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The Governance of American Manufacturing Sectors: The Logic of Coordination and Control

MPIfG Discussion Paper, No. 90/4

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Suggested Citation: Hollingsworth, J. Rogers (1990) : The Governance of American Manufacturing Sectors: The Logic of Coordination and Control, MPIfG Discussion Paper, No. 90/4, Max-Planck-Institut für Gesellschaftsforschung, Köln

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The Governance of American Manufacturing Sectors: The Logic of Coordination and Control

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90/4

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90/1050
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für Gesellschaftsforschung
Bibliothek
PLA-Z/9004
20498 000

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MPIFG Discussion Paper 90/4
ISSN 0933-5668
Mai 1990

Abstract

In recent years, scholars in a variety of disciplines have become interested in why there is variation in the institutional arrangements for coordination and control of economic activities in capitalist economies. Some have attempted to explain why transactions occur among actors within a market, a firm, or some form of network. Another body of scholarship has attempted to understand why there are collective forms of behavior among economic actors. This paper attempts to integrate these two traditions by developing a typology of two forms of coordination and control: coordination for coping with transactions among various actors and forms of coordinating collective behavior. Focusing on the economy of the United States since the late nineteenth century, this paper offers suggestions of why one form of coordination rather than another emerges, how various forms of coordination are related to one another, and how specific forms of coordination might influence the economic performance of various industries.

* * * * *

In den letzten Jahren haben sich Wissenschaftler verschiedener Disziplinen für die Frage interessiert, warum sich die institutionellen Strukturen kapitalistischer Wirtschaftssysteme für die Koordination und Steuerung wirtschaftlicher Prozesse unterscheiden müssen. Einige haben zu erklären versucht, wieso Transaktionen zwischen Akteuren in Märkten, Firmen oder anderen Netzwerkformen zustande kommen. Andere haben zu verstehen versucht, wie kollektive Verhaltensformen zwischen Wirtschaftsakteuren entstehen. Das vorliegende Papier will beide Traditionen mit Hilfe einer Typologie zweier Steuerungs- und Koordinationsformen integrieren: Koordination, um mit Transaktionen zwischen verschiedenen Akteuren fertig zu werden, und Arten der Koordinierung kollektiven Verhaltens. Fokussiert auf das Wirtschaftssystem der Vereinigten Staaten seit dem späten 19. Jahrhundert, entwickelt dieses Papier Hypothesen über die Emergenz einzelner Koordinationsformen, die Beziehungen zwischen diesen und den möglichen Einfluß spezifischer Typen der Koordination auf unterschiedliche Industriezweige.

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* In writing this paper, I very much appreciate the assistance of Leon Lindberg. He and John Campbell provided very useful comments on an earlier draft of this paper. In addition, I have very much profited from stimulating conversations with the following: Masahiko Aoki, Ken Bickers, Alfred D. Chandler, Jürgen Feick, Philipp Genschel, Wyn Grant, Jerald Hage, Robert Hanneman, Rob Kennedy, Diane Lindstrom, Tom McCraw, Renate Mayntz, Richard Nelson, Yoshi Okada, Charles Sabel, Fritz Scharpf, Christoph Scherrer, Philippe C. Schmitter, Volker Schneider, Marc Schneiberg, Wolfgang Streeck, David Teece, Raymund Werle, Oliver Williamson, and Eric Wright. But the person who did more than anyone else to sharpen my views about the issues developed here is Ellen Jane Hollingsworth.

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1. Introduction

The concern of this paper is to discover the logic by which American manufacturing sectors have been governed (e.g. coordinated) since the late nineteenth century. In recent years, a number of scholars have been very much concerned with identifying the institutional arrangements with which economic activity is coordinated and to understand why one form of coordination is chosen rather than another in different sectors of the economy, and this paper expands on that literature (Chandler, 1977; Williamson, 1975, 1985; Hollingsworth and Lindberg, 1985; Lindberg, Campbell, Hollingsworth, 1989; Schmitter, 1989; Schneider, 1989: 1-7).

At a rather general level, *governance (e.g. coordination) is the process by which activities and conflicts among various actors are coordinated and managed.* Thus, a major goal of this paper is to focus on the cooperative, antagonistic, and transacting relationships among various actors involved in American manufacturing, and to understand how they have been managed. The following actors influence almost every industry in American manufacturing: (1) suppliers of materials (this category includes producers of raw materials, suppliers of components for final assembly, and researchers who provide basic and applied knowledge), (2) processors of materials (e.g. manufacturing firms, (3) distributors (e.g. wholesalers, retailers), (4) suppliers of capital (e.g. investment houses, banks, private investors, the state, etc.), (5) transport firms (e.g. railroads, airlines, etc.), and labor.

Figure 1: A Typology of Governance Mechanisms*

Form of Coordination and Control: Degree of formal Integration		Range of Action: Individualistic: Coordination Based on Manipulation of Agents' Individual Incentives	Range of Action: Collective: Coordination Based on Appeals to Solidaristic Values & Collective Goods
Low	Imputed coordination and control through dispersed interaction of units: No discrete organizational structure	Cell One *Markets* - self-liquidating sales - spot market contracts - auctions	Cell Four *Monitoring Networks* - extensive corporate interlocks for information and control - price leadership arrangements
Med.	Network coordination and control among linked autonomous but interdependent actors	Cell Two *Obligational Networks* - inside contracting - subcontracting - joint ventures and strategic alliances - franchises - cooperative contracting	Cell Five *Promotional Networks* - R&D alliances - coalitions - action sets - interorganizational clans - industry training institutes
High	Bureaucratic or administrative control structure	Cell Three *Hierarchies* - vertical and horizontal integration - conglomerate - job control union contracts	Cell Six *Associations* - cartels - trade associations - employer associations - producer cooperatives - unions

* Modified from Lindberg, Campbell and Hollingsworth (1989)

The typology in Figure One contains six types of non-state governance arrangements which coordinate relations among these various actors, and it is the basis for the following discussion about the

governance of American manufacturing sectors.[1] The vertical dimension encompasses the literature which commonly focuses on various forms of economic coordination and control (Williamson, 1975, 1985; Eccles, 1981; Granovetter, 1985; Stinchcombe and Heimer, 1986), and embodies the distinction between formal and informal types of institutional arrangements. The horizontal dimension distinguishes between individual action (including that of individual organizations) and collective action, where there are processes to enable organizations to arrive at definitions of common interest.

The literature about markets, networks, and hierarchies, represented along the left side of the horizontal axis, has tended to focus on specific transactions among individual actors (Williamson, 1975, 1985) and has generally ignored collective forms of coordination (Schneiberg and Hollingsworth, 1989). However, forms of collective action (Cells Four, Five, and Six) play an important role in economic governance, and if transactions among actors are embedded in an environment in

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[1] The interested reader who wishes to read more about the typology should consult Lindberg, Campbell and Hollingsworth (1989). Each of the six types of governance has its own procedures for detecting deviations from rules and for enforcing compliance, and each involves an unequal set of norms or ideologies that helps to reduce the costs of enforcement. The typology will later be published in Campbell, Hollingsworth, and Lindberg (forthcoming), along with a different version of this paper.

In this paper, governance is used interchangeably with coordination and control - a common tendency in the literature since Williamson's two influential books on the subject (1975, 1985). This paper is not concerned with the state as a coordinating mechanism. In many respects, the most important institution for coordinating economic activity may be the state. However, an analysis of the state as a coordinating mechanism should properly be the topic for another paper, for as a coordinating mechanism it is of a different order from the other mechanisms. It is different in that it can operate at a variety of levels. For example, the state defines property rights and enforces contracts without which markets cannot function. It mediates and mandates certain types of behavior and institutions while prohibiting others. It shapes fiscal and monetary policy which, in turn, influences the behavior of other institutional mechanisms.

which forms of collective action are highly developed, this will have important implications for whether markets, corporate hierarchies, or obligational networks are chosen as instruments of governance and for how they perform. In other words, the three types of governance arrangements on the left side of Figure One coordinate transactions among the various actors listed above, but markets, obligational networks, and hierarchies may be embedded in one or more of the collective forms of coordination on the right side of the typology. Because the type of governance arrangement on the left side of the typology may be embedded in one or more of the governance arrangements on the right side of the typology, a major concern of the following discussion is to explore the relationship between the various collective forms of governance on the right side of the typology with the types on the left side.

Markets (Cell One) are transactions in which actors engage in arm's length bargaining. They involve short-term relationships which are self liquidating, relationships in which the identities of the parties do not affect the terms of the exchange. Hierarchies (Cell Three) manage transactions among different types of actors within an organization or firm (Williamson, 1975, 1985). In contrast, obligational networks (Cell Two) are institutional arrangements by which transactions among different types of actors are neither in a market or within a firm, though the transacting partners have informal, long-term stable relations with one another (Lindberg, Campbell, and Hollingsworth, 1989; Williamson, 1985).

The reader may not always find it intuitively obvious whether activity is being coordinated by an obligational network (cell two) or a promotional network (cell five), or both. Indeed, economic coordination often involves institutional arrangements on both sides of the typology. In general, the institutional arrangements on the left side of the typology coordinate transactions among the various actors listed above, while the primary concern of the collective forms of coordination on the right side of the typology is *not* to coordinate specific transactions. Rather, the three types of institutional arrangements on the right side (Cells Four, Five, and Six) are more involved in collec-

tive activity to promote cooperation among groups of actors with common goals -- often in a single industry.

When the federal government forms a coalition consisting not only of government agencies but also of numerous firms and university scientists in order to develop or improve a specific product, this would be a promotional network -- a form of collective behavior falling on the right side of the typology. On the other hand, when a private aircraft firm enters into a long-term joint venture to build an airplane engine with another firm, this involves a business transaction among two firms and would be in Cell Two, an obligational network.

Whereas obligational networks (Cell Two) involve relationships which are dyadic in nature, occur among pairs or small cliques of firms, and serve to coordinate the buying and selling of products, or to coordinate specific exchanges, monitoring networks (Cell Four) coordinate relations in a much more informal way. Monitoring networks exist more often in the form of interlocking directorships among a large number of firms or in the form of dominant firm pricing [e.g. whereby a single firm establishes the price of a product for an entire industry (Lindberg, Campbell, Hollingsworth, 1989; Burns, 1936)].

Associations (Cell Six) "are distinctive forms of collective governance that involve structured relationships among organizations which mutually recognize each others' status and entitlements" (Lindberg, Campbell, Hollingsworth, 1989: 35). Associations are formal organizations which generally coordinate a variety of economic activities of firms engaged in the same industry, whereas markets, hierarchies, and obligational networks tend to coordinate specific transactions among different types of actors (Schneiberg and Hollingsworth, 1989).

In many respects, the coordination and governance of American manufacturing since the late nineteenth century fall in two distinct periods: 1870 to 1950 and 1950 to the present. A complex explanation is required in order to understand the emergence of various governance arrangements during these two periods, for a host of contextual variables shaped transformations from one type of governance to another in American manufacturing sectors. There are variables which

are sectorally specific: the degree of competitiveness and capital intensity of specific industries; the size of the sector measured by the number of firms and employees; and the degree to which consumer tastes are diversified or homogeneous. Transformations were also influenced by product variables: technological complexity and the rate of technological change, as well as by variables which influence the costs of transactions. Of course, the age of a sector influences its flexibility for change. New industries generally have greater capacities to undergo structural change than older industries which have highly institutionalized arrangements. Very importantly, there is the industrial relations system of a sector. It not only reflects the way that relations between capital and labor are constrained within an industry, but it may influence the way that relations among other actors are coordinated. There are also country specific characteristics: the size of the country (space and population); complexity of the national economy; the degree to which firms are embedded either in a rich or impoverished set of institutional arrangements (e.g. highly developed trade associations, capital markets, training institutions for the development of broad skills for the work force); and the society's belief system, which gives rise to rules and normative constraints for the governance of particular sectors. And finally - but perhaps most importantly of all - there is the role of the state. The state defines property rights and the conditions under which each of the six types of governance arrangements may exist.

There is no universal and immutable logic involved in the governance of capitalist societies. Firms make decisions in response to a large number of variables which are interactive with one another. And while nothing is deterministic, there are in the histories of individual countries decision making styles and strategic policy choices which emerge again and again. And it is as a result of such a logic of decision making that certain options tend to be chosen in specific time frames in various countries and others are rarely chosen. It is the distinctive interaction of a large number of interdependent elements that forms what Max Weber (1978) labeled as historical individuals (Scharpf, 1989; Sorge and Streeck, 1988). It is an effort to discover the complex pattern by which numerous complex elements

interacted at the sectoral level during two periods of American history.

2. The Coordination of the American Economy 1870-1950

Prior to the Civil War, the United States was predominantly an agrarian society, in which most firms were small businesses owned by a single individual. Most industrial production took place in small shops, with goods purchased by merchants or commission men who then moved goods into streams of commerce. As a result of the communication and transportation revolution which led to declining transportation rates, many firms during the post-Civil War era were able to extend the geographical area over which they marketed their products. Because of the large market area in which they operated and the introduction of new machinery, firms in numerous industries were able to increase their output, to utilize economies of scale and scope, and to undersell smaller and less efficient firms. After a couple of decades of expanding markets and impressive profits, firms in numerous industries were faced with a classic problem in the history of capitalism: intense price competition, "saturated" markets, idle plants, accumulating inventories, severe price declines, and the threat of bankruptcy. It was the effort to cope with these problems which resulted in a fundamental transformation in the coordination of the American economy during the late nineteenth and early twentieth centuries - though there was considerable variation in the way that industrial sectors responded to these problems.

Firms in some industries reacted to overcapacity by producing more differentiated products - turning out high quality products and attempting to establish a good reputation for their brands.[2] For firms

[2] This is the same strategy which some firms employed in response to problems of overcapacity during the 1930s and 1980s. During each of these periods, this kind of strategy did little to contribute to an overall transformation of the sectoral structure. It is mentioned here simply because it is a logical reaction to the problem of overcapacity which capitalist economies periodically face. Such a

in most manufacturing sectors, the basic strategy for relieving the downward pressure on prices was to search for some means of stabilizing prices and/or restricting the output of mass produced, standardized products.

2.1 Coordination Among Firms in the Same Industry

During the late nineteenth century, some of the most severe price competition occurred in industries which were very capital intensive, which had high fixed costs, which were involved in the output of standardized products and in which no single firm had a clear-cut advantage over the rest - e.g. coal, metal and paper products, railroads (Warren and Pearson, 1932, 1933; Lamoreaux, 1985). In these sectors, firms increased their output as prices fell, causing prices to fall even more. It was in response to this type of syndrome that firms attempted to limit output and stabilize prices with a variety of collusive arrangements.

Collective action in the form of pooling agreements or cartels (Cell Six) have been classic devices in capitalist economies for regulating output and prices. Before the Civil War, these had rarely existed in American society and had occurred primarily in local or regional markets, but in the late nineteenth century they became increasingly common. At first, firms entered into rather simple and informal agreements to stabilize prices and to lower production levels. When these failed to be effective, more formal arrangements such as trade

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strategy permits firms to increase earnings with high margins per item rather than with volume production, to maintain output during recessions, and to avoid the cheapening of the firms' image by engaging in price reduction (Warren and Pearson, 1932, 1933; U.S. Bureau of the Census, 1960: 115). A few of the industries in which firms successfully pursued this strategy during the late nineteenth century were producers of high quality writing paper, aged bourbon and rye, high quality lubricants, and specialty metals (Lamoreaux, 1985: 16-27; Williamson and Daum, 1959: 274, 464-65, 684-87; Dewing, 1914: 51-52).

associations emerged. By the end of the century, associative behavior had become quite common in a variety of industrial sectors: mechanical industries such as lumber, flooring, furniture, shoes, and other leather products; refining and chemically oriented industries - such as petroleum, rubber footwear, paint, explosives, paper, and glass; industries engaged in mining, the fabricating of metals, and in most types of hardware (Schneiberg and Hollingsworth, 1989). According to Chandler (1977: 317) "No industry appears to have been immune. Only in textiles, apparel, publishing, and printing were the number of trade associations small" (Dewing, 1914; Ripley, 1916; Galambos, 1966; Lamoreaux, 1985; Burns, 1936; Becker, 1971; Williamson and Daum, 1959).

Even though cartel type trade associations became quite pervasive, they generally failed to stabilize output and prices. Cheating invariably occurred, as members would secretly cut prices, increase output, falsify reports, and/or leave the cartel. In most industries, a number of firms failed to join. Even when cartels met with initial success, this simply provided incentives for other firms to enter the industry, thus destablizing prices again.

There were two major reasons why cartel type arrangements of collective behavior were less successful in the United States than in several other capitalist countries at the same time. First, there was the size of the country. In contrast to Europe, most American industries had many more firms, and the larger the number of firms, the more difficult it was to organize and regulate them. Because of the large size of the country, there was more uneven industrial development among regions in the United States than was the case in smaller countries. In general, the larger the country and the more uneven the regional development, the greater the diversity of interests among firms. And the greater the heterogeneity of interests among firms in the same industry, the more difficult it was for collective strategy *via* cartels to be effective.

Another major reason for the ineffectiveness of cartel type arrangements was the fact that American courts and legislatures declared them to be illegal. The courts had long refused to enforce private

contracts which were in restraint of trade or which were designed to develop monopolies. Then in the 1880s, in response to the development of cartel type arrangements, a number of states passed anti-monopoly laws, and in 1890 Congress passed the Sherman Anti-Trust Act. Congress has since expanded this legislation, clearly making cartel type arrangements a violation of federal law. Important reasons why the Americans historically have taken antitrust considerations far more seriously than most European countries are the large size of the country, the uneven regional development, and the low dependence of the country on foreign trade. Had the United States been a small country with relatively few firms in each industry and heavily dependent on foreign trade, no doubt there would have been greater homogeneity of interests and a greater tendency among firms and the state to promote inter-firm cooperation at the industry level in order to assist domestic firms in having a competitive advantage in international markets.

Even though state and federal governments have effectively limited the capacity of trade associations to fix prices and to limit production, it is important to emphasize that trade associations have been important institutions for the coordination of the American economy throughout the twentieth century, though never as densely developed as in a number of European countries. Indeed, during the First World War, the American government encouraged the development of trade associations so that it could more effectively coordinate the war economy. Moreover, Congress passed the National Industrial Recovery Act in 1933 which attempted to organize all manufacturing sectors in order to regulate prices and production - though the Supreme Court later held this legislation to be unconstitutional.

Even if American trade associations (Cell Six) have not generally operated to limit production and to fix prices, they have since the turn of the century provided many coordinating functions for their members: the gathering of information about product markets, the advertising of products, the conducting of research, the aggregating and articulating of member interests, establishing codes of fair competition, the developing of industry standards, the sharing of information about production costs and industry output. These functions have

been more important in industries in which firms have been too small to carry out most of these activities for themselves - competitive industries (e.g. textiles, apparel, shoes) - than in oligopolistic industries (e.g. automobile, steel, copper). Because of the large size of the country, the large number of firms eligible to join associations, and the heterogeneity of interests among firms in the same industry, business associations in the United States have been somewhat less developed and therefore have tended to have less autonomy, fewer resources, and less capacity to govern their members than in those smaller countries in which sectors have had fewer firms and the firms have had more homogeneous interests within the same industry.

2.2 The Unintended Effects of Antitrust Legislation

There were not only numerous cartels in Europe at the turn of the twentieth century, but the courts tended to enforce them (Cornish, 1979). But in America, antitrust law was complex and dense. Ironically, the absence of effective antitrust law in Europe had the effect of perpetuating relatively small family firms, while in America, the evolution of antitrust law had the unintended consequence of accelerating the development of large scale corporations or hierarchical arrangements (Cell Three).

In other words, antitrust law facilitated the transformation of a number of industrial sectors in the American economy. In the United States, the courts firmly ruled that "loose combinations" - e.g. "gentlemen's" agreements, pools, and other types of cartels were illegal under the Sherman Anti-Trust Act. However, firms could not be held to be in violation of the Sherman Act simply because of their size and market share. Thus, "tight combinations" - even if their purpose was to lower output and to raise prices - would not automatically be held in violation of law. Before the courts would rule that consolidations and "tight combinations" were illegal, the government had to build a case based on the evidence of customers and competitors that the firm had engaged in abusive, restrictive, and/or predatory behavior. In order to prosecute firms under the Sherman Act successfully, the government had to demonstrate that a company had acted

with the "intent to restrain trade" and that as a result of this "intent," it had already succeeded or would succeed in the future in obtaining monopoly power. By acting reasonably toward one's competitors - by adopting a live-and-let-live posture toward rivals - firms were permitted to do those things within a "tight combination" that were illegal under a "loose combination" or cartel type arrangement. This over time became known as the "rule of reason." For many years conviction under the Sherman Act required the testimony of competitors or customers in order to demonstrate "intent." It was in this context that Justice McKenna wrote that there could be no restraint of trade as long as there were no complaints (U.S. v. U.S. Steel et al., 251 US 451). This kind of live-and-let-live policy meant that as long as firms did not engage in such "unfair" business practices as exclusive dealing contracts, railroad rebates and other cartel type arrangements, tight consolidations involving horizontal and vertical mergers were acceptable, legal forms of behavior (Lamoreaux, 1985). Thus, the implementation of the Sherman Act encouraged firms to abolish their previous practices of restraining their competitors through loose combination, and to pursue internal strategies (e.g., hierarchical arrangements) to enhance their market position and to stabilize their industries. Even though many Congressmen voted for the Sherman Act because they wanted to maintain a very decentralized, competitive American economy, a long-term consequence of the act was to facilitate the development of horizontal and vertical integration in numerous industries and to enhance concentration of the American economy. In short, the American state in its antitrust policies unintentionally transformed the governance of many manufacturing sectors of the American economy to hierarchical type arrangements (Letwin, 1965; McCurdy, 1979; Pratt, 1980; Thorelli, 1955; Bork, 1978; Fox and Halverson, 1979; Lamoreaux, 1985).

2.3 The Emergence of Hierarchies via Horizontal Integration

Once it was widely understood that contracts establishing loose combinations were illegal, firms resorted to a strategy of merger, and it is in this context that the extensive merger movement of the late nineteenth and early twentieth centuries occurred. Horizontal mergers

occurred with great frequency in industries which were capital intensive, employed strategies of mass production, had undergone rapid expansion prior to the depression of the 1890s, and experienced severe price competition. However, many of the consolidations failed, for they succeeded only when tight integration resulted in economies of scale, led to lower labor costs, or raised barriers to entry in the industry. Thus, horizontal consolidations tended to succeed in industries engaged in high volume, large batch, or continuous process production strategies, in industries which were capital intensive, which were high energy consuming, and which had large mass markets. These included firms in the following industries: food processing, oil, chemicals, primary metals, paper, and consumer durables (e.g. sewing machines, office machines, agricultural machinery, electrical equipment, elevators, and other forms of standardized machinery). Consolidations which had no cost advantage over their competitors tended to fail. Indeed the failure rate was especially high in the following industries: textiles, apparel, leather, shoes, furniture, printing and publishing. Significantly, these were industries in which there were diversified consumer tastes and in which it was relatively easy for new firms to enter the industry.

In the long run, cost advantages over competitors tended to lay in becoming vertically integrated. Whereas horizontal mergers were a form of transformation which addressed interdependencies among firms in the same industry, strategies of vertical integration represented a transformation by which firms confronted their interdependencies with actors on whom they had a dependency relationship - e.g. the relations processors had with producers, distributors, transportation firms, etc. (Chandler, 1977; Galambos, 1966).

2.4 The Emergence of Hierarchies via Vertical Integration

2.4.1 The Strategy of Backward Integration

There were two basic motives for American firms to employ strategies of vertical integration. The first was to reduce the level of uncertainty about the availability of raw materials and transport facilities by

engaging in backward integration, and to attain an outlet for their products by a strategy of forward integration. The second was to enhance their market share by erecting barriers to new competition. From the available historical evidence, it is often difficult to measure the relative importance of each of these motivations, though there was a clear logic to whether firms engaged in forward and/or backward forms of integration, and an understanding of this logic is important to understand the transformation which occurred in the coordination of manufacturing sectors in the first part of the twentieth century.

In general, American firms resorted to strategies of vertical integration because of the inability of markets to coordinate technologically separable production functions. More specifically, backward forms of integration tended to occur when processors had relatively few sources of suppliers for resources on which they were heavily dependent, it was difficult for firms to write contracts for supply far into the future, the technology involving the production process was relatively stable, and the product was in a relatively mature stage of the life cycle. Thus, food processing and tobacco industries tended not to engage in backward forms of integration, for they had large numbers of suppliers, no one of which was capable of producing enough to shape prices. In industries where there were large numbers of producers engaged in non-recurring transactions with processors and there was little uncertainty in the minds of processors about the availability of resources in the future, coordination among actors tended to be coordinated by market transactions rather than within a firm. On the other hand, backward forms of vertical integration were quite common in the oil refining, steel, aluminum, and copper industries - industries in which processing firms believed that they might be vulnerable to having their sources of supply cut off or that they might have to pay monopoly prices.

Where firms were engaged in recurring transactions with other firms for the use of highly specific forms of assets, vertical integration was also a preferred strategy as a means of avoiding monopolistic pricing. Hence, the following industries tended either to develop their own railway cars or their own transportation facilities in order to reduce uncertainty and transacting costs with transportation firms: oil,

chemical, coal, steel, automobile, meat processing. On the other hand, if transportation did not require unusual types of facilities for shipping, firms did not vertically integrate into the transportation industry (Chandler, 1962, 1977; Hennart, 1982; Lamoreaux, 1985; Williamson, 1975, 1985).

However, there was also often an offensive dimension to backward forms of vertical integration. Firms in some industries bought up raw materials in order to limit their competitors' access to materials. In the steel, copper, aluminum, and newsprint industries, a small number of firms gradually gained control of vital ore deposits and timber, thus removing the possibility for other domestic producers to compete. Where there was a threat of competition from abroad, firms in these industries often lobbied for tariff barriers (Smith, 1970; Bain, 1956; Parsons and Ray, 1975; Schroeder, 1953; Fell, 1979).

Research and development also tended increasingly to become vertically integrated in the twentieth century. During the nineteenth century, American manufacturing firms had obtained most of their R and D in stand-alone research organizations. One such organization was Thomas Edison's laboratory in Menlo Park, New Jersey, and in it he developed the light bulb and many other products (Friedel and Israel, 1986). Vertically integrated in-house research became increasingly common, for it was exceedingly difficult for firms to write satisfactory contracts for specifying research on new products which were not yet developed. In short, firms feared that by contracting out research and development, they might lose their proprietary interests to opportunistic contractors. Hence, proprietary considerations were served by tight integration (Teece, 1988). However, firms also used in-house research as a means of restricting competition. For example, American Telephone and Telegraph, General Electric, Westinghouse and numerous other firms used their laboratories to develop patents as a strategy of keeping substitute goods from being developed by their competitors and as a means of enhancing and maintaining market share with similar strategies (Noble, 1977; Reich, 1977, 1980; Passer, 1953).

The main consideration here is that the consolidations which took place during the late nineteenth and early twentieth centuries could keep their dominance over time only by developing some edge over their competitors. These were obtained not only with economies of speed and appropriate management of horizontal consolidations, but where appropriate, firms erected barriers to entry by backward forms of integration, and for a number of years, their superior competitive position could be altered only if other firms duplicated the firm's vertically integrated structure.

2.4.2 The Strategy of Forward Integration

In contrast to the relationship between producers and processors, the logic which transformed the relationship between processors (manufacturers) and distributors was much more complex. The critical consideration involved the role which wholesalers and retailers exerted on the purchase decisions of consumers, and the ability of the retailer to influence the purchase decision of consumers, which depended very much on the nature of the product.

Most relationships between manufacturers and retailers involving low priced consumer goods have been coordinated by simple market transactions. Such products (e.g. food, matches, cigarettes) tended to have low unit prices and were bought very frequently. Because consumers did not invest much time and energy in searching for these products, manufacturers attempted to differentiate their product by creating brand images through advertising. If the manufacturer was successful in creating a brand image, the retailer had little leverage in dealing with the manufacturer, who had to exert very little effort to convince distributors to market the product. In such circumstances, the relationship between manufacturers and distributors was coordinated by market type transactions. On the other hand, the less able the manufacturer was in differentiating the product through advertising, the more the manufacturer was dependent on the distributor. The manufacturer then had an incentive to control the distribution process either by authorizing exclusive dealerships, franchising, or integrating forward into retailing.

American manufacturers have often integrated forward into distribution when they have introduced new complex consumer durable products. In such situations, not only has the public been unaware of the product, but also the normal retail establishments have frequently lacked knowledge about how to operate and to service the product. In general, the more complex the product, and the less sophisticated the buyer, the greater the incentive for forward forms of vertical integration (Hennart, 1982: 86). Thus, in the sewing machine, office equipment, and farm implement industries, manufacturers moved from a market form of coordinating distribution to forward integration to provide not only proper demonstration of their products but also such ancillary services as repairs and credit. Companies such as Singer Sewing Machine, IBM, Honeywell, and Xerox are only a few manufacturers of complex consumer durables which still maintain their own retail outlets (Jack, 1957; Wilkins, 1970; Hennart, 1982).

On the other hand, manufacturers of consumer durables have long resorted to franchising when coordinating of manufacturing and retailing have led to high management costs. When sales have required detailed knowledge of local conditions, manufacturers have found that central direction is inefficient. For example, automobile manufacturers have found that automobile trade-ins vary so much in condition that it is necessary for local retailers to have considerable autonomy to make decisions about prices. Thus, auto and truck manufacturers have tended to market their products through franchised dealers (Caves and Murphy, 1976; Hennart, 1982).

In general, when variations in local conditions are considerable, franchising (Cell Two) has become the preferred strategy over vertical integration. For example, manufacturers of beverage syrups such as Seven-Up and Coca-Cola decided very early to grant franchises to independent local bottlers, for successful wholeselling of soft drinks required in-depth knowledge and close monitoring of the local reselling outlets (Hennart, 1982; Caves and Murphy, 1976: 582).

2.5 Monitoring Networks

2.5.1 The Strategy of Price Leadership

Even after corporate hierarchies were established by horizontal and vertical forms of integration, it was still possible for firms to engage in ruinous price competition with one another. Thus many such firms still wished to engage in some form of industry-wide or collective strategy of stabilizing prices. Though it was illegal to fix prices with cartel type arrangements, oligopolistic type hierarchies frequently engaged in an alternative form of collective price setting: price leadership or what is frequently called dominant firm strategy. In our typology, this form of collective behavior is called a monitoring network. Price leadership existed when the price of the goods in an industry was announced by one firm - usually the largest - and the rest of the firms in an oligopolistically structured industry responded by adopting essentially the same prices. When one firm was much larger than others in the industry, it usually had the most interest in preventing price cutting. It generally had the most capacity to prevent price reductions, as it tended to have the greatest amount of financial resources and unused productive capacity. Moreover, in order to achieve price stability, smaller firms were willing for the largest firm to set industry prices.

The sectors in which price leadership occurred most frequently prior to 1950 were steel, copper, petroleum, agricultural implements, anthracite coal, newsprint, fertilizer, industrial alcohol, cement, and the refining of sugar and corn products. While dominant firm pricing tended to stabilize prices in industries in the short term, in the long run, price leadership was somewhat unstable: the leader's proportion of market share in the industry tended to decline, the differentials among size of firms diminished somewhat, and the leadership tended to decay as a result of competition from other industries or from foreign competitors in the same industry. Because price leadership stabilized the industry in the short term, firms tended not to have high incentives to innovate or to adopt new technologies. Hence, in the long run, firms adopting price leadership as a strategy, tended to decline in efficiency. In this respect, it is interesting to note that while

these industries used dominant firm pricing to their advantage prior to and after World War II, Japanese firms in some of these same industries fiercely engaged in price competition within Japan after the War, and this is a consideration of importance in understanding why Japanese firms were so efficient and successful once they eventually entered the American markets. In short, the Japanese strategy suggests that corporate hierarchies without collective forms of price leadership tend to lead to intensive competitiveness among firms over prices, but high levels of innovativeness and efficiency over the long run (Scherer, 1980: 232 - 236; Stigler, 1968: 108 - 112; Lamoreaux, 1985: 120 - 158; Burns, 1936: 76 - 145).

2.5.2 Sources of Capital and the Emergence of Corporate Interlocks

To understand how important the source of capital potentially is in the coordination of industrial sectors, one need simply to think comparatively. In Japan and Germany, where industrialization occurred somewhat late and where mass markets have always been much smaller than in the United States, large firms before the Second World War were quite dependent on outside financiers for capital - the large banks in Germany and the major financial groups (e.g. *Zaibatsu*) in Japan. Historically it was quite common for Japanese and German firms to rely on one or two major banks for capital. Not only did those banks closely monitor the firms' operations, but banks often held equity in the firms - making the bank-firm relationship quite tight. In Japan there were extensive cross-company forms of stock ownership. These patterns in both countries are important reasons why Japanese and German firms were able to forsake short-term profit maximization in favor of a strategy of long-term goals. In the United States where the equity markets have been much more developed, however, American managers of large firms have been much less dependent on commercial banks for financing. Indeed, during part of the twentieth century, the proportion of industrial funds contributed by commercial bank loans to American firms has been among the lowest in the world (Oliver and Wilkinson, 1988; Ackroyd, et al., 1988).

The capital markets developed earlier and became more important in the development of capital intensive industries in the United States because it was an earlier industrializer. Substantial profits generated from textiles and sailing ships were available for investment purposes in the late nineteenth and early twentieth centuries. Specifically, it was the investment banking houses in the United States which served as the intermediary between those in need of capital and those having capital to invest, and without this intermediary to monitor investments and corporate practices, many large scale hierarchical type arrangements could not have emerged in the United States during the late nineteenth and early twentieth centuries.

For example, American investment banks not only channelled investment capital into American industry during the late nineteenth and early twentieth centuries, but they also imposed themselves on the boards of directors of numerous firms in order to convince investors that their investments were being carefully monitored and were relatively safe. The role of a few investment banks was so great in transforming the American railroad industry during the late nineteenth century that they could determine which railroads would grow and which would not, which areas of the country would have railroad expansion, and how many railroads would be established between major cities (Kotz, 1978; Chandler, 1956; Carosso, 1970; Moody, 1919; Navin and Sears, 1955). The most powerful investment bank was J.P. Morgan and Company which had access to vast amounts of capital because of its close financial ties with various New York commercial banks and insurance companies. With its power to provide capital and promote consolidations, the House of Morgan and its financial associates by 1912 exercised control through a system of interlocking directorships over a dozen major railroad systems, several of the nation's largest urban transportation systems, United States Steel, International Harvester, General Electric, American Telephone and Telegraph, and Western Union. In addition, Kuhn, Loeb and Company and the Rockefellers, through their control of the National City Bank, also exercised control over a number of companies - among which were Westinghouse Electric, Standard Oil, the Union Pacific Railroad, and Amalgamated Copper - predecessor of Anaconda

Copper (U.S., Congress, House Banking and Currency Committee, 1913; Kotz, 1978; Nevins, 1953).

By channelling investment capital into these various industries, these investment banks played an important role in transforming and stabilizing the railway, steel, copper, telephone, oil, and electric products industries during the late nineteenth and early twentieth centuries. Firms within these industries may have become large scale hierarchies (Cell Three), but they were embedded in a well established monitoring network (Cell Four) which was extremely important as a governance mechanism. Without the monitoring and discipline exercised by these investment banks, these hierarchies would not have emerged when they did and in the same form. Moreover, without the key role played by investment banks in promoting mergers in the late nineteenth and twentieth centuries, these industries would have been much more unstable. But after 1912, the role of investment banks as a monitoring institution for these industries declined. Thus, for several reasons, there was a further transformation in the coordination of these industries.

State policy was the most important reason for the declining role of investment banking in governing these industries. For example, the Clayton Anti-Trust Act of 1914 made interlocking directorships among large banks and trusts illegal. Moreover, it forbade a corporation to acquire the stock of another if the acquisition reduced competition in the industry. In the longer term, the Clayton Act tended to reduce the ability of investment banks and firms to carry out a long-term strategy of promoting a community of interests among firms either in the same or in complementary industries - as was the case with the *Zaibatsu* and later the *Keiretsu* in Japan, or with the relationship between banks and large firms in Germany. In addition, the American government in 1933 forced a sharp separation between commercial and investment banking. From that point on, investment banks lost much of their access to capital and had diminished capacity to regulate or govern nonfinancial corporations. The net result was that both types of banks lost much of their control over the modern American corporation.

As a consequence, American nonfinancial corporations became dependent on liquid financial markets for raising capital rather than on the kinds of stable networks which Morgan and other financial banking houses had established at the turn of the century. Increasingly, corporate managers became dependent on the whims and strategies of stockholders and bond owners. When owners of American securities have thought that their investment was not properly managed - as reflected by price earnings ratios, current dividends or interest on the value of the bonds - they have tended to sell their assets. Since American management during the past half century has been evaluated more and more by the current selling price of the stocks and bonds of the company which they manage, the American corporate structure has increasingly been embedded in an institutional arrangement which places strong incentives on management to maximize short-term considerations at the expense of engaging in long-term strategy. Below, we will observe how this process has placed constraints on the type of transformations which have occurred at subsequent points in time.

2.6 Industrial Relations and Hierarchical Coordination

The way in which relations between employees and employers are coordinated is of fundamental importance in shaping the performance of a capitalist economy. Moreover, the type of coordination between labor and capital places limits on the type of transformation which can occur in an industry. In the United States, there has been considerable variation in the way that labor-management relations have been coordinated, not only over the last century and a half but among different sectors of the economy. For example, during the 1870s and 1880s, inside contracting (Cell Two: "subcontracting") was a common form of employee/employer relations in the iron, steel, and construction industries. Under this system, the owners of a firm generally provided floor space, machinery, raw materials, and capital, and the work was carried out by inside contractors who hired their own employees, supervised the work process and received a piece rate from the firm. Under this system, the owners of the dominant firm had little technical knowledge about the work process and limited

their involvement to negotiating contracts with inside contractors, inspecting the flow of products, and assuming responsibility for final sales. Contractors exercised considerable autonomy in determining when to work, how much to work, and how the work would be done. However, as Braverman points out, this type of subcontracting was plagued by problems of irregularity of production, loss of materials in transit, embezzlement, slowness of manufacture, lack of uniformity, and uncertainty about product quality. But most of all, firms were limited in their ability to change the processes of production (Braverman, 1974: 60-61. See also Stone, 1974; Williamson, 1975, 1985; Buttrick, 1952). In other industries, work was organized very differently. There were artisans who worked as regular employees in a single firm - e.g. shoemakers, wagon, bicycle, furniture makers. They tended to be highly skilled and were very much in control of the work process.

During the late nineteenth century, the communication and transportation revolution permitted firms to expand the size of their markets if they could only produce more. And it was the expansion of the market which transformed the system of production in many industrial sectors to one of mass production. Through the 1950s, the model of mass production became the undisputed means of enhancing industrial efficiency in numerous sectors of the American economy. For about a century, industrial economists assumed that the most efficient means of reducing costs was by employing economies of scale and a standardized system of production. Mass production became the basic strategy for expanding markets, and expanding markets became the means of minimizing costs.

Firms engaged in mass production followed a distinctive logic. They employed a particular form of industrial relations, used specific types of machinery, and related in particular ways to other firms in the manufacturing process. Mass producers took seriously Adam Smith's prescription that the most efficient way of organizing a factory was to routinize and differentiate workers' tasks down to the smallest detail. The key to breaking down manufacturing into even more detailed operations was to employ specific purpose machinery for each manufacturing task along an assembly line. In much neo-liberal

thinking about mass production, employment was viewed as an impersonal economic exchange relationship, and machines (when profitable), could easily be substituted for workers. Whatever labor was needed to work on assembly lines could be hired or dismissed on short notice. As machinery became more and more specialized, the skill and autonomy of individual workers often declined - though the process of "de-skilling" varied from industry to industry. As employees became increasingly "de-skilled," one worker could easily be exchanged for another. Management had little incentive to engage in long-term contracts with workers or to invest in the skills of employees.

Prior to 1960, mass production strategies were dominant among (1) mass producers of low priced, semi-perishable packaged products, relying on large batch and continuous process technology - e.g. cigarettes, breakfast cereals, canned foods, and soaps (2) processors of perishable products for regional and national markets - e.g. meat packing and processing firms (3) manufacturers of mass-produced consumer durables which used continuous process technology - e.g. sewing machines, automobiles, office equipment and farm implements (4) makers of high margin production goods that were technologically complex but standardized - e.g. elevators and pumps (5) other industries which were capital intensive, high energy consuming and which relied on continuous large batch production technology for mass markets - e.g. chemicals, oil refining, glass, paper, and rubber products (Hollingsworth and Lindberg, 1985).

Despite the fact that standardized mass production was the dominant technological paradigm for a number of decades, there were always industries which were organized differently. In short, there was considerable diversity in production strategies among firms and industrial sectors. Standardized mass production always demanded the existence of industries organized along completely opposite principles. For example, the special purpose machines necessary for mass production could not be mass produced but had to be custom made. Therefore, it was always necessary that there be a sizeable work force having broad and flexible skills with the capability of continually redesigning, reorganizing, and reproducing special purpose

machines. In other words, industrial dualism was always a logical necessity even when standardized production was the dominant technology (Piore, 1980).

Mass production and the "de-skilling" associated with it was also inappropriate in industries if processes of production were labor intensive and low in energy consumption and if the markets for the products were quite heterogeneous. Examples included firms involved in lumber products, printing and publishing, and residential construction. In these industries, craft based work was dominant, and it was essentially incompatible with systems of mass production, and thus continued. With craft work, each product was relatively unique, requiring considerable worker autonomy. Hence, craft type activities took place in settings involving long-term stable contracts, often resulting in what Eccles (1981) has called the "quasi-firm" and which is analogous to obligational networks in the typology.

By 1950, numerous manufacturing sectors of the American economy were tightly integrated into a system of mass production, in which the whole was greater than the sum of the parts. This form of production was dependent on stable and relatively defined but very large markets for products which were usually low in their technological complexity and relatively slow in their rate of technological change. Hierarchical governance structures were particularly well suited for mass production and distribution. When the transaction costs of working with external suppliers and distributors became high, firms frequently resorted to vertically integrated structures and performed diverse functions in-house. Such a system was complemented and supported by public sector mass education which provided a labor force with the basic training in reading, writing, and discipline to work on assembly lines. The capital markets were sufficiently well developed to provide the capital the standardized system of production required. Because the American model of coordinating mass production with hierarchical institutional arrangements was widely thought to be the undisputed means of enhancing industrial efficiency, many observers believed through the 1950s that the hierarchical form of mass production was the direction in which

manufacturing sectors were converging both within and across countries.

3. The United States Economy Since 1950: The Transformation from Hierarchies to Networks

As suggested above, many of America's industrial firms had succeeded with a hierarchical form of coordination because the barriers to entry were too high for effective competition from other firms - both domestic and foreign - in the same industry. But the day of reckoning was to come. Following the Second World War, various European and Japanese manufacturers adopted the latest technology in industry after industry at a time when transportation costs were declining and markets for high quality consumer goods - as distinct from standardized products - were expanding. Moreover, manufacturers in Japan, Germany, and several other countries had never become as committed to the hierarchical form of standardized mass production as had manufacturers in many sectors of the American economy. Indeed, those countries had a very different form of coordinating manufacturing sectors - coordination forms geared to flexible forms of production, such as obligational networks based on subcontracting coalitions, strategic alliances rather than hierarchies based on vertical integration, and collective forms of governance.

In Japan, Germany, and other countries where industrialization occurred later and where markets were smaller, forms of coordination which were less hierarchical but more network in nature had long been common. These forms of coordination were more effective in coping with their environment than hierarchical type arrangements once markets became unstable and consumers increasingly demanded products based on technologies which were highly complex and changing very rapidly. In other words, hierarchical forms of coordinating industrial production are quite effective when markets are quite stable, consumer tastes are relatively homogeneous, and the technology is not highly complex and is slow to change. But when markets are less stable, consumer tastes are more heterogeneous, and

the technology of products is complex and fast changing, various types of obligational networks (Cell Two) tend to be more appropriate for coordinating economic transactions among various types of actors.

During the 1950s and 1960s, the managers of most American manufacturing firms were unaware that obligational networks, as more efficient organizational forms, would eventually challenge firms in many older American industries - e.g. automobiles, steel, consumer electronics, etc. Nor were they highly conscious that in newer American industries in which the technology was highly complex and changing very rapidly - pharmaceuticals and other bio-tech industries, aero-space and computer related industries, etc. - various types of obligational networks were becoming a dominant form of coordination. But astute observers were noting that as the demand for more flexible forms of production increased, obligational networks provided flexibility in coordination far more so than hierarchically oriented strategies in vertically integrated firms (which in an earlier era had been engaged in producing standardized products).

Following the first world oil crisis of the 1970s, many American manufacturers who had been engaged in producing standardized products found themselves in the position of having products for which there was little demand, and yet their rigid system of production meant that they had little capacity to produce the products which were in demand. Once again, the teachings of Adam Smith were instructive: standardized production and an increasing division of labor were limited by the size of the market, but now markets were shrinking as they became increasingly saturated, volatile, and/or unstable.

Many American firms engaged in producing standardized products responded to saturated markets and the decline in profits simply by trying to reduce costs. Some froze or rolled back their employees' wages. Others took advantage of the declining costs of transportation and communication by shifting production to low wage areas at home (e.g. the meat processing industry) and/or abroad (as in the auto industry). Most reduced their labor force and introduced new forms of automated equipment. Many firms and their trade associations -

especially in the shoe, textile, steel, and automobile industries - pressured Washington for protection against foreign competitors. However, these were only temporary expedients, for it became increasingly evident that standardized systems of production were incompatible with volatile and unstable markets. Even when the market demand for certain goods remained relatively stable, less developed countries with lower wage rates were able to copy standardized products and sell them in the United States at lower prices. Hence, American mass producers increasingly faced severe price competition and losses.

Eventually, it became increasingly obvious that a different coordinating strategy was needed in many manufacturing sectors of advanced capitalist societies. And the question was whether industries in the United States, historically coordinated predominantly by hierarchical strategies, could shift to a mix of more flexible and less hierarchical coordinating strategies employed by their foreign competitors. The need for different forms of coordination did not, of course, extend to all industries. Standardized production strategies associated with hierarchical forms of coordination continued to be effective in industries where the technology was not very complex and rapidly changing, consumer tastes were relatively homogeneous, and markets were relatively stable.

The coordinating form which was slowly emerging in numerous manufacturing sectors was one involving flexible forms of production, with coordination based on a variety of networks. This was not an entirely new paradigm in the United States, but it had long been subordinate to the mass production perspective. However, a flexible system of production involves vastly different views of labor management relations, levels of skills and work tasks, and relations among producers, processors, and distributors. Whereas standardized production was characterized by an increasing hierarchically imposed division of labor, flexible systems of production require work forces with broad levels of skills, employees who have "learned to learn" about new technologies and can easily shift from one work task to another, and who can work closely and cooperatively with other employees and management. Labor relations must be structured so

that people of various ranks engage in meaningful consultation with one another, rather than constantly responding to commands. Whereas many firms which earlier had engaged in mass production tended to pursue hierarchical strategies of vertical integration in order to lower transaction costs (Chandler, 1977; Williamson, 1975, 1985), manufacturing firms producing products with rapidly changing technologies reduce transaction costs by relying on long-term stable networks with their suppliers and distributors. The historic strengths of vertical production in the auto, aircraft, steel, consumer electronics, and many other industries are increasingly perceived to have enormous costs in a world in which markets are volatile and the technology is increasingly complex and changing. The older, more hierarchically vertically integrated firms have increasingly become saddled with structural inertia, slow response time, inability to develop in-house components with complex technologies and high production costs.

How widespread have flexible systems of production become across manufacturing sectors of the American economy and why have flexible forms of production become more pervasive in some sectors than in others? Unfortunately, it is difficult to determine the extent to which firms and sectors are moving in the direction of a flexible system of production. From the exterior of firms, it is often difficult to code production systems. Public and private statistics are often unreliable sources for understanding the internal labor markets of firms and the kinds of relationships which exist among producers, processors, and distributors. Even so, there is a great deal of qualitative and quantitative data, as well as in-depth studies of firms and industries which make it possible to assess the pervasiveness of flexible forms of production. To understand why firms in some sectors have adopted flexible methods of production more than others, the analysis must be sensitive to the following variables: the degree of and nature of international competitiveness; the level of technological complexity and rate of technological change of the products; the degree to which other types of production arrangements had already become highly institutionalized within the sector; whether the industry has a long or a short history; and the potential of firms in an industry to engage in collective behavior.

For purposes of this discussion, a flexible system of production is simply the inverse of mass production. It is the production of goods by means of general-purpose resources rather than vice-versa, a system of production which can quickly adapt to different market demands. Thus, firms which are embedded in obligational networks and which have flexible strategies of production have enhanced potential to be competitive in volatile environments, for they can make an ever-changing range of goods to appeal to specialized tastes with customized designs (Sabel and Zeitlin, 1985; Streeck, 1987b; Piore and Sabel, 1984; Kristensen, 1986; Friedman, 1988).

Markets for many products are changing with great speed, and in such sectors, it is less appropriate for firms to invest in product-specific machines and workers with a capability of doing only one thing. Production systems are closely linked to and conditioned by technology. For example, the emergence of microelectronic circuitry in numerous industries has done much to revolutionize systems of production. In short, the flexibility of microelectronic circuitry now permits firms to produce a variety of products in production runs of variable sizes. Because employees and general purpose machines can be used for many different purposes in a flexible production system, manufacturing must be coordinated in ways that permit its various parts to be combined and re-combined; and the extent of flexibility is measured by the ease with which suppliers, machinery and workers can be rearranged for different tasks (Kristensen, 1986: 38). However, flexible producers require a work force with high levels of skills, workers who can make changes on their own, with less hierarchical work supervision than under a mass production system. Because of the need to shift production strategies quickly, management must be able to depend on employees to assume initiative, to integrate conception of tasks with execution, and to make specific deductions from general directives. Moreover, firms engaged in flexible systems of production tend to be less vertically integrated than firms engaged in mass production, and to be in close technical contact with other firms. Thus, firms operating in environments with volatile markets must adopt strategies that rely on highly skilled work forces operating with minimal supervision, general-purpose machinery, and flexible network forms of coordination with other producers.

As a result of microelectronic production technology, mass producers have been able to improve the quality and diversity of their products and to reduce the size of their production runs. At the same time, many craft oriented firms have been able to increase their production volume without sacrificing their quality standards. And in the process, such large and small firms increasingly compete in terms of quality as well as price. (Sorge and Streeck, 1988).[3]

As flexible production systems become more pervasive, there is a tendency for mass markets to be broken up into specialized segments, for consumers in more affluent environments to demand more customized and/or diversified products, and for firms to be smaller than would be the case with a mass production system. Even in capital intensive industries, product diversification and small batch production are becoming very common. Flexible mini-mills are taking over an increasing share of the steel industry from the integrated mills. Large chemical companies have found it necessary to become increasingly flexible in order to produce more specialty products in small volume. Automobile factories increasingly produce thousands of varieties of cars in small batches. Thus, manufacturing firms with flexible production systems must develop a wide range of options for coping with demand shifts, material shortages, foreign competition, and other types of disruptions. Whereas firms engaged in mass production historically had a tendency to respond to market disruptions by lowering prices, reducing the scale of operations, and dis-

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[3] In writing this paper, I am very indebted to the stimulating essays by Charles Sable (see bibliography). However, I do have profound differences with Sable. Whereas he sees the introduction of microelectronic technology as introducing a new industrial divide in which small producers will become increasingly dominant, my perception of capitalist development is less utopian. My paper assumes that very large firms in many industries will also adopt microelectronic circuitry technology and will over the long term compete very successfully against small firms. In short, there is likely to be great variability across industries with large firms dominating some industries (e.g. automobiles) and small firms doing very well in others (see the criticisms of Sable's perspectives in the essays in Hyman and Streeck (1988).

charging employees and reducing wages, firms with flexible systems of production have tended to respond by developing new market niches and new products. And the emphasis on new products tends to contribute to more expert skills among management, workers, and subcontractors (Friedman, 1988; Sabel, 1987a; Lazerson, 1988), thus increasing the demand for ever more products.

Even if there is an ideal typical form of industrial organization which we may label as a flexible production system, there is no single pattern of flexible production. However, there are several strategies of coordinating flexible systems of production which are becoming quite common. Consistent with the typology in Figure One, the coordinating form which is becoming increasingly pervasive in advanced capitalist societies is the obligational network.

3.1 Obligational Networks

Obligational networks assume autonomy of linked firms working in an interdependent fashion. There are several forms of relationships subsumed under the term obligational networks: (1) subcontracting among firms (2) cooperative contracting among small firms, and (3) strategic alliances and joint ventures among large and small firms, both at the nation state and global level. *While it is possible analytically to differentiate these various forms of coordination, they often overlap and are integrated in practice.* All of these forms of obligational networks involve actors in pursuit of the interests of individual firms. In other words, this form of coordination is not part of an effort to govern collectively an entire industry, though obligational relationships function most effectively when they are embedded in a rich set of promotional networks.

3.1.1 Subcontracting Among Firms

Increasingly, highly capital intensive manufacturing firms producing products which have technologies which are complex and rapidly changing are engaging in long-term stable relationships with other

firms. One type of relationship which is becoming quite common can be labeled as subcontracting. In contrast to vertical integration strategies for mass, standardized production, large firms in many manufacturing sectors are increasingly attempting to base their production process on many smaller scale suppliers. Examples are found in the automobile, consumer and durable electronic goods, metal products, aircraft, aerospace, and computer industries. Because the American automobile industry has historically been more vertically integrated than many of its foreign competitors (e.g. the Japanese), it has been somewhat slow to "dis-integrate vertically," but even in the American automobile industry, the trend is toward long-term stable relationships among sub-contractors rather than the construction of components in-house. Such subcontracting provides the opportunity to move away from mass standardized production and to develop more diversified, higher quality systems of production.

In most of these industries, there is usually a hierarchy of firms - the very large corporation at the top and a number of smaller firms under its influence. By relying on subcontracting, larger firms are able to reduce the amount of capital which they must invest, to change quickly the technology upon which their production is based, and to produce a variety of goods in small and medium batches using many kinds of materials and components. In general, the more complex the firm's technology and the better skilled the firm's labor force, the more autonomous the subcontracting firm. On the other hand, subcontracting is not very common in certain industries: furniture, food processing, petroleum, coal, ceramics, and stone products industries where the technology is not very complex and rapidly changing.

The industrial relations system of industries is increasingly the key to a diversified quality system of production, to more obligatory network types of coordination. To attain diversification, and high quality production, firms must have a labor force with very flexible and broad job skills. But in order to maintain such a labor force, medium- and long-term manpower planning and training are necessary (Hyman and Streeck, 1988).

In order to stay at the cutting edge of technology, large and small firms are becoming increasingly interdependent. Just as large firms increasingly have broadly trained workers in order to remain competitive in world markets, so also have subcontractors had to train their workers according to flexible principles. This has become feasible as relationships among firms have become long term and stable. Arm's length contracting based on short-term market pricing is not conducive to investing in the long-term training of a highly skilled work force.

Increasingly, large firms in the auto, aircraft, aerospace, computer and other industries must provide capital, marketing, and research services to their suppliers. As products become more complex and change rapidly, many large firms no longer know exactly how to produce their products. To keep up with changes in the market, large and small firms must learn from one another about new markets and new technologies. To facilitate this, middle level management increasingly moves back and forth between suppliers and final assemblers. Meantime, price considerations have become less important in shaping the relationships among suppliers and customers (Hyman and Streeck, 1988; Sabel, 1987a, 1987b).

As subcontractors work with complex technology, they increasingly attempt to develop long-term stable relationships with several companies, reducing their dependence on a single large firm. In some sectors, smaller firms not only have increased the number of buyers to which they sell, but also have diversified into several product lines. Through diversification, firms protect themselves in the event of a downturn in the market for a single product, and they become immune from "strong arm" tactics that could be exerted from a single customer. It is not uncommon for firms which make dies and molds for auto assemblers as well as parts for aircraft assemblers, to make tractor parts as well as specialty machinery for electronics and computer industries.

The key to high quality product diversification is technology based on a highly and broadly trained labor force using microelectronic machinery. This strategy has increasingly shifted competition away from

a focus on prices to greater concern with product quality and other considerations of work force capability to meet rapidly changing demands.

While it is popular today to minimize the role of technology in dictating the strategies of firms and the governance arrangements dominant in particular industries, advances in semiconductor and computer technology since the 1970s have made it possible to develop a generation of machine tools which can easily adapt to new tasks and products. Before these advances in computerized technology, firms generally had to obtain new equipment whenever they produced different products. For firms engaged in mass production, it generally meant replacing the machinery. By relying on microelectronic technology, firms can put their manufacturing equipment to new uses simply by reprogramming the machinery. Because microelectronic technologies have almost limitless uses in a vast array of industrial sectors, firms can more easily shift into different product lines - assuming they have broadly trained workers.

Computerized technology alone cannot assure the emergence of flexible production systems and the existence of a broadly trained labor force. Indeed, firms engaged in standardized production often use computer based technologies for rather rigid purposes. In many American industries, the paradigm of mass production is declining more rapidly than a new paradigm of flexible, diversified quality production is being institutionalized. Ideally, before a production system based on an obligatory form of networks can be highly effective, firms must be intricately embedded into an institutionalized infrastructure which provides for training of labor, extensive links with research institutes and business associations, cooperation with local governments and various types of credit institutions - in short in a system of promotional networks (Cell Five). Moreover, firms must have a willingness to cooperate and have trusting relationships with their competitors, suppliers, and customers. However, the degree to which firms are embedded into these two types of networks varies greatly across industries (Sorge and Streeck, 1988; Piore and Sabel, 1984; Herrigel, 1989).

Even if this type of industrial coordination becomes increasingly more common, it will not completely replace hierarchical processes of standardized production. Flexible production processes require standardized production processes. For example, Herrigel (1989) has demonstrated that industrial sectors employing flexible, diversified and high quality forms of production are dependent on the mass production of flexible machines. Moreover, the customization of many products is based on the standardized production of component parts. Thus, it is still uncertain how widespread the diffusion of a flexible system of production will be across sectors of advanced capitalist societies.

The study of firms employing a strategy of diversified quality production and engaging in long-term relations with firms in several industries poses difficult problems for sectoral analysis, for as firms become increasingly flexible in their production capabilities, they tend to engage in more and more product diversification. But as firms move into multiple product lines, the boundaries among sectors become increasingly blurred. Of course, product diversification within firms is not new, as the histories of the chemical and other industries demonstrate (Chandler, 1962). But more recently the pace of diversification is accelerating. Textile firms are producing medical supplies, optical fiber materials, and print distributing boards; transport machinery makers have shifted to the general machinery sector and are producing motors and industrial machinery; chemical firms are moving into applied areas of biotechnology and are producing medical supplies and enzyme products, print distributing boards, electromagnetic materials, resins related to electronic products, carbon and optical fibers, as well as video tapes. Food manufacturers are moving into the service sector, particularly into the restaurant business; steel manufacturers are making electromagnetic products. On the other hand, there has been much less diversification in petroleum, paper and pulp, and rubber industries.

3.1.2 Cooperative (Relational) Contracting Among Small Firms

In this institutional form, firms are small and skill intensive. Each small shop specializes in one phase in the chain of production, but is engaged in long-term stable relations with other firms in the same community or region. These relationships are open-ended and continuous, with relationships being periodically redefined. This form of production is especially common in the industrial areas of Italy, in Smaland in southern Sweden, in the western part of Denmark, and in different regions of Japan. What is remarkable is the similarity in the structure and process of these small firms whether they exist in Japan or in Western Europe. In general, they rely heavily on microelectronic tools and extremely well trained labor to produce high quality shoes, silverware and cutlery, ceramics, textiles, apparel, agricultural implements, special machines, electronic musical instruments, and well-designed furniture. As each shop tends to engage in only one task in a complex chain of production, the long-term stable relationship among firms is similar to the following model: A + B + C + D + E + F. Thus in the shoe industry, one firm makes the sole and another the heel, another cuts and sews the leather, etc. Cooperative contracting is based on high interdependence, with each actor completely dependent on every other for its survival. This type of production is labeled "cooperative contracting" rather than "subcontracting," though the final product of all of these firms may ultimately go to a large distributor as some form of sub-contracting.

There is increasing evidence that in these industries this type of cooperative arrangement leads to higher levels of productivity than an hierarchical type arrangement. At one time the United States mass produced shoes, cutlery, and many other products in which this coordinating form exists, but because of their impoverished institutional environment, American firms in these industries have lacked the capacity to be transformed from a coordinating system based on hierarchical forms of mass production to one of cooperative contracting. And lacking the capacity to develop this form of coordination, American firms in these industries either are declining or have already died - though firms in these industries perform extremely well in some advanced capitalist societies. Why is this the case?

Cooperative contracting tends to flourish in those regions which historically had strong artisan traditions and where there had also been a tradition of small firms engaging in strong collective action - e.g. where highly institutionalized promotional networks exist. However, the United States either never had a strong artisan tradition in these industries or - if the tradition ever existed - it succumbed long ago to hierarchical forms of mass production. Moreover, the tradition of antitrust legislation, the strong ethno-cultural cleavages in American society, the large size of the country, and heterogeneity of interests among firms in the same industry have placed severe constraints on the ability of firms in these industries to develop the kind of institutionalized networks for sustaining effective collective actions. In other words, cooperative contracting among small firms can be effective only if they are embedded in an environment consisting of a highly institutionalized set of promotional networks.

With cooperative contracting, each firm is dependent on a collectivity of firms - cooperative pacts and local associations in order to regulate their relations - to carry out a multiplicity of tasks in separate work settings that in the United States was historically more likely to have been carried out in a large factory. Elsewhere, small firms in these industries even join together to reduce all kinds of overhead costs - rent, insurance, accounting and it is not uncommon that they borrow machinery from one another. Through negotiations conducted by their business associations, they often receive special subsidies from local, regional and national governments. Moreover, they are embedded in a set of long-term stable networks with specialized banks, credit associations and government lending agencies. Efficiencies are achieved by rapid responses to market needs because of the flexible organizational structure of the entire system (Lazerson, 1988; Friedman, 1988; Sabel, 1987a).

While declines in business cycles or in specific markets can injure all the firms engaged in this kind of relationship, when these conditions occur, firms cooperate in the development of new products. Because it is not easy to shift to different product markets, firms share in the costs of continual training and retraining their workers and the acquisition of new machinery. Indeed, cooperative production among

potential competitors helps producers to prevent downward price competition and wage squeezing. Familiarity breeds cooperation and a willingness to share risks (Lazerson, 1988; Sabel, 1987a).

The survival of this kind of relationship depends on the intensity of group solidarity among firms. The stronger their sense of collectivity, the more successful they are in regulating the relations between owners of firms and their employees. Strong group solidarity permits small firms to resist high wage demands and profit pressures from large distributors. Otherwise, firms might lay off workers, reduce wages, move elsewhere, or close down.

Though this type of cooperative contracting is pervasive among small firms in Japan, Italy, and elsewhere, it would be a mistake to assume that this form of production is common across all manufacturing sectors in which small firms exist in large numbers. For example, the cooperative contract model is much less common in the production of printing, pencils, and food products - in short, in industries in which the skill levels have remained quite low, and the technology of production has remained standardized and slow to change.

3.1.3 Strategic Alliances and Joint Ventures Among Firms

Firms in a number of industries which historically conducted transactions with either a corporate strategy of vertical integration or in market type transactions are presently conducting these transactions through obligational networks, specific forms of which are here labeled as joint ventures. These are also forms of obligational networks and are becoming increasingly common in advanced capitalist societies.

These relationships are of a different order from the cooperative contracting and subcontracting discussed above. In the language of agency theory, firms in this type of relationship are both principals and agents: risk-takers who allocate tasks and share in the gains or losses of the final product (Powell, 1988). These relationships have the potential to be long-term and durable, much more flexible than the

type of hierarchical arrangements which historically characterized firms specializing in standardized production.

In an era when the rate of technological change was relatively slow, production processes in an industry relatively standardized, and production runs quite long, vertical integration was an appropriate strategy for firms which faced high uncertainties and small numbers in their relationships with either suppliers or distributors. However, there have always been costs to integrating interdependent relationships within one firm. For example, there is high potential for bureaucratic rigidities to develop in vertically integrated firms. Moreover, it becomes increasingly inefficient for firms to produce everything in house when technology is very complex and changes very rapidly.

Historically, some companies developed special long-term relationships with firms in other countries in order to gain market access or to transfer technology through licensing agreements. In more recent years, however, joint ventures among firms have become more varied in goal and scope - e.g. the search for economies of scale, the need for market access, the sharing of risks, the need to have access to technology and to pool know-how. Moreover, the frequency of these relationships has increased - especially in industries involving high cost products with complex and rapidly changing technologies. Like mergers, strategic alliances and joint ventures offer benefits quickly, but without the necessity of giving up much of one's independence. Unfortunately, our knowledge about the conditions under which strategic alliances emerge - at both the empirical and theoretical level - is still quite limited.

In general, joint ventures function best when the various actors are embedded in a highly institutionalized set of promotional networks which facilitate trust and cooperation. However, the American political economy has a strong neo-liberal tradition with networks designed to promote cooperation among actors in the same industry being poorly developed - especially in more traditional industries. But as the section below will argue, cooperative and collective forms of

networks have been better developed in newer industries where the technology is more complex and changing more rapidly.

3.2 The Importance of Multilateral and Collective Action

Hierarchical forms of governance are based on the assumption that in order to reduce uncertainty among actors, relationships must be coordinated within a firm. Markets tend to generate fierce competition among like actors, and through such competition, actors attempt to eliminate their competitors. But in advanced capitalist societies - when obligational networks become more pervasive as a governance form - different forms of behavior become manifest.

Due to high research and development costs, rapid change in products and volatile markets, it is no longer possible, in many industries, to coordinate as many things in-house as was possible during the age of mass standardization. Markets and hierarchies can work best when firms are embedded in an impoverished institutional environment. But for obligational networks to operate efficiently, they must be embedded in an institutional environment which is highly developed with institutions which promote cooperation between processors and suppliers and even among their competitors, an environment which facilitates the exchange of information among competitors as well as among suppliers and producers. Firms must also be embedded in an environment which develops rich, broad and flexible skills for the work force. In short, advanced capitalist societies require cooperative relations and collective resources far in excess to what is needed for markets and hierarchies to function effectively and in excess of what single firms can develop for themselves (Streeck 1987a, 1988). These collective arrangements are displayed in the right hand column of Figure One.

Highly effective sharing of information and cooperation among various actors requires all of the following: collective action on the part of competitors, training centers - whether within vocational schools, universities, or other institutions - and institutions willing to provide financing on a long-term basis. In other words, obligational

networks function best when they are embedded in an institutional environment with rich multilateral or collective dimensions which provide these conditions.

Of course, a number of American industries have long been coordinated by obligational networks which have also been firmly embedded in an institutional environment of promotional networks. In the American case, some of the most effective promotional networks (Cell Five) have involved cooperative relations among university based firms, commercial firms in the same industry, and the state and federal governments. For example, American agriculture owes much of its twentieth century success to the way that agricultural producers have been embedded in a rich institutional environment which has provided cooperative activity among producers, the dissemination by the state of university based knowledge to agricultural scientists, and financial assistance from a number of public and quasi-public institutions. Another sector with a long history of being embedded in promotional networks is the American chemical industry. Since the turn of the century, chemical firms have been extensively involved in promotional networks which have consisted of university based scientists and from time to time the federal government. It is no exaggeration to argue that those countries which have lacked promotional networks involving rich university resources for the training of chemists and for the conduct of non-proprietary research have failed to develop a successful chemical industry.[4]

The key actor in promoting multilateral activity among producers in American society has generally been the American state. Significantly, the American state has rarely taken the lead in developing promotional networks among manufacturing firms which historically were coordinated primarily by markets and/or hierarchies. Rather, the American state has been most active during the past half century in developing promotional networks for manufacturing firms which have addressed the military and health related needs of the society. For example, the following are some of the products and technologies

[4] I am indebted to Richard Nelson of Columbia University for this observation.

derived from firms coordinated by obligational networks which were firmly embedded in an environment (e.g. promotional networks) involving cooperative relations with university based scientists and engineers, the state - especially the military - and other firms - both suppliers and competitors: commercial aircraft, semi-conductors, integrated circuits, computers, nuclear power, microwave telecommunications, new materials such as high strength steel alloys, fiber-reinforced plastics, titanium, and new methods of fabricating metals such as numerical-controlled machine tools. Without obligational networks embedded in promotional networks involving multilateral relations with universities, various agencies and departments of the federal government, and numerous business firms, these technologies and products could not have occurred in the United States at the time they did (Landau and Rosenberg, 1986; Nelson, 1982).

The importance of obligational networks being embedded in an environment rich with promotional networks is that it links together organizations having different knowledge bases. This kind of coordination is not possible within a single hierarchy, as no firm has had the capacity to incorporate all the knowledge and resources to develop any one of the technologies and products listed above. Nor could a single firm linked with its suppliers in an obligational network have developed these products. They could be developed only because obligational networks were embedded in an environment with highly developed promotional networks. In this context, the Agency for Science and Research reported in 1985 that twenty percent of the firms it surveyed were linked with other firms, universities, and government laboratories through networks involving joint research projects, commissioned research, or other forms of information exchange - and it predicted that in 1990, there would be twenty-six percent (Aoki, 1988).

Thus, advances in electronics have required extensive communication networks involving physicists as well as engineers in electronics and material science. Even though American firms are highly sensitive to antitrust issues, the American government has increasingly realized the importance of cooperative research among competing firms and in recent years has relaxed its enforcement practices in certain indus-

tries. This has facilitated collaboration among firms in the semi-conductor industry through the Semi-conductor Industry Association and the American Electronics Association, both of which have research programs in conjunction with various American universities. In the pharmaceutical industry, promotional networks have been extensive in linking together experts in industry, government laboratories and land universities in the fields of pharmacology, biochemistry, immunology, molecular and cell biology.

Because of the flexibility of obligational and promotional networks as well as the flexibility of the external labor market, and because venture capital markets have been quite well developed in the United States, it has been relatively easy - by world standards - for entrepreneurial oriented American researchers and engineers to develop their own firms in order to commercialize new products. This has been especially common in information-based industries in and around the Silicon Valley, California as well as in the biomedical, biochemical, and artificial intelligence related industries throughout the United States.

With a cross national perspective, it is apparent that this type of institutional arrangement has performed extremely well in American society in advancing knowledge at the frontiers of science and in the development of new products derived from basic science. The Americans have been particularly successful in the development of new products which have many kinds of military and health related applications. However, the American R and D system has been less successful in improving upon older and new products for commercial markets. For example, when one observes the Japanese system of research and development, one quickly becomes aware that the American system of networking facilitates creativity in developing new products, but it has its shortcomings in improving on existing products. Though the Japanese are much weaker in basic science, have not succeeded in developing radically new products, and are somewhat deficient in entrepreneurial leadership, they have concentrated on establishing very close communication among researchers and engineers with production and marketing personnel involved in existing product technologies. Japanese firms are also increasingly

embedded in networks involving university based scientists and engineers - but established networks are closely linked with established production facilities, whereas in the United States, manufacturing networks tend not to involve production personnel - or else the production activity is only at the periphery of the network. In Japan, R and D and production personnel frequently move back and forth among production sites, research laboratories, and engineering departments. Americans are socialized in their educational system to make scientific discoveries and to develop new products. In contrast, the Japanese are socialized to be highly attentive to detail and to improve upon existing products. Whereas the Americans excel in horizontal communication across organizations in the development of new products, the Japanese excel in establishing horizontal feedback types of communication "from marketing to production and production to redesign" (Aoki, 1988: 247). In other words, the Japanese emphasis is clearly on the production phases of the industrial process, whereas the Americans have tended to be less creative in this area. And this difference in where networks focus their energies in the two countries does much to explain why the Japanese have over the long run been so successful in commercially producing and marketing products which the Americans first developed.

Similarly in Europe, producers of more traditional products (automobiles, ceramics, textiles, furniture, machine tools, shoes) are embedded in a rich infrastructure consisting of training institutes, business associations, and local and regional governments (Schmitter and Streeck, 1981; Piore and Sabel, 1984). And it is from this cooperative environment that diversified, high quality production has emerged in these European industries. One reason why American firms in these industries have not been highly competitive in recent decades - at least internationally - is because of the weakness of obligational networks embedded in a rich institutional environment of promotional networks.

Finally, there is one other aspect of American obligational networks in high tech industries which deserves mention. Because of the flexible external labor market in the United States, it is very difficult for American firms to keep knowledge proprietary. The moving of

personnel from one organization to another undoubtedly facilitates communication, creativity, and the development of new products. But it also tends to limit the ability of individual firms to focus all of their talents on the long-term development of particular products once they come into existence - whereas the rigid external labor market in Japan and Germany permits firms in these countries to focus enormous energy on the improvement and refinement of products.

This brief comparison of networking in the Japanese, European and American environments suggests that despite the utility of our concept of obligational networks, there are different types of obligational networks, and they may be concentrated primarily at the research and development stage of new products or at the production stages or both, and they may or may not be deeply embedded in a set of promotional networks. All of this variation in national arrangements leads to different performance consequences following from the emphasis of the network.

4. Concluding Observations

Historically, there has been much greater variability in the coordination of manufacturing sectors in the United States than in Japan, Germany, or the smaller democracies of Europe. The greater variability in the American case results from several factors - chief among them: (1) the United States has a very complex economy, much more complex than any other advanced capitalist society, with many more manufacturing sectors to be coordinated. (2) The United States is much larger - both in space and population - than any other advanced capitalist country, with very heterogeneous sectors. And because there is considerable heterogeneity of interests within sectors, it has historically been more difficult for firms to engage in collective action, to develop effective associative structures for the governance of their sectors. If there are large numbers of firms in industries but weak associative structures - as in the United States - there is more variability in the coordination of industries than in countries which have extremely well developed systems of associations. (3) Because

the United States became a highly industrialized society much earlier than most other capitalist societies, it has a mixture of earlier forms of coordination and new forms of coordination which have emerged since the Second World War. (4) More than in most countries, there are sectors at many different stages of the product life cycle - and variation in product life cycle leads to differences in coordinating styles. Some sectors are always growing or declining more rapidly than others. Because the United States industrialized relatively early and over a long period of time, because of the American tendency to be inventive in the development of new industries, and because of the complexity of the American economy, there tend to be more industries at different stages of the life cycle than is the case in most countries. In American history, there have been institutional forms for the coordination and governance of multiple economic sectors at different points in time. Thus, batches of sectors - branches of the economy - have similar competitive and cooperative arrangements. But some of the variability in governance of different branches of the economy occurs because industries developed and coordinating arrangements emerged at different time points. In other words, part of the variation in the coordination of the same industries across countries results from the fact that institutional arrangements for coordinating specific industries developed at different time points.

Taking a long-term perspective on the governance mechanisms used in American manufacturing, one sees truly effective forms of coordination of a collective nature for only brief periods. Monitoring as a form of coordination has been relatively uncommon, and promotional networks have been even less conspicuous, but most prominent in manufacturing industries which address the military and health needs of the society and which involve products which are very costly and with complex and rapidly changing technologies.

In contrast to most advanced capitalist countries, the distinctive feature of collective governance in the American case is its weakness of associative institutional arrangements (Schmitter and Streeck, 1981; Hawley, 1966; Galambos, 1966; Hollingsworth and Lindberg, 1985; Schneiberg and Hollingsworth, 1989). A variable of considerable importance in shaping the associative structure of an industry is the

degree to which the country has historically been dependent on foreign trade. Political elites in countries heavily dependent on foreign trade encourage firms to develop strong associational structures in order to cooperate in competing internationally, while countries less dependent on foreign trade tend to be less tolerant of associations, seeing them as institutions that retard change and grant monopolistic status to firms. It is in this context that antitrust legislation emerged more strongly in the United States than in most other capitalist societies. And in recent years as foreign trade has become more important in the overall American economy, there is evidence that the rigidity of antitrust enforcement is being moderated.

Countries with strong associative structures tend to have firms which cooperate not only with competitors but also with suppliers and distributors in long-term stable networks (Schneiberg and Hollingsworth 1989). On the other hand, where associations are more weakly structured - as in the United States - coordination through markets and hierarchies has historically been more pervasive. In the past forty years, however, there has been very substantial decline in the importance of the hierarchical form of coordination. Obligational networks, in numerous varieties, have become more prominent. Through joint ventures and strategic alliances, they may offer the prospect of economic coordination at a global level, especially when markets are volatile and technology is unstable (Porter, 1986).

In assessing the relative roles of corporate hierarchies and networks in the United States, several points should be noted. First, since stable, homogeneous markets remain for many products which have technologies with low levels of complexity, hierarchical forms of coordination remain in many industries. "Dis-integration" may be occurring, but hierarchical forms of coordination are still widespread in American manufacturing. Paper products, breakfast cereals, soft drinks, bug sprays, floor wax, deodorants, soaps, shaving cream, and hundreds of other products remain, symbolic of the familiar hierarchical form of corporate America. The mass markets to which these products are directed seem quite stable and unsaturated, ready for products manufactured by semi-skilled workers and distributed by general purpose firms.

Second, the ability of the United States to move rapidly toward more network forms of coordination is drastically limited by prevailing practices of industrial relations. The type of industrial relations which facilitates diversified and high quality production strategies is one in which workers have broad levels of skills and some form of assurance that they will not be dismissed from their jobs. Indeed, job security or other arrangements which assure long-term employment tend to be necessary for employers to have sufficient incentives to make long-term investments in developing the skills of their workers. And this type of incentive and skill system has become much more widespread in Japan, West Germany and Sweden than in the United States (Hyman and Streeck, 1988; Aoki, 1988). In the United States, manufacturing employment has tended to be much more job specific, workers have been less broadly trained, internal labor markets have been more rigid, and employers have had much less incentive to invest in their workers' skill development. Because the United States has a very flexible external job market, it is much easier for American workers to leave jobs for other firms than is the case in countries where workers have long-term job security. This also provides disincentives for American employers to invest in worker training. Firms with semi-skilled work forces have little capacity to be substantially involved in flexible production arrangements coordinated by obligational networks.

Third, the associational system of a country influences both its industrial relations system and its ability to engage in obligational networks. Where there is a well developed associational system, firms have greater capacity to enter into collective agreements with their competitors not to poach one another's workers, in effect creating more rigid external labor markets. But this in turn encourages firms to develop more flexible internal labor markets, to invest in the skills of their employees, to develop more flexible forms of production and more pervasive forms of obligational networks, and to produce higher quality products. Thus, countries with firms tightly integrated into highly institutionalized systems of business associations (e.g. Japan, Germany), have rather rigid external labor markets but flexible internal labor markets, while countries (the United States) with weak

associative structures tend to have more flexible external labor markets but more rigid internal labor markets.

Fourth, the capital markets in the United States have placed constraints on the development of broad employee skills. The kind of capital markets which have emerged in the United States have encouraged firms to engage in short-term maximization of profits. On the other hand, large firms in Japan and Germany have relied more on bank loans and/or cross firm ownership as a major source of capital because of the lack of a well developed bond and stock market such as that which developed in the United States (Aoki, 1988; Zysman, 1983). The short-term profit horizon of many American corporations has been very much due to their high dependency on very liquid equity markets, combined with the fact that American banks have been disinclined to provide long-term, low interest loans. This kind of emphasis on a short-term horizon has placed constraints on the development of long-term stable relations between employers and their employees - a prerequisite for a highly skilled and broadly trained work force.

Fifth, as technology in sectors of advanced capitalist societies becomes increasingly complex, changes more rapidly and becomes more expensive, actors in these sectors are increasingly finding that obligational networks are an effective form of coordinating and transacting with each other. But to maximize their effectiveness as governance arrangements, obligational networks need to be embedded in a rich institutional environment involving various forms of collective behavior. However, American firms with obligational networks as a major form of coordination are very weakly embedded in institutional arrangements of a collective nature. On the other hand, their Japanese and German competitors not only rely on obligational networks as a dominant form of coordination but they are embedded in a rich institutional environment (Aoki, 1988; Hyman and Streeck, 1988). And it is for this reason that they are likely to continue outperforming their American competitors.

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