signals sent throughout the network. Reputation can be bad, and a bad reputation will spread quickly in networks whose members are visible, because they all subscribe to a common frame of reference. In such districts, high failure rates may be interpreted by firms as negative reputational signals, indicating shrinking opportunities. It would be difficult to argue that declining districts would be viewed more favourably by investors than expanding ones, even though coordination seems easier in the former case because fewer firms are involved.

Ecologists have drawn on ideas from neo-institutional theory to explain how the addition of organizations, at low population levels, can lead to reduced failure rates, by providing role models, social legitimation, sponsorship, and so forth. In densely populated districts, though, competitive processes tend to dominate over cooperative relations, as has been shown in many industry studies (Hannan and Carroll 1992). In crowded districts, the addition of new firms intensifies competition for limited resources. The addition of a firm in an already crowded district could limit the survival prospects of all the firms in the district, if the new firm merely copies existing organizational forms because it wants to conform to prevailing institutional rules. Under normal circumstances, crowding also creates problems of coordination, via the increase in the volume and intensity of interaction, requiring the allocation of resources to administrative and communicative functions. Whether the social fabric is strong enough to prevent ruinous competition in densely populated districts, when the carrying capacity of the environment is fixed or declining, is an empirical question.

Recent studies of industrial districts indicate that co-operation and integration should not be taken as a fixed characteristic, but may be historically and spatially quite limited. Even districts that were formerly regarded as models of social integration and collaboration are increasingly 'shaped by a deep-seated individualism' (Dunford et al. 1993: 134). Observers have noted a general increase in recent years in destructive price cutting and structural fragmentation, suggesting developments consistent with ecological reasoning. In the Italian Prato district, for example, a 'process of natural selection has been leaving Prato with an increasingly aging and less efficient mix of producers' (Harrison 1994: 100).

### **Hypotheses**

The ecological assumption of organizational inertia suggests a distinction between the delayed effect of district size at the time of the firm's founding and the contemporaneous effect of district size during the firm's lifetime. The most critical decisions about organizational strategy and structure are made at the time of founding, constraining the firm's subsequent development and

ability to change (Stinchcombe 1965). Whether to participate in existing networks, build new relations, affiliate with firms outside the district, recruit similar or dissimilar network members, and so forth are decisions about how to manage resource constraints, obtain legitimacy, and discover new opportunities. This 'imprinting' argument, which draws heavily on neo-institutional theory, predicts that the constraining effects of decisions made early in the organization's life persist over time and, when made at a time when numerous firms existed in the district, raise the risk of organizational failure by a constant amount throughout the firm's lifetime. By contrast, the effect of contemporaneous district size stems from the coordination problems associated with competitive pressures and institutional problems that firms experience at any time during their lifespan, independent of conditions at the time of founding. Studies of newspapers, breweries, and semiconductor firms provide empirical support for this argument (Boeker 1989; Carroll and Hannan 1989; Swaminathan 1996) and suggest the following hypotheses:

*Hypothesis 1: Large district size at the time of the firm's founding increases the likelihood of its termination at any time in its life cycle.*

*Hypothesis 2: Large district size during the firm's lifetime raises the likelihood of its termination.*

The effect of district size on organizational mortality may also depend on the experience that the firm has with collaboration. The neo-institutional perspective predicts that, under conditions of uncertainty, firms are likely to engage in relations with organizations with whom they have interacted in the past, because it is these organizations about whom they have the greatest knowledge (Podolny 1994). Repeated exchange allows actors to observe equity in the relationship and clarify reputations. Positive experience breeds trust, which in turn raises the likelihood of continued co-operation (Parkhe 1993). Studies of interfirm relations among business interest associations (Aldrich et al. 1990), wineries (Butler and Hansen 1991), investment banks (Podolny 1994), and manufacturers (Parkhe 1993; Hanssen-Bauer and Snow 1996) suggest that cooperative skills can be learnt and that pre-existing links enhance organizational survival. The implication is that, as firms gain experience with co-operation, the presence of numerous firms becomes less constraining for network building and organizational survival, suggesting the following hypothesis:

*Hypothesis 3: The constraining effect of contemporaneous district size on firm survival is weaker than its effect at the time of the firm's founding.*

Unless all firms in the district are identical in their practices and structures, it is unlikely that they will contribute equally to district development. From the neo-institutional perspective, the question is: What type of firm should actors imitate or associate with? Firms do not simply imitate the organizational forms of others blindly, but discriminate in their choices of how to innovate and whom to affiliate with. From the ecological perspective, competition matters more to some firms than to others, depending on the



resources available to manage external relations and to influence others in the district. The effect of district size is thus likely to be felt differentially throughout the system.

Of particular interest in this regard is the degree of horizontal and vertical specialization of firms. The district model postulates that specialized firms are more adaptable, because they are lighter on their feet than integrated enterprises (Storper and Christopherson 1987). With respect to interfirm relations, the question is whether specialists derive greater benefits from networking than generalists and whether they have the resource and learning capacity to cooperate. Specialists may benefit from networking more than generalists, because of greater external dependencies. However, they may also find it more difficult to manage across organizational boundaries, because of internal resource limitations. For this reason, specialists may be more myopic in their external reach. Studies of firms in the Scottish knitwear and US biotechnology industries suggest that specialized enterprises tend to cooperate less and with a smaller number of organizations than generalists (Porac et al. 1995; Powell and Brantley 1992). In competitive situations, even small differences in networking capacity may accumulate rapidly, driving the least capable and most isolated firms out of the system. I test the following hypothesis:

*Hypothesis 4: The constraining effect of district size on firm survival is the greatest for specialized firms.*

### **Research Site**

I test the hypotheses in the Reutlingen textile district for three reasons. First, this district lies in Baden-Württemberg, Germany, a region which has often been cited in the industrial district literature as a model of 'flexible specialization' and extensive interfirm networking (Sabel et al. 1989; Pyke 1994). The Reutlingen district has a long history of district-type institutional arrangements for innovation, such as research centres, interest associations, and cooperative banks. Second, this district is centred on an industry, textiles, in which networking seems to be most important. Textile production, especially at the upper end of the fashion scale, is characterized by extreme demand volatility and uncertainty (Mariotti and Cainarca 1986; Richardson 1996). To survive, producers need to experiment continuously with new designs, styles, materials, waste disposal methods, and so forth. Fickle consumer tastes mean that market demand is difficult to predict, but production must take place well in advance of sales. The high degree of specialization in this industry requires extensive and speedy information exchange across all stages in the textile 'pipeline'. The third reason for choosing this district is that it contains sufficient variation, over time, in the key variables of interest, district size and firm mortality. The number of textile firms fluctuated widely during the post-World War II period, ranging from a low of 196 to a high of 406 firms.

Whether this district resembles the Third Italian more than Marshallian type

is an empirical question, which I investigate below. From what is known about performance variations across areas and industries in Baden-Württemberg (Braczyk et al. 1995; Staber 1996), it would be wrong to characterize the Reutlingen district *a priori* as conforming to one or the other model. It seems more appropriate, as Herrigel (1993) has done for industrial production in Baden-Württemberg as a whole, to consider the existence and interpenetration of at least two industrial orders, a small-firm decentralized and a large-firm centralized order. The Reutlingen district includes both specialists and generalists, and interviews (see below) with the owners and managers of 8 textile firms indicate fairly extensive, albeit uneven, co-operation.

## Methods

### Data

I used local and national business directories, trade publications, yellow pages, trade association membership listings, newspaper clippings, and various archival materials to compile a list of all textile enterprises based in the Reutlingen district and active after World War II. Because the available information on the business population before World War II is sketchy, I limit the analysis to firms that were founded after 1945. The data search produced a total of 315 enterprises that were founded after World War II and were active for at least one year during the study period, which ends in 1993. An additional 241 firms that were founded before World War II and survived to the study period are included in the measure of district size. Of these firms, 154 (64 percent) were terminated by 1993.

To strengthen the interpretation of formal model estimates, I conducted interviews with a small number of business owners and managers in the district. From the 66 firms that were in operation in 1993 and employed fewer than 20 employees, I selected 10 firms. The managers or owners of 8 firms agreed to be interviewed. Six of these firms were involved in various aspects of textile production (e.g. spinning, knitting, finishing), and two firms produced both textiles and clothing. The respondents were asked about the extent to which they cooperated with other firms in the district, and about the significance they attached to concepts such as trust, risk, legitimacy, and rivalry. The qualitative evidence obtained from these interviews is not necessarily representative of all interfirm relations that exist in this district, and is certainly not conclusive, but is broadly consistent with the quantitative results presented below.

### Variables and Measures

The data sources contain information on various organizational attributes of firms, but, for the models estimated below, I used only those data that were available for all firms. With the exception of workforce size, these

attributes were stable during the period of observation. Only six percent of the firms founded after World War II added or deleted product groups (defined at the four-digit Standard Industrial Classification level) during the study period, which may be viewed as a crude indicator of organizational inertia in this business population.

The dependent variable in this study is organizational mortality. I defined the date of termination as the first year in which the firm was no longer listed in directories. In nearly all cases, this could be verified with information from telephone and address books. When there was a discrepancy between sources (never more than 3 years), I used the mid-point as the year of termination. The data set contains no known mergers. I coded organizational mortality 1 if the firm was terminated before the end of the observation period (1993), and 0 otherwise. Of the firms founded after 1945, 196 firms (62 percent) did not survive to the end of the study period.

The key independent variable of interest is the number of firms in the district. To test Hypotheses 1 and 2, I measured district size in the year of the focal firm's founding and in the year of its termination. To examine the possibility that district size had differential effects on the mortality of specialists and generalists (Hypothesis 4), I created two interaction terms by multiplying the measures of horizontal and vertical specialization with district size at the time of the firm's termination, or 1993 if the firm was alive in that year.

The model includes a number of control variables, to capture variations in the organizational characteristics of firms. *Product specialization* is a binary variable, equal to 1 if a firm was active in a single product group, defined at the four-digit Standard Industrial Classification level (e.g. men's neckties, children's underwear), and 0 otherwise. *Phase specialization* is also a binary variable, coded 1 if a firm was engaged in only one stage in the chain of production (e.g. spinning, weaving, knitting), and 0 otherwise. The simple correlation between both dimensions of specialization is relatively weak (0.23,  $p < .01$ ) in this district. Available data also permit controls for legal form and export orientation. *Incorporation* is a binary variable, coded 1 for all forms of incorporation (e.g. limited liability, joint stock ownership), and 0 otherwise. *Export orientation* distinguishes firms that sold in foreign markets (coded 1) and those which did not export (coded 0).

In estimates of mortality rates, it is also important to control for variations in environmental conditions. Similar to the 'imprinting' effect of district size at the time of founding (Hypothesis 1), one would expect that firms founded in times of environmental resource scarcity are disadvantaged compared to firms established under munificent conditions, and that these disadvantages persist over time. Under conditions of resource scarcity, it is difficult to develop organizational routines, become an accepted member of existing networks, or build new networks. I distinguish three periods in the development of the Reutlingen textile industry after World War II, each corresponding to a particular level of resource scarcity (Reese 1968; Steiger 1978; GTB 1995). The industry flourished until the late 1950s as part of Germany's general economic reconstruction, and it dominated the

Reutlingen economy both in terms of employment and number of enterprises. The industry began to stagnate in 1960, and by the late 1970s firms faced increasingly intense competition from low-cost producers in other countries, mirroring developments in the Baden-Württemberg textile industry as a whole. Although the size of the business population was similar during the early 1950s and early 1980s, economic conditions were dramatically different. I coded *period* effects as dummy variables to distinguish between firms founded between 1946 and 1959 (the omitted reference category), 1960 and 1979, and from 1980 onwards.

### Estimation

I estimate hazard functions to analyze the effect of variations in business population size on firm mortality (Allison 1984). Such methods estimate a probability process, using information on the number and timing of events, in this case the termination of a firm in a particular time interval (defined as year) during the period of observation, from 1946 to 1993. Because I am not interested in the exact timing of termination, I specify the hazard model as a partial likelihood (Cox 1972). This approach models the influence of explanatory variables on the hazard of termination without specifying a parametric form for the precise time to termination. Instead, it rank orders firms in terms of the sequence of terminations and maximizes the partial likelihood that the  $i$ th firm will terminate, conditional on the characteristics of the other firms at risk at the time of termination. The hazard is defined as the probability that a firm will terminate, conditional on no previous termination. The proportional hazards model is specified as:

$$h(X) = h_0 e^{bX}, \quad (1)$$

where  $b$  is a set of regression-like coefficients indicating the effects of the independent variables in shifting, upward or downward, a baseline hazard function,  $h_0$ , associated with a baseline group of firms with characteristics taking a value of zero. The odds coefficients  $e^{bX}$  show the proportionate increase in the hazard that occurs as a result of firms having a given non-zero vector of independent variables. An odds coefficient greater (less) than unity for a given variable indicates that firms with this characteristic are more (less) likely to experience termination and to do so more (less) rapidly after founding, compared to the baseline group of firms.

Partial likelihood has been found to provide reasonable and robust estimates, as long as the number of censored cases (firms surviving beyond the end of the observation period) is reasonably large and the number of ties (in the rank ordering of terminations) compared to those at risk is not too high (Allison 1984). This data set satisfies both criteria.

## Empirical Results

The analysis proceeds in two steps. First, I compute nonparametric, bivariate life-table estimates of the survivor function, showing the mean survival time (i.e. the average age to which the firms with this characteristic survived) for the categories of each covariate (Table 1). In a second step, I perform multivariate proportional hazard analyses on the data (Table 2).

The estimates shown in Table 1 suggest that firms performed better in times when the district included fewer firms. Evaluated at the mean of district size at the time of founding, firms which were born into a population of fewer than 332 businesses could expect to live to an average age of 41 years, compared to an age of 33 years for firms born into a population of more than 332 businesses. The difference in survival time is only three years when district size is measured at the time firms terminated. Firms founded during the district's growth phase, immediately after World War II, outlived firms founded in more recent years. Integrated firms had a survival advantage over specialists. There is also some indication that incorporation and international market orientation enhanced survival chances. The estimated mean survival times are significantly ( $p < .05$ ) different on all variables shown in Table 1.

Table 1  
Mean Survival  
Time Estimates of  
Risk Factors

Variable	No. of Cases	Mean Survival Time (in yrs)
<b>All Firms</b>	315	37
<b>Business Population Size</b>		
At time of founding		
< 332	141	41
> 332	174	33
At time of termination		
< 269	178	38
> 269	137	35
<b>Founding Period</b>		
1946–1959	175	41
1960–1979	103	26
1980–1992	37	12
<b>Organizational Attributes</b>		
Product specialization		
Generalist	222	39
Specialist	93	31
Phase specialization		
Integrated	63	39
Disintegrated	252	36
Legal form		
Single proprietorship	207	35
Incorporated	108	42
Export orientation		
Not exporting	236	35
Exporting	79	41

All differences are significant at  $p < .05$

Table 2 reports the estimates of multivariate model specifications. The baseline specification against which proportional effects are evaluated includes firms that are horizontally and vertically integrated, not incorporated, not exporting, and were founded between 1946 and 1959. In model 1, the estimated effect of district size both at the time of firms' founding and termination is in the predicted direction (Hypotheses 1 and 2), suggesting that the presence of a large number of enterprises increased the likelihood of firm mortality. The effects are large and statistically significant. Using estimates in model 1, a one-standard-deviation increase in the number of firms at the time of the focal firm's founding raises the probability of termination more than eight times ( $\exp[52.8 \times .04] = 8.26$ ). A one-standard-deviation increase in district size at the time of termination raises the risk of failure by more than half ( $\exp[75.4 \times .007] = 1.70$ ). I also tested a curvilinear specification of district size, consistent with the density-dependence formulation in ecological research on population growth (Hannan and Freeman 1989; Hannan and Carroll 1992). The results show that the effect of district size in this organizational population is positive and linear, confirming the results reported in Table 2.

Table 2  
Proportional  
Hazard Log-Odds  
Estimates of  
Mortality Rates  
(st. errors in  
parentheses)

Independent variable	(1)	(2)	(3)
<b>District Size</b>			
No. firms at founding	.040*** (.005)	.039*** (.004)	.040*** (.004)
No. firms at termination	.007*** (.001)	.005*** (.001)	.013*** (.003)
Specialist $\times$ No. firms <sup>+</sup>	—	—	-.004 (.003)
Disintegrated $\times$ No firms <sup>+</sup>	—	—	-.008** (.003)
<b>Founding Period</b>			
1960–1979	2.978*** (.608)	2.940*** (.607)	2.975*** (.607)
1980–1994	10.112*** (.879)	9.992*** (.878)	10.086*** (.881)
<b>Organizational Attributes</b>			
Specialist	—	.281* (.163)	1.379** (.693)
Disintegrated	—	.032 (.250)	1.903** (.902)
Incorporated	—	-.394* (.215)	-.418** (.216)
Export orientation	—	-.091 (.111)	-.096 (.112)
Model $\chi^2$	413.5***	426.0***	428.2***
Degrees of freedom	4	8	10

<sup>+</sup> No. firms measured in the year of the focal firm's termination.

\*  $p < .10$   
\*\*  $p < .05$   
\*\*\*  $p < .01$

The constraining effect of numerous firms in the district is also evident in the comments of respondents who were interviewed for this study. All but one of the 8 respondents considered the presence of many firms an impediment to effective networking. Some managers spoke about the difficulty of not knowing whom to 'trust', others expressed concern over 'commitments' not being 'readily apparent', especially when market conditions are volatile and 'there are many competitors'. As one manager put it, 'When there are so many firms in the industry, how can you expect to get to know one another and decide which one is worth having as a partner?' Another owner said that 'I'm constantly asking myself if I shouldn't switch to another supplier [of fabric]. But I don't know them all, so I'll probably stick to [name of firm] for a while longer, even though I may get a better deal elsewhere.' Another respondent addressed the same problem, but suggested that 'the number of businesses we had to deal with was only one concern; what made things even more difficult was the high turnover of firms in the industry. How do you build a relationship with someone when you don't know if the firm will still be around next year?'

The owners of half the firms also discussed some implications of the recent introduction of 'never-out-of-stock' (NOS) systems in textile retailing. NOS methods require extensive and speedy information exchange across all stages in the textile 'pipeline', to minimize the risk of over- or understocking. The costs of fine-tuning the necessary inventory control and inter-firm coordination are prohibitive for many small firms, and even large companies are concerned about monitoring what other firms are doing. Firms operating in fashion-sensitive markets will generally not have more than one third of their sales volume covered by NOS systems, because of their fear of not being able to adjust quickly enough. While 'electronic alliances' help to minimize these risks, they do not eliminate the need for trust. Some respondents noted the importance of 'honest partnership' in such alliances, and expressed the fear of becoming overly 'dependent' on the few firms with which they have close relations. The dilemma, they suggested, is that, while having a small number of partners facilitates communication, it also increases dependence and raises the potential for opportunistic behaviour. Large networks help to diffuse costs and socialize risk, but they also imply greater problems of coordination (Jones et al. 1997).

The quantitative data also support Hypothesis 3, which derives from the argument that cooperative skills can be acquired through repeated exchange. The estimated coefficient of district size at the time of termination is considerably smaller than the effect at the time the firm was founded. Interpreted in terms of the influence of a one-standard-deviation increase in district size (model 1), the estimated effect at the time of founding is about five times as large as the effect at the time of termination ( $8.26/1.70 = 4.86$ ). This finding is supported by the comments of some of the interviewees. One owner noted that 'it's always hard to know who the best suppliers might be, and that was our biggest problem when we started out. We didn't realize that our choice was not the best one until several years

later.' Another respondent said that 'I remember how difficult it was to get some of the retailers we wanted to work with to understand that we were looking for stable relations. It took years before they realized this, but now they seem committed to us and won't take their business elsewhere, unless we make serious mistakes.' Other respondents emphasized the time it took them to learn co-operation, noting that 'you don't commit yourself overnight', 'reputation was not easy to achieve', or that 'trust doesn't come easily'.

Model 1 includes controls for the founding period. Firms founded more recently, under conditions of greater environmental resource scarcity, were more likely to terminate than firms founded in earlier, more munificent times. All three of the interviewees whose firms were formed during the 1950s remembered the immediate post-war period as one that was 'full of opportunities' and had 'plenty of growth potential', compared to the 'dog-eat-dog conditions' in the industry in more recent years. One manager said that 'for many years we could produce without worrying much about customer needs. Now, competition has become so murderous that either you cooperate with your rivals or you stick it out on your own. But co-operation is difficult when everyone is afraid of giving up precious know-how, and going it alone is just as risky.' Similar assessments can be found in published interviews in the industry's leading trade magazine *Textil-Wirtschaft* with business managers, bankruptcy lawyers, and association officials who express concern about what they see as a general lack of trust in the industry.

Controls for differences in the organizational attributes of firms are introduced in model 2. The estimates suggest that of the two dimensions of specialization only phase specialization had a significant effect on mortality. Compared to generalists, specialists had a 32 percent ( $\exp[.281] - 1$ ) higher probability of failure. Incorporation raised survival chances by 33 percent ( $1 - \exp[-.394]$ ), while involvement in export markets had no consequences for organizational survival. Controlling for all organizational characteristics significantly improved the fit of the model ( $\Delta\chi^2$  model 1 vs. 2 = 12.5, 4 d.f.,  $p < .05$ ), without changing the estimates of the other covariates.

The test of Hypothesis 4, which predicts that the constraining effects of large district size are greatest for specialized firms, involves interaction terms for specialization and district size. The estimated coefficients of both interaction terms in model 3 are negative, suggesting that product and phase specialization conferred survival advantages when numerous firms existed in the district. However, one consequence of adding the interaction terms is that the estimated main effects of product and phase specialization are increased and reach a higher level of statistical significance, compared to the estimates in model 2. Their inflated standard errors suggest multicollinearity as an explanation, which results from including main and interaction effects in the same model. In a collinear environment, coefficients are highly unstable and their statistical significance cannot be assessed directly. The conventional procedure for testing the significance of coefficients in this case is to compare



nested regression models in terms of  $\chi^2$  differences (Kmenta 1971). The comparison of chi-square values shows that adding the interaction terms does not improve the model fit ( $\Delta\chi^2$  model 2 vs. 3 = 2.2, 2 d.f., n.s.). Hypothesis 4 is therefore rejected.

## Discussion and Conclusion

Questions of network integration and change in industrial districts have not received much empirical attention, perhaps because they involve variables that are difficult to measure, such as sense of belonging, quality of information flows, and learning capacity. In some cases, researchers have simply accepted the assertion that the district enterprise 'finds itself dependent on neighbouring firms with complementary specializations; and because the latter can never tell when the situation may be reversed, the help is forthcoming' (Hansen 1992: 99). Alternatively, researchers have invoked sociological concepts such as 'social embeddedness' and 'institutional thickness' to propose that non-market social relations give rise to co-operation and local integration (You and Wilkinson 1994). Such assertions seem difficult to maintain *prima facie*, because they assume a certain automaticity in district integration and downplay problems of sustaining co-operation in a dynamic context.

Measurement problems mean that theoretical predictions concerning the role of social embeddedness in sustaining co-operation and inducing innovation are not easily refutable. No study has been able to demonstrate convincingly that it is the local culture rather than, say, the state of the general economy which sustains co-operation and, by deduction, enhances the viability of individual firms. In addition, no previous study has been able to show, or has even attempted to show, that the organizational attributes of district firms (such as specialization) and the competitive structure of the district (such as the number of firms) can confound cooperative and competitive processes. In the present study, I argued that the number of actors in the district is an important factor in coordinating exchange (Jones et al. 1997). I drew on neo-institutional and ecological theory to interpret the effect of numbers and to postulate distinct change processes. The empirical results indicate that the survival chances of firms in the Reutlingen textile district were constrained by the presence of numerous enterprises. The qualitative interview data suggest that district size contributed to coordination difficulties.

A few words of caution are in order. In the absence of direct data on network governance and change, I treated district size as a surrogate variable. The analysis of the 'number problem' tells us little about the effects of district size *per se*. The number of firms *per se* does not limit co-operation. The causal variables, with which district size is correlated, include factors such as those identified in neo-institutional and ecological theory: trust, reciprocity, legitimacy, and resource competition. Similar to research on the implications of numbers for network governance within organizations (Burt 1997), the use of district size as a proxy may be considered reasonable and

necessary where the unavailability of data prevent the direct measurement of actual exchange relations. This strategy raises several issues for further research.

First, additional information is needed to understand *why* the presence of numerous firms had constraining consequences for organizational viability in this district. For example, has the local institutional fabric collapsed under the strain of numerous firms competing for fewer resources, or has the district's progressive integration into the global economy simply altered the basis of co-operation and initiated the search for new forms of co-operation? We don't know if firms interpret the presence of numerous enterprises similarly, and if they look towards others as models because they seem successful, or as potential partners because they hold vital resources. When data *are* available, permitting a more direct investigation of the ways in which firms manage their interdependencies in expanding or declining districts, they ought to be specified as much as possible.

Second, the ecological *structure* of the district network can complicate the management of interdependencies. Network structures — the density and diversity of ties and the position of actors within the network — affect the direction and speed with which new solutions are sought and adopted. Learning happens more quickly in dense networks than in thin ones, and solutions discovered in the centre will spread more quickly than those found at the periphery (Burt 1997). Dense districts dominated by hub firms may learn more quickly if the solutions are sufficiently convincing to the most influential firms, but dense networks may not be the most adaptive ones under volatile circumstances. Glasmeier's (1991) study of the Swiss watch-making industry and Grabher's (1993) study of the steel industry in Germany's Ruhr region found that tight and homogeneous networks constrained the discovery of new opportunities and contributed to the decline of firms. Too much integration can lead to ignorance about potentially useful information in other parts of the industry, impede innovation, and cause firms to fall into a 'competency trap' (Levitt and March 1988). As firms accumulate experience with co-operation, they may learn to ignore potentially superior routines. Firms in densely connected districts may learn quickly from others, but may not take the time to search for potentially better solutions in less well connected parts of the system.

This means that small district networks are not necessarily more flexible than large networks, depending on their structure. In large districts there is a greater probability that firms will deviate from the prevailing institutional rules, to the extent that firms in large districts are less well connected. Uzzi (1996) found in his study of apparel firms in New York City that business failure rates were highest when networks included mostly embedded ties or mostly arm's length ties. He proposed that the optimal network structure contains a mix of weak-tie arm's length and strong-tie embedded connections, similar to the argument that successful districts contain a balance of co-operation and competition (You and Wilkinson 1994). Further research should explore the conditions under which particular network structures are optimal.

Thus, a third area for further research concerns the need to study district networks comparatively. Many studies of industrial districts have emphasized the place specificity of local development, describing them as 'unique social artefacts which are the product of a singular, and therefore unrepeatable, history' (Zeitlin 1992: 279), and which 'defy easy replication by policy planners' (Lazerson 1995: 56). Business-society relations in Baden-Württemberg are in some ways distinct from those in other regions in Germany (Schmitz 1992; Medick 1993). Even within this relatively small region, there are significant local variations in industry structure and performance, stemming from a long history of political fragmentation and industrial diversity (Megerle 1982; Staber 1996). Even if institutional arrangements were identical across areas, there is the possibility that variations in local cultures will lead to a 'very different "social use" of institutions, evoke very different strategies and constitute politics in very different ways' (Kristensen 1994: 194). Governance strategies that are feasible in one local context may be untenable in others, independent of the number of firms involved. Place-specific factors create problems for interpretation because they cannot easily be incorporated into a general model of network relations. Nevertheless, efforts should be made, as much as possible, to define the relevant parameters of the local setting and to adopt consistent measures of variables. Important criteria for comparison would include differences in the developmental stage of districts, market uncertainty, industrial diversity, and political infrastructure. The research goal should be to develop explanations that are not limited to particular spatio-temporally defined units.

Despite data limitations, it is possible to argue from the present findings that the Reutlingen textile district resembles the Marshallian more than Third Italian type district, as defined above. Most of the organizational change over the last few decades has been through the differential selection of firms, rather than the transformation of existing firms. The district as a whole has been declining, because few of the newly established firms have introduced new competencies that are better adapted to current market conditions. Employment levels of most enterprises, regardless of size and degree of specialization, have declined dramatically over the last two decades, and many of the most recently founded enterprises are micro-businesses surviving on comparatively low wages and seasonal contracts. The textile industry in Baden-Württemberg as a whole has been subject to growing international competition from increasingly sophisticated low-cost producers in Southeast Asia and East-Central Europe (GTB 1995). Businesses complain about 'social dumping' in the textile trade, rigid collective bargaining structures, and increasingly stringent pollution control regulations requiring expensive technological upgrading. In these circumstances, high business failure rates are best seen as a sign of decline, not renewal.

Recent studies of Italian textile districts have led to similar conclusions. Business failure rates have increased, employment levels have dropped, competition has intensified, and co-operation has weakened (Dunford et al. 1993; Bigarelli and Crestanello 1994). The most vulnerable firms tend to be

small and highly specialized, as in the Reutlingen district. As Signorini (1994: 376) notes, ‘in districts like Prato, very small firms act as a sort of buffer in lean times, whereas larger firms constitute a sort of hard core that can survive even rather long recessions, perhaps at the expense of other, weaker firms.’ Many of these firms see a need for more financial centralization and hierarchical integration, rather than greater specialization and disintegration (Dunford et al. 1993). Nevertheless, these developments do not imply an inexorable trend toward Marshallian-type agglomerations, driven mainly by external selection forces. Nor do they indicate, more generally, a collapse of localized production systems in an increasingly global market environment. There may always be room for locally integrated districts, with a social fabric strong enough to at least partially withstand the onslaught of global forces (Amin and Thrift 1992; Scott 1996). Industrial development, and its relationship with territorial development, proceeds along multiple paths, not always by design, and often with unintended consequences.

In conclusion, research on interfirm networks in industrial districts should recognize explicitly the industry-structural and socio-political conditions under which they evolve, keeping in mind variations in the micro-foundations of network relations. History matters because the context changes over time and because each network may have its own time-dependent path of development. Analyzing the causes of changing district structures requires understanding the processes that affect variations in the number of firms as well as changes in business strategies and structures. Further research will need to specify more clearly the mechanisms and processes by which changes in the number of district enterprises affect co-operation and competition, and to identify the empirical implications of different causal mechanisms. Such efforts would give the concept of network integration operational meaning and show why and how the balance of co-operation and competition is dynamic. Such studies, if buttressed by internally consistent and parsimonious theoretical formulations, would then also lead to clearer policy and managerial implications with respect to promoting and governing interfirm linkages.

Note

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<b>References</b>	Aldrich, Howard, Ben Rosen, and William Woodward 1987 ‘The impact of social networks on business foundings and profit’. Paper presented at the Babson Entrepreneurship Conference, Malibu.	Aldrich, Howard, Udo Staber, Catherine Zimmer, and John Beggs 1990 ‘Minimalism and organizational mortality: Patterns of disbanding among U.S. trade associations, 1900–1983’ in <i>Organizational evolution</i> . J. Singh (ed.), 21–52. Newbury Park: Sage.
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- Allison, Paul  
1984 *Event history analysis*. Beverly Hills: Sage.
- Amin, Ash, and Kevin Robins  
1990 'The re-emergence of regional economies? The mythical geography of flexible accumulation'. *Environment and Planning. D: Society and Space* 8: 7-34.
- Amin, Ash and Nigel Thrift  
1992 'Neo-Marshallian nodes in global networks'. *International Journal of Urban and Regional Research* 16: 571-587.
- Baum, Joel, and Christine Oliver  
1992 'Institutional embeddedness and the dynamics of organizational populations'. *American Sociological Review* 57: 540-559.
- Bianchi, Giuliano  
1994 'Requiem for the Third Italy'? 34th European Regional Science Congress, Groningen.
- Bigarelli, D., and P. Crestanello  
1994 'An analysis of the changes in the knitwear/clothing district of Carpi during the 1980s'. *Entrepreneurship and Regional Development* 6: 127-144.
- Boeker, Warren  
1989 'Strategic change: The effects of founding and history'. *Academy of Management Journal* 32: 499-515.
- Braczyk, Hans-Joachim, Gerd Schienstock, and Bernd Steffensen  
1995 'The region of Baden-Württemberg: A post-Fordist success story'? In *Industrial transformation in Europe*. E. Dittrich, G. Schmidt, and R. Whitley (eds.), 203-233. London: Sage.
- Bruderer, Erhard, and Jitendra Singh  
1996 'Organizational evolution, learning, and selection: A genetic-algorithm-based model'. *Academy of Management Journal* 39: 1322-1349.
- Brusco, Sebastiano  
1982 'The Emilian model: Productive decentralisation and social integration'. *Cambridge Journal of Economics* 6: 167-184.
- Bull, Anna, Martyn Pitt, and Joseph Szarka  
1991 'Small firms and industrial districts, structural explanations of small firm viability in three countries'. *Entrepreneurship and Regional Development* 3: 83-99.
- Burt, Ronald  
1997 'The contingent value of social capital'. *Administrative Science Quarterly* 42: 339-365.
- Butler, John, and Gary Hansen  
1991 'Network evolution, entrepreneurial success, and regional development'. *Entrepreneurship and Regional Development* 3: 1-16.
- Carroll, Glenn, and Michael Hannan  
1989 'Density delay in the evolution of organizational populations: A model and five empirical tests'. *Administrative Science Quarterly* 34: 411-430.
- Cox, D.R.  
1972 'Regression models and life tables'. *Journal of the Royal Statistical Society B34*: 187-220.
- Dei Ottati, Gabi  
1994a 'Trust, interlinking transactions and credit in the industrial district'. *Cambridge Journal of Economics* 18: 529-546.
- Dei Ottati, Gabi  
1994b 'Co-operation and competition in the industrial district as an organization model'. *European Planning Studies* 2: 463-483.
- DiMaggio, Paul, and Walter Powell  
1991 'Introduction' in *The new institutionalism in organizational analysis*. W. Powell, and P. DiMaggio (eds.), 1-38. Chicago: Chicago University Press.
- Dunford, M., A. Fernandes, B. Musyck, B. Sadowski, M. Cho, and S. Tsenkova  
1993 'The organization of production and territory: Small firm systems'. *International Journal of Urban and Regional Research* 17: 132-136.
- Fombrun, Charles  
1988 'Crafting an institutionally informed ecology of organizations' in *Ecological models of organizations*. G. Carroll (ed.), 223-239. Cambridge: Ballinger.

- Glasmeier, Amy  
1991 'Technological discontinuities and flexible production: The case of Switzerland and the world watch industry'. *Research Policy* 20: 469–485.
- Grabher, Gernot  
1993 'The weakness of strong ties: A network theory revisited' in *The embedded firm*. G. Grabher (ed.), 255–277. London: Routledge.
- GTB (Gewerkschaft Textil-Bekleidung).  
1995 *Baden-Württemberg: Standort für die Textil- und Bekleidungsindustrie*. Stuttgart.
- Hannan, Michael, and Glenn Carroll  
1992 *Dynamics of organizational populations: density, legitimation and competition*. New York: Oxford University Press.
- Hannan, Michael, and John Freeman  
1984 'Structural inertia and organizational change'. *American Sociological Review* 49: 149–164.
- Hannan, Michael, and John Freeman  
1989 *Organizational ecology*. Cambridge: Harvard University Press.
- Hansen, Niles  
1991 'Factories in Danish fields: How high-wage, Flexible production has succeeded in peripheral Jutland'. *International Regional Science Review* 14: 109–132.
- Hansen, Niles  
1992 'Competition, trust, and reciprocity in the development of innovative regional milieux'. *Papers in Regional Science* 71: 95–105.
- Hanssen-Bauer, Jon, and Charles Snow  
1996 'Responding to hypercompetition: The structure and processes of a regional learning network organization'. *Organization Science* 7: 413–427.
- Hardill, Irene, Denise Fletcher, and Solange Montagne-Villette  
1995 'Small firms', "distinctive capabilities" and the socio-economic milieu'. *Entrepreneurship and Regional Development* 7: 167–186.
- Harrison, Bennett  
1992 'Industrial districts: Old wine in new bottles'? *Regional Studies* 26: 469–483.
- Harrison, Bennett  
1994 *Lean and mean*. New York: Basic Books.
- Herrigel, Gary  
1993 'Power and the redefinition of industrial districts: The case of Baden-Württemberg' in *The embedded firm*. G. Grabher (ed.), 227–251. London: Routledge.
- Illeris, Sven  
1992 'The Herning–Ikast textile industry: An industrial district in West Jutland'. *Entrepreneurship and Regional Development* 4: 73–84.
- Jones, Candace, William Hesterly, and Stephen Borgatti  
1997 'A general theory of network governance: Exchange conditions and social mechanisms'. *Academy of Management Review* 22: 911–945.
- Kmenta, Jan  
1971 *Elements of econometrics*. New York: Macmillan.
- Kristensen, Peter  
1994 'Spectator communities and entrepreneurial districts'. *Entrepreneurship and Regional Development* 6: 177–198.
- Lazerson, Mark  
1988 'Organizational growth of small firms: An outcome of markets and hierarchies?' *American Sociological Review* 53: 330–342.
- Lazerson, Mark  
1995 'A new Phoenix? Modern putting-out in the Modena knitwear industry'. *Administrative Science Quarterly* 40: 34–59.
- Levinthal, Daniel  
1991 'Organizational adaptation and environmental selection — Interrelated processes of change'. *Organization Science* 2: 140–145.
- Levitt, Barbara, and James March  
1988 'Organizational learning'. *Annual Review of Sociology* 14: 319–340.

- Mariotti, Sergio, and Giancarlo Cainarca  
1986 'The evolution of transaction governance in the textile-clothing Industry'. *Journal of Economic Behavior and Organization* 7: 351-374.
- Marshall, Alfred  
1947 *Principles of economics*. London: Macmillan.
- Medick, Hans  
1993 'The unique industrial development of Württemberg: A review essay'. *Business History Review* 67: 439-447.
- Megerle, Klaus  
1982 *Württemberg im Industrialisierungsprozess Deutschlands*. Stuttgart: Klett-Cotta.
- Mezias, Stephen, and Theresa Lant  
1994 'Mimetic learning and the evolution of organizational populations' in *Evolutionary dynamics of organizations*. J. Baum and J. Singh (eds.), 179-198. New York: Oxford University Press.
- Miner, Anne, Terry Amburgey, and Timothy Stearns  
1990 'Interorganizational linkages and population dynamics: Buffering and transformational shields'. *Administrative Science Quarterly* 35: 689-713.
- Parkhe, Arvind  
1993 'Strategic alliance structuring: A game theoretic and transaction cost examination of interfirm co-operation'. *Academy of Management Journal* 36: 794-829.
- Piore, Michael, and Charles Sabel  
1983 'Italian small business development: Lessons for U.S. industrial policy' in *American industry in international competition*. J. Zysman and L. Tyson (eds.), 391-421. Ithaca: Cornell University Press.
- Podolny, Joel  
1994 'Market uncertainty and the social character of economic exchange'. *Administrative Science Quarterly* 39: 458-483.
- Podolny, Joel, and James Baron  
1997 'Resources and relationships: Social networks and mobility in the workplace'. *American Sociological Review* 62: 673-693.
- Porac, Joseph, Thomas, Howard, Fiona Wilson, Douglas Paton, and Alaina Kanfer  
1995 'Rivalry and the industry model of Scottish knitwear producers'. *Administrative Science Quarterly* 40: 203-227.
- Porter, Michael  
1990 *The competitive advantage of nations*. New York: Free Press.
- Powell, Walter, and Peter Brantley  
1992 'Competitive co-operation in biotechnology: Learning through networks' in *Networks and organizations*. N. Nohria and R. Eccles (eds.), 366-394. Cambridge: Harvard University Press.
- Pyke, Frank, G. Becattini, and Werner Sengenberger, editors  
1990 *Industrial districts and inter-firm co-operation in Italy*. Geneva: ILO.
- Pyke, Frank  
1994 *Small firms, technical services and inter-firm co-operation*. Geneva: International Institute for Labour Studies.
- Reese, Hans  
1968 'Die jüngere Entwicklung der Industrie in Reutlingen'. M.A. Thesis, University of Reutlingen.
- Richardson, James  
1996 'Vertical integration and rapid response in fashion apparel'. *Organization Science* 7: 400-412.
- Sabel, Charles, Gary Herrigel, Richard Deeg, and Richard Kazis  
1989 'Economic prosperities compared: Baden-Württemberg and Massachusetts in the 1980s'. *Economy and Society* 18: 374-405.
- Schmitz, Hubert  
1992 'Industrial districts: Model and reality in Baden-Württemberg' in *Industrial districts and local economic regeneration*. F. Pyke and W. Sengenberger (eds.), 87-121. Geneva: ILO.

- Scott, W. Richard  
1995 *Institutions and organizations*. Thousand Oaks: Sage.
- Scott, Allen  
1996 'The craft, fashion, and cultural-products industries of Los Angeles: Competitive dynamics and policy dilemmas in a multisectoral image-producing complex'. *Annals of the Association of American Geographers* 86: 306–323.
- Signorini, L. Frederico  
1994 'The price of Prato, or measuring the industrial district effect'. *Papers in Regional Science* 73: 369–392.
- Staber, Udo  
1996 'Accounting for variations in the performance of industrial districts: The case of Baden-Württemberg'. *International Journal of Urban and Regional Research* 20: 299–316.
- Steiger, Helmut  
1978 'Regionale und strukturelle Aspekte der Beschäftigtenentwicklung in der Industrie'. *Baden-Württemberg in Wort und Zahl* 26: 274–280.
- Stinchcombe, Arthur  
1965 'Social structures and organizations' in *Handbook of organizations*. J. March (ed.), 142–193. Chicago: Rand McNally.
- Storper, Michael, and Susan Christopherson  
1987 'Flexible specialization and regional industrial agglomerations: The case of the U.S. motion picture industry'. *Annals of the Association of American Geographers* 77: 104–117.
- Swaminathan, Anand  
1996 'Environmental conditions at founding and organizational mortality: A trial-by-fire model'. *Academy of Management Journal* 39: 1350–1377.
- Uzzi, Brian  
1996 'The sources and consequences of embeddedness for the economic performance of organizations: The network effect'. *American Sociological Review* 61: 674–698.
- You, Jong-Il, and Frank Wilkinson  
1994 'Competition and co-operation: Toward understanding industrial districts'. *Review of Political Economy* 6: 259–278.
- Zeitlin, Jonathan  
1992 'Industrial districts and local economic regeneration: Overview and comment' in *Industrial districts and local economic regeneration*. F. Pyke and W. Sengenberger (eds.), 279–294. Geneva: ILO.