**discussion paper**

WISSENSCHAFTSZENTRUM BERLIN
FÜR SOZIALFORSCHUNG

SOCIAL SCIENCE RESEARCH
CENTER BERLIN

FS I 96 - 322

# The Development of Decentralized Supplier Networks in East Germany: A Challenge to the German Model of Industrial Organization

Steven Casper

October 1996
ISSN Nr. 1011-9523

**Research Area:**
**Labour Market and Employment**

**Forschungsschwerpunkt:**
**Arbeitsmarkt und Beschäftigung**

**Research Unit:**
**Economic Change and Employment**

**Abteilung:**
**Wirtschaftswandel und Beschäftigung**

**ZITIERWEISE / CITATION**

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**Reichpietschufer 50**
D-10785 Berlin

## Abstract

The paper examines the relationship between supplier network organization and regional economic development. A distinctive feature of the German economy is the existence of a large and productive base of small and medium companies, commonly called the *Mittelstand.* Chambers of Commerce, trade associations, local research institutes and other para-public institutions provide a public infrastructure helping groups of *Mittelstand* companies develop research and development, quality control, training and other important competencies that they are too small to invest in individually. The paper argues that sophisticated firms must also engage these institutions if they are to function. Case studies of the newest East German car production networks show that final assemblers are creating supplier chains with minimal technical collaboration with local suppliers and the delegation rather than sharing of contracting risks. As a result, few sophisticated companies are engaging local para-public institutions, with negative consequences for the development of local *Mittelstand* companies in the two regions.

## Zusammenfassung

In dem Papier werden die Beziehungen zwischen den organisatorischen Strukturen der Zulieferer-Netzwerke und der regionalen Wirtschaftsentwicklung untersucht. Ein typisches Element der deutschen Volkswirtschaft ist die Existenz einer weitgefächerten und produktiven Basis kleiner und mittlerer Unternehmen, gemeinhin als *Mittelstand* bezeichnet. Industrie- und Handelskammern, Wirtschaftsverbände, lokale Forschungsinstitute und andere para-staatliche Institutionen bilden eine öffentliche Infrastruktur, die den mittelständischen Unternehmen hilft, Forschung und Entwicklung, Qualitätskontrollen sowie Ausbildungskapazitäten aufzubauen und andere wichtige Kompetenzen zu entwickeln, in die zu investieren sie alleine zu klein wären.

In dem Diskussionspapier wird die Meinung vertreten, daß „aufgeweckte“ Unternehmen sich aber auch dieser Institutionen bedienen müssen, sollen sie funktionieren. Fallstudien der erst kürzlich aufgebauten Produktionsnetzwerke von Autoherstellern in Ostdeutschland zeigen, daß die Endhersteller Zuliefererketten aufbauen, die nur in geringem Umfang mit den lokalen Zuliefereren technisch kooperieren. Außerdem versuchen die Endhersteller, Vertragsrisiken abzuwälzen statt sie gemeinsam mit den Zulieferern zu übernehmen. Als Ergebnis kann festgestellt werden, daß nur einige „clevere“ Unternehmen diese lokalen und regionalen para-staatlichen Institutionen nutzen. Dies hat negative Konsequenzen für die Entwicklung der lokalen und regionalen mittelständischen Unternehmen in den beiden untersuchten Regionen Sachsen und Thüringen.

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## 1. Introduction

Between 1989 and 1990 Volkswagen and Opel, two of Germany's largest car manufacturers, set up shop in the former East Germany. [1] In both cases, fully integrated East German car manufacturing conglomerates, or *Kombinate*, were broken into parts and privatized to VW, Opel, and numerous supplier companies. Volkswagen took over the Sachsen Ring conglomerate located in Zwickau, Saxony, while Opel took over the Wartburg conglomerate in Eisenach, Thuringen. Other parts of each plant were privatized to supplier companies. Most of the more sophisticated component products, such as seats or axles, became subsidiaries of West German or in some cases American suppliers. But dozens of independently owned firms were also founded by West German entrepreneurs and managers of the old East German plants. Within a year, both VW and Opel had set up fully operational car assembly operations.

By late 1995 the tumultuous process of rationalizing the organization of work and carrying out massive new capital investments within both regions had largely been accomplished. Employment has stabilized and most plant upgrading investments are complete. Both Opel and VW are producing successful lower market segment models at very high levels of quality. Since both firms rely on supplied parts for some 70% of value added, this high level of quality reflects not just two isolated plants, but the creation of a broader network of high quality parts suppliers.

Both Opel and Volkswagen are using new decentralized production concepts in East Germany. Decentralized production entails the construction of supplier networks in which final assemblers outsource the manufacture and design of entire components to a new class of companies called "system suppliers." In addition, tighter information links facilitate the ordering of a variety of component configurations in a very short time period. These orders are then synchronized with final assembly and delivered by way of "just-in-time" (JIT) logistical systems that supply parts directly to the final assembler's production lines.

This paper examines patterns of supplier network organization adopted in Eisenach and Zwickau by Opel and VW. From this analysis, the paper identifies several challenges presented by the new forms of supplier network

[1] I am grateful to Bob Hancké, Isabela Mares, David Soskice, and Sigurt Vitols for helpful suggestions. I also thank the U.S. National Science Foundation for financial support and the Wissenschaftszentrum Berlin for institutional support. This paper is forthcoming in a special issue of the *Journal of Industry Studies* on Modell Deutschland in the 1990s.

organization to the “German model” of economic organization. Compared to the U.S., France or UK, Germany has a large and productive base of small and medium sized, or *Mittelstand* firms (Acs and Audretsch 1993; Vitols 1995). An important part of the German Model is the existence of what Katzenstein (1989) calls “para-public institutions” such as Chambers of Commerce, trade associations, cooperative savings banks, and research institutions. Para-public institutions provide a public infrastructure helping groups of *Mittelstand* companies develop research and development, quality control, training and other important competencies that they are too small to invest in individually.

The literature on decentralized production arrangements has examined in detail one particular constellation of technical arrangements and related governance structures that has been labeled “collaborative manufacturing” (Sabel 1995). This paradigm of industrial organization combines intense and long-term technical collaboration between firms in the production chain with the pooling of most legal and contractual risks through informal governance arrangements. The paper argues that there is a direct link between this paradigm of decentralized production and the success of German para-public institutions in providing resources to *Mittelstand* firms. Some of the most acclaimed aspects of this framework, in particular the system of pooled research and development projects, is predicated upon companies collectively engaging para-public institutions.

Supplier network organization in both Eisenach and Zwickau does not conform to the collaborative manufacturing model. While basic organizational principles underlying the new supplier network concepts have been maintained, the relationships between final assemblers and suppliers within both regions is characterized by a lack of deliberative or cooperative technical relationships between companies, the delegation of most legal and market risks to particular firms through formal legal arrangements, and the immersion of important firms within private corporate networks on the national level rather than within local networks with other firms.

The paper argues that this alternative model of decentralized production creates a series of obstacles for small and medium sized independent firms. Both the Eisenach and Zwickau regional economies are populated by a pool of both independent suppliers and numerous branch plants of sophisticated “full service” supplier companies from West Germany and the United States. Even though the individual plants of the full-service suppliers are very similar to those of the independent firms in Zwickau and Eisenach, the full-service plants benefit from access to valuable technical assistance and financial resources from internal corporate networks that do not exist for the independent firms. Local para-public institutions in Zwickau and Eisenach are not developing important technical competencies needed by small firms largely because “full service” suppliers are not engaging these institutions.

The organization of the paper is as follows. The next section examines the "collaborative manufacturing" paradigm and shows how its principles are ideally suited to the creation of robust para-public institutions within German regional economies. The third section provides a detailed examination of decentralized production as implemented by Opel and Volkswagen in East Germany. Both firms have used an alternative decentralized production paradigm centered around "module production". The fourth section examines in detail the governance structures created by VW and Opel to support long term flexible price clauses and JIT delivery. These governance structures encompass both the organization of technical arrangements developed between Opel and VW and their suppliers but also the strategies used to manage important market and legal risks created by the new supplier network concepts.

The fifth section of the paper examines the challenge to small firms created by these arrangements and argues that local para-public institutions are unlikely to develop the necessary competencies to help them. To exemplify this point, this section examines the introduction of quality management systems, a new firm competency made critical by JIT delivery. Though German para-public institutions have in the past created similar competencies in other areas, supplier network architecture in both Zwickau and Eisenach has so far prevented the necessary coalition of interested firms from emerging. This is followed by a conclusion.

## 2. The collaborative manufacturing paradigm

Car companies across the world are rapidly downsizing through outsourcing the production and design of many critical subassemblies to supplier firms. Through subcontracting the production of seats, brake systems, and a variety of other discrete subassemblies relying on micro-electronic, chemical or other technologies to specialist suppliers, car manufacturers can concentrate on their core competencies of engine design and final assembly. Furthermore, the use of flexible procurement systems and JIT delivery schemes increases product variety, allows the creation of more sophisticated marketing and distribution systems (Asanuma 1993), reduces inventory costs, and improves quality control (Schonberger 1982).

One of the first and most prominent examples of a company creating decentralized production networks is the German high-end car producer BMW (Herrigel and Sabel 1994; Casper 1996). BMW is noted for benefiting from highly collaborative inter-firm relationships. For example, a recent report on Japanese joint product development noted that Toyota, a world-leader in the field, sets up full-scale collaborative engineering teams from the conceptual

stage of product design onwards with only “a handful” of key supplies (Kamath and Liker 1994: 156). BMW’s goal is to conduct full-scale joint product development with suppliers responsible for each of 40 to 50 basic system components or subassemblies it has identified in all models; it has currently developed the organizational infrastructure to do this with about 30 suppliers for each of its three basic model platforms (Meissner et al. 1994: 69; BMW 1992: 11).

Based on case studies of BMW and many other firms in other industries, both in Germany and elsewhere, many scholars have associated decentralized production with the creation of what Charles Sabel calls “collaborative manufacturing.” (Sabel 1995) Volatile world market and accelerated technological change, these authors argue, lessens market power and scale economy advantages held by giant vertically integrated firms. Successful companies today are instead specializing in a limited number of core activities and then creating numerous long-term technical partnerships with other firms. This allows scope economies created through extensive cooperation over product design, quality control, and logistics to be shared across firms in the production network.

Decentralized production creates numerous legal and market risks that final assemblers and suppliers must create governance structures to cope with. Companies using collaborative manufacturing relationships creates incentives to *create governance structures that pool or share risks*. This is sometimes necessary because technical relationships blur traditional boundaries between firms, making it difficult to write legally binding contracts delegating legal risks to one firm or the other. This is clearest in joint product development. In the car industry, unforeseen interaction effects between subassemblies produced by suppliers and the rest of the car can create substantial re-engineering costs and if not found in testing, create expensive product recalls or product liability lawsuits (Casper 1995). When engineers from the final assembler and supplier jointly collaborate for several months on a design, responsibility in fact is usually shared. In such cases collaborative product development relationships are only possible if firms agree to share risks and settle internal disputes over liability for mistakes privately.

Even when risks could be delegated entirely to one of the manufacturing partners, risk sharing is important to sustain close technical ties. Sabel has argued that firms then use ongoing technical relationships to closely examine each other’s activities and through doing so satisfy themselves that partners are living up to their obligations. “Learning by monitoring” is the concept Sabel uses to describe how firms capture gains from collaboration while at the same time assuring themselves that partners are not skimping on their responsibilities (Sabel 1993).

The important point here is that the way firms manage risks strongly influences the organization of technical collaboration. Simply put, when business risks are shared across firms, there is a much stronger incentive for companies to work together to alleviate problems than in cases when business risks are delegated entirely to one firm or another. In other areas of the supplier relationship, such as creating JIT logistical systems or negotiating long-term pricing agreements, it is often possible to write legally enforceable contracting delegating most legal and market risks entirely to one firm. However, case studies of BMW and other firms using collaborative manufacturing concepts show that risk sharing and monitoring through intense technical collaboration is also used in these areas (Casper 1995).

This argument can be taken one step further. Companies entering collaborative relationships can do so in a number of ways. All aspects of the relationship, both the governance structure used to share risks and the organization of technical relationships, can be privately developed by the firms. But they can also be embedded within para-public institutions contained within a regional economy. It is here that the type of governance structures used by firms directly influence the viability of para-public institutions. There is an enormous literature examining the role of Chambers of Commerce, trade associations, technical institutes, and other local bodies providing support for small and medium sized firms in Germany (see Katzenstein 1989 for an overview). While these institutions often help individual firms, the most important strand of this literature argues that these institutions provide an infrastructure or companies seeking to pool resources (Herrigel, 1993).

But what is clear is that firms must be engaging in collaborative manufacturing relationships for this to work. If firms are not pooling risks they usually do not engage in intensive technical collaboration. If not, there is little chance that they will collectively engage the local para-public institutions that are crucial for the German model to perform. This is the case in both Eisenach and Zwickau. In both regions final assemblers have found other ways to organize supplier relationships that avoid both risk pooling and intensive technical collaboration. Partially as a result, vibrant para-public institutions are not developing in either locality. This has hampered the development of a strong supplier base of independent *Mittelstand* firms in both regions.

## 3. Another strategy for decentralized production: Opel and VW's New East German production networks

One might expect that Volkswagen and Opel would attempt to follow the lead of their highly successful upper-market competitor BMW and use collaborative

manufacturing principles when setting up their new supplier networks.[2] Both firms could essentially start from scratch in building their East German supplier bases. Volkswagen's early announcements that they would use their East German development as an "experiment" in developing new supplier network concepts based on extensive outsourcing to JIT producers sounded very promising (Meissner et al. 1994:51-55). The Opel-Eisenach plant was explicitly set up to introduce Japanese "lean production" concepts into Germany (*Frankfurter Allgemeine Zeitung* 1994). Since cooperation with system suppliers forms a core component of the Japanese production system, it was fair to assume that Opel would introduce similar concepts when organizing supplier relationships in Eisenach.

VW and Opel have created sophisticated supplier networks in East Germany**,** but have constructed them along a different organizational logic of industrial organization. Both VW and Opel organized their new plants around a supplier strategy centered on the incorporation of discrete component modules that are independently designed by suppliers**.** The module strategy can lead to suboptimal engineering performance, since long-term joint product development relationships with suppliers are not created. Instead, final assemblers present suppliers with desired performance characteristics, physical descriptions, and attachment points and then leave the further design and production of the component completely to the supplier. Many volume market assemblers prefer it because it is much cheaper to implement, does not require the development of long-term relationships with particular suppliers, and does lead to some product market flexibility (Asanuma 1993; Ulrich 1994).

The module production system requires the investment of fewer product development resources in collaborative relationships. Development resources are typically used instead to pursue more radical product market advances wholly appropriable to the individual firm (Casper 1995: 10) More distant supplier relationships lead to the accumulation of fewer relationship specific assets co-developed with particular suppliers. This allows final assemblers to switch between different suppliers on price grounds when changing models. Furthermore, by asking suppliers to design a spectrum of comparable components with different performance characteristics, final assemblers can achieve a high degree of customization. The configuration of cars with different module configurations leads to the possibility of thousands of product variations. JIT delivery is the key to this scheme, as it is the production and sequencing of component modules with very short ordering times that allows

[2] Except where cited, the case material that follows in next two sections comes from interviews with managers at Opel, Volkswagen and several supplier companies in Eisenach and Zwickau conducted between October and December, 1995. These interviews were conducted as part of a larger project on new patterns of supplier network organization in Germany. See Casper (1995, 1996) for preliminary reports on West German cases.

buyers to customize their cars or the final assembler to quickly change production to target shifts in demand or tastes (see Asanuma 1993).

Opel and Volkswagen can pursue the module strategy due to the availability in Germany in recent years of an ever growing pool of large, integrated system suppliers. When Ford and Opel started to implement a new round of "global sourcing" in the late 1980s, both firms invited their largest, fully-integrated American suppliers to service their European plants. For example, two large American seat manufacturers have in the last five years established over 40 fully integrated JIT seat plants in Europe, including the plants in Eisenach and Zwickau. In addition, there is a group of German companies which BMW, and to a lesser extent, Mercedes-Benz, worked closely with to upgrade into full-service suppliers during the 1980s. When added to the moderate number of large German companies that have long-established automotive divisions, such as Bosch, Siemens, or ZF-Friedrichshafen, it is clear that there is now a large pool of full-service suppliers within Germany.

Full-service suppliers have the resources to establish wholly-dedicated production sites to meet the product development and JIT delivery needs of particular final assemblers. Individual plants are usually very small. The JIT seat producers in Eisenach and Zwickau employ less than 45 production workers per shift. In probably the most extreme example within Germany, the large German supplier firm Hella has set up a JIT facility for Volkswagen in Zwickau that employs only seven workers per shift to assemble the entire front end of a car (Turner 1994: 56-57). But these small production sites are backed up by tremendous corporate resources typically found at the firm's general headquarters. This includes research and development facilities, quality-control and production engineering departments, large financial reserves, and highly trained management dedicated to large purchasing, engineering, and sales departments.

The module production approach facilitates simpler risk management strategies with suppliers. Instead of sharing risks and monitoring suppliers privately through technical relationships, final assemblers create a legal contract delegating risks to either themselves or to suppliers and use public legal sanctions to enforce the agreement. Because suppliers independently design components, when product defects occur responsibility can easily be assigned through determining whether the performance and technical specifications provided by the final assembler and contained in the contract were met. If they are, then the final assembler is responsible, otherwise the supplier becomes culpable. Such agreements are common in German industry and enforceable in German courts (Casper 1996: 20-22).

The VW Golf and Opel Corsa were both established models before production started in each company's new production site. Both VW and Opel

decided to outsource much more production to suppliers in these new production sites than in the preexisting plants in Wolfsburg and Russelsheim. This meant there was little new product development that needed to be carried out, since reliable existing specifications were provided to suppliers with only minor modifications for yearly model upgrades.

However, there are two other areas in which substantial risks must be managed: the adjustment of long-term price clauses and the negotiation of liability rules for "just in time" delivery. The next section analyzes in detail the risk management strategies developed for both areas. VW and Opel have whenever possible delegated legal and market risks to suppliers. Partially as a result, neither Volkswagen or Opel have engaged in extensive technical collaboration with their suppliers, even though, as we will see below, JIT production in particular demands that all suppliers substantially upgrade their quality management systems.

## 4. Risk Management Strategies Used by Opel and Volkswagen

### 4.1 Price clauses:

In the car industry both suppliers and final assemblers must make large investments in product specific capital equipment for each model. Contracts with suppliers are signed for the entire model life of the car being produced, usually 3-5 years. Suppliers will not commit to making large investments customized to the needs of a particular customer without a long term contract. For example, a JIT producer would never build a plant in close proximity to a final assembler without a long term contract which allows the amortization of these fixed costs. However, it is impossible to write fixed price clauses for this entire time period. Wage costs change, factor prices fluctuate, plus production costs usually drop over time due to efficiency gains created by improved work organization or the incorporation of more advanced capital equipment. For these reasons, standard practice with both VW and Opel is design 3-5 year "framework contracts" that allow for yearly renegotiation of price clauses. The problem is determining the criteria by which new prices are set.

From the final assembler's point of view, negotiating price terms is problematic when suppliers are building unique parts. Final assemblers must worry about the supplier taking advantage of private information about its true costs in order to charge excessive prices. One reason why many final assemblers enter into extensive joint product development relationships with suppliers making unique parts is not just to develop scope economies from

collaboration, but to be able to monitor that prices charged are justifiable. However, because the cars being built, the Opel Corsa and VW Golf, are models being produced at other production sites, both companies as a matter of policy chose different supplier companies to produce similar parts at each production site, or produce the parts internally at some locations. This allows straightforward comparison of prices and promotes competition between suppliers. Thus, even though both VW and Opel are "single sourcing," or using just one supplier for each component used in their new production chains, managers at neither firm worry about suppliers charging excessive prices.

The management of supplier companies of both VW and Opel, however, are very concerned that final assemblers will use flexible price clauses to opportunistically demand lower prices. This is especially troublesome once large capital investments have been made. Thirteen of the Volkswagen suppliers and two Opel suppliers have constructed dedicated JIT delivery plants in Zwickau and Eisenach. Because these plants cannot easily switch production to other purposes, they are especially vulnerable to demands that prices be reduced. (Williamson 1985). Even if this means the plants will be making a loss, management would be forced to accept demands for lower prices as long as it is economically better than the next best use. Short of shutting down production, most suppliers are helpless against such demands, even though they sometimes clearly violate German contract law (Martinek 1991).

While price clause adjustments have not been a major issue for Opel Eisenach suppliers, Volkswagen suppliers in Zwickau have been plagued by two different problems. First, incomplete price contracts are often exploited unintentionally, through the final assembler lowering planned production capacity. Price bids by suppliers are usually based on an estimate given by the final assembler of the number of cars it will produce per day. When it wins the contract, the supplier either allocates existing capacity or, in the case of most of the Zwickau and Eisenach suppliers, builds new plant to meet the expected demand. The price offered is based on the optimal usage of this capacity. When the actual volume of orders is lower, costs are usually higher. This is due to a combination of factors, such as economies of scale not being met, redundant labor (which in Germany is very difficult to lay off in the short term), and learning curves being flatter than expected due to reduced production.

In 1990 VW began production of about 450 cars per day at the old Sachsen Ring assembly plant. At the same time VW received massive subsidies of close to 500 million dollars from the German government and European Union to build a new factory. VW announced that by 1993 the new plant would open with a minimum capacity of 800 cars produced per day, and the factory was built with a maximum capacity of 1200 per day. Most of the more sophisticated JIT supplier companies, when building new factories,

expected this 800 cars per day target to be reached and established its minimum capacity at this level.

Though construction was finished in 1992, Volkswagen then decided to delay opening of the new plant by several years, producing just 450 cars per day at the original factory. This left many suppliers not just with costly excess capacity, but also contractually bound to prices based on much higher capacity utilization. For most suppliers, reduced production meant economies of scale would not be reached, making each part more expensive to produce and cutting profit margins. Though Volkswagen announced in 1995 that production would finally begin in 1997, this has recently been called into question due to demands from the European Union that an additional 100 million dollars in subsidies provided by the state of Saxony be returned. (*Der Spiegel* 1996)

Second, final assemblers can also use flexible price clauses to demand lower prices from suppliers in order to externalize internal cost problems. Invocation of the now infamous "Lopez clause" in Volkswagen purchasing contracts is a prime example of this problem. Particularly during the 1992-1993 period, when Volkswagen was desperate to reduce large loses, the company complemented internal reorganization with repeated demands that suppliers cut costs (*Handelsblatt* 1993). VW made repeated use of clauses placed in all contracts by Jose Ignacio Lopez, Volkswagen's now infamous purchasing director. These clauses simply gave VW the right to unilaterally demand lower prices from suppliers "due to changed market conditions." Managers interviewed at several of the VW suppliers admit to receiving faxes from VW headquarters in Wolfsburg instituting five percent cuts in price per part, effective immediately.

In a famous case concerning Mercedes Benz, the German high court ruled in 1982 that open-ended flexible price clauses are in violation of German contract law (Martinek 1991). However, even with this clear legal precedent the Volkswagen suppliers, including the large dedicated JIT firms, were defenseless against these demands. The Golf assembly line at Wolfsburg is one of VW's most highly vertically integrated assembly lines. Seats, wire assemblies, and other components now routinely subcontracted to specialist JIT suppliers by most final assemblers are still produced in-house at Wolfsburg for the Golf. There was considerable pressure from Wolfsburg to simply ship these components to the Zwickau site directly from Wolfsburg. Should suppliers balk at these unilateral price lowering demands, VW has an extremely credible threat to simply take production back in-house. A supplier might win a legal action, but would assuredly lose the contract. As a result, supplier firms have had to cope with the "Lopez clause" as best they can. Fortunately, since 1993 Volkswagen has tempered its policy of asking for unilateral price reductions, partly out of concerns that the severity of the price crunch was causing a decline in quality-control at its suppliers.

## 4.2 Liability issues with JIT delivery

Through transporting parts from suppliers directly to the final assembly line as needed, JIT delivery allows final assemblers to substantially reduce inventory costs and increase internal plant efficiency and quality levels (Cunsamono 1985; Schonberger 1992). However, the delivery of parts directly to assembly lines with neither quality-control checks nor large inventories of replacement parts leads to a number of well known problems. Some defects, especially when of a serial nature, can cause production to come to a standstill and, if not detected before use in assembly, can damage expensive capital equipment and create extensive re-work costs. To manage these risks, Opel and Volkswagen have designed formal contracts assigning responsibility for all potential liability problems caused by JIT.

JIT contracts are especially interesting in that they have caused a substantial reshuffling of liability risks as spelled out in normal German business law. These laws were designed over a hundred years ago in a very different industrial world. Under the old system, in which the final assembler kept large inventories of thousands of simple parts used in final assembly, random defects would be found by “entry inspections” legally required to be carried out by the final assembler when taking delivery of goods (Grunewald 1995). Suppliers of parts must guarantee the quality of their goods and immediately replace any parts found defective. But the law assumes that final assemblers can easily spot defective parts through simple inspections. Through requiring these inspections, German law limits the supplier’s exposure to product liability damages should defective parts cause damages to either the final assembler or end customers (Ensthaler 1994).

Final assemblers argue that the technological organization of JIT delivery prevents them from performing normal entry inspections. This is caused by both the lack of replacement inventories and the introduction of computer assisted flexible logistical systems. For example, Opel’s JIT seat supplier assembles six different designs for different model versions produced by their final assembler. These designs are further customized by the color of upholstery to match different painting and interior decoration schemes. Deliveries from the seat producer are synchronized into the exact sequence to be used in final assembly according to design style and color and delivered less than four hours before use in production. Even if normal entry inspections were possible, any defective seat automatically causes liability problems due to inevitable production delays and rework costs.

Final assemblers use these arguments to support the introduction of contractual clauses instituting “exit inspections” to replace the scrutinizing final assemblers are legally obliged to perform. Though sensible from a technological point of view, this switch in business practice carries with it a

huge redistribution of liability risks away from the final assembler and towards the supplier. Under the JIT contracts designed by both VW and Opel, suppliers must assume responsibility for quality control and offer a “zero defect” guarantee, meaning that they bear full responsibility for any liability damages caused by their products.

The loss of liability rights is felt immediately by suppliers in the form of increased premiums for liability insurance. JIT suppliers must replace standardized insurance policies, which assume that normal business laws are used, with customized policies that take into account both the new liability risks and the ability of the firm to manage the risks through internal quality control measures. Such policies are usually more expensive both because of the increased risk exposure but also because the costs of evaluating the risk profile of individual companies increases. Insurers often insist on performing technical audits to gauge the adequacy of the supplier’s quality management system. Under normal contracting conditions these audits are not needed, since most liability risks were minimized by the entry inspections and carried by the final assembler in cases when they were not carried out.

Similar JIT contracts have since the late 1980s been developed by most German car assemblers and thus affect virtually every important car parts supplier nation-wide (Casper 1996: 8-19). Large supplier companies have accepted these contracts, but only after a number of measures were taken within national level trade associations to lower the increased insurance costs.

Under JIT contracting final assemblers always conduct audits of a supplier’s quality control system. Even if liability risks reside with suppliers, final assemblers still want to avoid production shutdowns and losses to reputation caused by defective products. Over the last several years negotiations within the national office of the German automobile association (VDA) have been conducted between large supplier companies and final assemblers to design a standard set of technical norms specifying an adequate quality control regime acceptable under JIT production conditions (Casper 1996: 23-24). These standards are loosely based on the ISO 9000 based quality control norms first developed in the United States. ISO 9000 norms are attractive because the audit results are easy to understand by third parties. A separate agreement was then negotiated between the VDA and the trade association representing German industrial liability insurers. This agreement allows auditing results to be shared with insurers and, if they meet the highest certification levels, to be used to replace the technical audits normally conducted by insurers. Furthermore, the German trade association representing liability insurers now recommends that fee increases be entirely waived when firms have good prior records and receive top-level certification scores on quality audits.

Meeting the highest ISO-9000 certification levels involves substantial reengineering of process organization within the firm, including the introduction of sophisticated statistical process control schemes. Even though their assembly plants in Eisenach and Zwickau are small and relatively unsophisticated in terms of the capital equipment they employ, each of the full-service JIT suppliers visited were able to receive this top level certification and avoid higher insurance costs. In every case firms received extensive aid from quality control experts located in the company's corporate headquarters back in West Germany. Later we will come back to this point, as the pooling of important knowledge within private corporate networks instead of within local para-public institutions is one of the key factors influencing the regional development of both Eisenach and Zwickau. But in general, a national-level solution has been developed that allows sophisticated JIT suppliers to cope with the increased legal risks

Volkswagen currently has thirteen full-fledged JIT suppliers for the Zwickau plant while Opel has two. However, both firms have asked *all* their suppliers to sign contracts designating them as "JIT" suppliers, complete with abrogations of traditional entry inspections by final assemblers and the "no defect" guarantee. Since Opel imports most simple parts from Spain, few local firms are affected. However, Volkswagen has dozens of suppliers in both Eisenach and Zwickau, all of which are affected by these legal clauses. To save on inventory costs, VW asks for daily or every other day delivery from most suppliers. But in most of these cases suppliers are delivering standardized goods in fairly large quantities. For example, three of the companies surveyed produce batteries, lighting fixtures, and stamped parts for the frame of the car. Each of these standardized parts producers are contractually designated as JIT suppliers. These firms are all "second tier" suppliers and none have the computer controlled flexible procurement systems or synchronized lot deliveries seen with the full-fledged JIT suppliers. The primary reason VW designates all firms as JIT suppliers is because through doing so a substantial part of its liability burdens can again be shifted over to suppliers.

It is this class of firms that is most directly affected by increased liability risks and the higher insurance costs. Though all these firms were introducing quality control schemes based on ISO 9000 standards, in none of the firms visited were the highest levels of certification demanded by the insurance companies for waivers of technical audits met. Industry experts stress that less than 30% of German supplier firms nationwide have markedly increased insurance costs due to the new contracts, but also admit that the firms influenced are usually small and medium sized firms caught in the process of upgrading (source: interviews at German national insurance association (VDS)). Overall, the class of companies most in need of insurance protection is least able to obtain it.

## 5. Can para-public institutions help *Mittelstand* companies adopt to the new supplier network strategies?

Even though both the price clause and JIT supplier contracts entail an adoption of substantial new market and legal risks, all the sophisticated JIT suppliers in Eisenach and Zwickau have largely accepted these one-sided contractual arrangements. Fierce competition in virtually all product market segments within the car component industry has simply forced many firms to accept the new state of affairs i¦ order to win contracts. At least in the short term, these companies have the financial resources to survive unilateral demands to reduce prices. Furthermore, as large, sophisticated organizations, these companies have the resources to make the necessary adaptations to their quality-control systems in order to accept "zero defect" contracts and assume full liability for any problems that do occur. Especially in the cases of the two seat producers, which are American companies, they are used to working in different legal environments in which contract laws do not exist to protect smaller market participants. Accepting full legal liability for every part leaving their factory doors is part of doing business.

However, a large number of independent small and medium sized suppliers are caught within a dilemma. Wage competition from Eastern Europe and elsewhere has essentially closed off market niches for simpler components, such as stamped parts, that many smaller companies once held. To win contracts in currently fiercely competitive automobile parts markets, manufacturers of simpler parts must make contract bids with very thin profit margins. They are thus the first to suffer from unexpected demands to reduce prices. These firms are typically engaged in the expensive and organizationally taxing activities of upgrading their capabilities in order to win contracts for higher value-added component parts. They are often just developing the sophisticated quality-control and product development systems needed to participate in decentralized production arrangements. Untried and less robust quality-control systems increase the chance that liability problems will occur. However, small, independent suppliers are unlikely to be able to afford liability insurance, especially when non-standard contractual arrangements increase its cost.

The question then becomes, are there other resources smaller, independent suppliers can draw upon to solve these problems? During the German unification process the institutional system regulating the West German economy was imported wholesale into East Germany.[3] Chambers of

[3] In addition to the company interviews, this section draws on interviews with the directors of Chambers of Commerce and Economic Promotion Offices in Zwickau and Eisenach conducted in November, 1995 as well as interviews at national offices of the VDMA (machine tool industry trade association), VDA (automobile industry trade association), both in Frankfurt, in April, 1995.

Commerce, private and state-funded research institutes, local offices of trade associations, and economic promotion offices exist in both Zwickau and Eisenach. These institutions oversee the provision of numerous services to individual firms. Most important are access to the training system, information on numerous tax breaks, subsidies, and low interest loans available in Eastern Germany, access to consulting services provided by the Chamber of Commerce and local research institutes, and on a very limited scale, participation in research and development projects sponsored by local government in conjunction with local technical universities.

Recent research by Gary Herrigel shows that while all local economies in Germany have a similar set of para-public institutions, only in Baden Württemberg and a few other areas in Southwestern Germany do firms collectively use these institutions as an infrastructure to pool research and development and other collaborative activities (Herrigel 1993, 1995). Herrigel (1995) argues that due to highly fractured land ownership patterns and other unique historical conditions, groups of small textile and metal working firms in some regions of Southern Germany formed decentralized production arrangements within local para-public institutions in the 18$^{th}$ and 19$^{th}$ century as an organizational alternative to the large, autonomous firms that came to dominate the German economy. Now that firms everywhere are rapidly decentralizing production due to dramatically increased technological complexity in most manufacturing industries, the process by which industrial districts such as those in Baden Württemberg develop has become an important research topic.

The analysis of supplier network organization strongly predicts that firms are highly unlikely to pool collaborative engage local para-public institutions in Eisenach and Zwickau. If firms do not develop collaborative manufacturing relationships with each other, seen both by extensive technical cooperation and the sharing of most market and legal risks, they are unlikely to collectively engage local para-public institutions. Numerous other local factors, such as patterns of civic activity created through the political and economic organization of the socialist East German state might promote or inhibit patterns of institutional engagement. The organization of collaboratory supplier networks is probably not a sufficient factor, but it is a necessary one for the development of pooled firm activities within para-public institutions.

To make this argument in more detail, it is worth analyzing an important example: the development of quality management systems within companies. This is an obvious area where local para-public institutions could help independent firms. Because all suppliers in both regions are contractually designated as “JIT suppliers,” they all must introduce quality management systems based on the same ISO 9000 norms. The ISO-9000 norms do not dictate the precise organization of work or managerial oversight. What they do

is dictate a number of broad processes that must be integrated into the firm. These include the inclusion of statistical process controls and the involvement of both workers and managers in a number of continuous quality oriented schemes (Paradis and Small, 1996). At the local level, firms literally need help redesigning the structure of their organization so as to meet the standards while remaining efficient manufacturers of their product.

The development of such competencies within local para-public institutions is possible. National-level standardization makes this an area in which local para-public institutions could conceivably organize a resource pooling program modeled after local in technology projects seen elsewhere in German regional economies (Lutz 1993). It is clear, however, that for this to work the more sophisticated local firms would have to join the system and pool their resources. They would conceivably do this if they expected to receive something in return, such as access to quality control schemes used by other sophisticated firms, or if they were collaborating with other firms in the local economy that would benefit from the program. In this second case, even if direct benefits were minimal, gains from the upgrading of other firms would feed back to them in terms of higher reliability from local suppliers.

There does not exist a coalition of local firms in either Zwickau or Eisenach with sufficient technical competencies that would benefit from the establishment of local cooperative programs in quality control. As a result no cooperative programs exist. Again, the structure of the supplier networks explains why. The local final assemblers are the best candidates, since they have a direct interest in assuring that their local suppliers produce high quality parts. However, both VW and Opel's quality management programs are directed by their West German headquarters. Because both firms have hundreds of suppliers, systematic help to those not meeting the standards is not provided.

The large, sophisticated JIT supplier firms also are disinterested. The local branch factories of these large companies are in fact already members of extensive cooperative networks to improve their quality management systems, but these dialogues are structured within private corporate networks. The managers in charge of quality control at the local factories of larger firms have access to managerial experts in implementing quality control systems at corporate headquarters and also participate in regular information exchanges with their counterparts at other production locations. Having already achieved high-level quality control certification, why risk sharing knowledge with potential competitors when internal networks achieve many of the possible learning effects that a local para-public one could generate?

Even though the national harmonization scheme at least provides a single and relatively stable set of criteria they must meet, independent firms do not have access to know-how through broader corporate networks. Partnerships

with other firms are either very formal, as with the final assemblers, or not geographically concentrated. Some of the largest full-service suppliers regularly enter into their own quality-control dialogues with their suppliers. For example, one small local firm visited made specialty parts for and received quality control help from ZF-Friedrichshafen, a sophisticated producer of transmissions based in Stuttgart. But these activities are not systematic or regionally based. Most independent firms must develop the new quality control measures on their own. The most common source of outside help are private consultancies, often associated with certification agencies.

## 6. Conclusion

It is clear that the organization of supplier networks in Zwickau and Eisenach regional economies are very different than what is typically seen in West Germany, and particularly within the industrial districts located in Southern Germany. These differences are not caused by the legacy of East Germany's 45 year experiment with socialist political and economic organization. Instead, they are explained by a combination of delegated rather than pooled risk management strategies and hands-off rather than collaborative technical organization used to organize supplier networks in the two areas.

An important part of the German model is the provision of a wide number of services to *Mittelstand* companies through para-public institutions. The paper has argued that these institutions work most effectively when they are collectively engaged by local companies. Supplier network organization is a key factor creating the incentives leading to the collective engagement of para-public institutions. The vibrancy of many important para-public institutions will thus be determined in part by the supplier network strategies of large companies.

Many large German firms, such as BMW, Bosch, Siemens, and ZF-Friedrichshafen are known for their use of collaborative manufacturing principles with suppliers. As each of these firms has adapted well to competitive challenges of the 1990s, it is possible that the collaborative manufacturing principles that support collective engagement of para-public institutions will grow in use. However, particularly in the automobile industry, the "module" production system appears to have taken firm root, especially among volume producers. Volkswagen, for example, now uses a similar contractual structure with most suppliers throughout Germany (Casper, 1996). As the "module" approach to organizing supplier networks is implemented elsewhere in Germany, these two East German cases might resemble the

shadow of the future over Western Germany as well, with ominous implications for the German model of economic organization.

## Bibliography


Acs, Z. and D. Audretsch 1993: *Small Firms and Entrepreneurship: An East-West Perspective*. Cambridge: Cambridge University Press.

Asanuma, B. 1993: 'Co-ordination between production and distribution in a globalizing network of firms: assessing flexibility achieved in the Japanese automobile industry', in M. Aoki and R. Dore (eds), *Perspectives on the Japanese Firm*. Cambridge: Cambridge University Press.

BMW Corporation 1992: *BMW and its Suppliers: Aims, Instruments and the Spirit of Cooperation*. Munich: BMW Materials Management Department.

Casper, S. 1995: 'How public law influences decentralized supplier network organization: the cases of BMW and Audi', WZB working paper FS I 95 - 314.

Casper, S. 1996: 'German industrial associations and the diffusion of innovative economic organization: the case of JIT contracting', WZB Working Paper FS I 96-306.

Cusamano, M. and L. Nobeoka 1992: 'Strategy, structure and performance in product development: observations from the auto industry', *Research Policy* 21: 265-293.

Ensthaler, J.1994: "Haftungsrechtliche Bedeutung von Qualitätssicherungsvereinbarung", *Neue Juristische Wochenschrift* 47: 817-832.

*Frankfurter Allgemeine Zeitung* 1994: 'Die Eisenacher und die Rüsselheimer' August 6.

Grunewald, B. 1995: 'Just-in-time Geschäfte - Qualitätssicherungsvereinbarungen und Ruegelast', *Neue Juristische Wochenschrift 48*: 1777-1784.

*Handlesblatt* 1993: 'Mittelstand wehrt sich gegen Preisdiktate aus den Reihen der Automobilindustrie', July 22.

Herrigel, G. 1993: 'Large firms, small firms, and the governance of flexible specialization: The Case of Baden Württemberg and Sozialized Risk." in Bruce Kogut (ed.), *Country Competitiveness*. New York: Oxford University Press.

Herrigel, G. 1995: *Industrial Constructions: The Sources of German Industrial Power.* Cambridge: Cambridge University Press.

Herrigel, G. and C. Sabel 1995: 'Craft production in crisis: industrial restructuring in Germany during the 1990s', unpublished manuscript.

Kamath, R. and L. Jeffrey 1994: 'A second look at Japanese product development', *Harvard Business Review* 72: 154-170.

Katzenstein, P. 1989: 'Stability and change in the emerging third republic', in P. Katzenstein (ed.), *Industry and Politics in West Germany*. Ithaca: Cornell University Press.

Lutz, S. 1993: *Die Stueuerung industrieller Forschungskooperation*. Frankfurt: Campus.

Meissner, H.-R., K. Kisker, U. Bochum, and J. Assmann. 1994*: Die Teile und die Herrschaft*. Berlin: Edition Sigma.

Migge, L. 1992: 'Qualitätssicherungsverträge: Versuch einer Zwischenbilanz aus der Sicht der betrieblichen Praxis', *Versicherungsrecht* 42: 665-675.

Paradis, G. and Small, F. 1996: *Demystifying ISO 9000*. Reading: Addison-Wesley.

Popp, K. 1992: *Die Qualitätssicherungsvereinbarung*. München: Carl Hanser Verlag.

Sabel, C. 1993: 'Learning by monitoring', in N. Smelser and R. Swedberg (eds.), *Handbook of Economic Sociology*. Princeton: Priceton-Sage.

Sabel, C. 1995: 'Bootstrapping reform', *Politics and Society* 23: 5-48.

Schonberger, R. 1982: *Japanese Manufacturing Techniques*. New York: The Free Press.

Turner, L. 1994: 'Social partnership in the global economy: crisis and reform in unified Germany', book manuscript.

Ulrich, K. 1995: 'The role of product architecture in the manufacturing firm', *Research Policy* 24: 419-440.

Vitols, S. 1995: 'German banks and the modernization of the small firm sector: long-term finance in comparative perspective', WZB working paper FS 1 95 - 309.

Williamson, O. 1985: *The Economic Institutions of Capitalism*. New York: The Free Press.