prominently in many stories of British business failure, regardless of how firms were owned or managed. In addition, in twentieth-century Britain the uncompetitive domestic environment, aided and abetted by public policy makers, was a long-term negative influence on the competitiveness. Throughout the twentieth century many British firms have sought to escape from their environment through multinational investment abroad. It is noteworthy that, despite organizational weaknesses and perhaps suboptimal value systems, they were able to sustain this strategy over the long term.

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5

Germany: Competition abroad – cooperation at home, 1870–1990

ULRICH WENGENROTH

"Competition abroad – cooperation at home" was the leitmotif of German manufacturing business through most of the past century. In the years before World War I, German industry developed along liberal capitalistic principles with the important qualification of a powerful protectionism resting on the two pillars of tariffs and cartels, both of which were manifestations of a deliberate government policy to curtail competition and to engineer a socially peaceful and stable transition to an industrial society dominated by the old elites. Given the extraordinary success of industrial growth and performance in Imperial Germany, this model won wide support among German industrialists as much as among the public at large. It was a point of reference through the years of upheaval to come and only gradually gave way to the acceptance of the more free-trade, neocorporatist model of today.

The watershed in this development is to be found somewhere in the late 1950s or early 1960s when the politically enforced reorientation of German business toward the principle of open markets finally won wide acceptance among management and became the cherished ideal of most of West German industrialists, ever more so since they felt they could outcompete many of their European rivals on an equal footing.

This was not the end of cooperation to be sure, but formal cooperation, the trademark of German industry over most of its history, lost much of its legal and institutional foundations through the General Agreement on Tariffs and Trade (GATT) and the coming of the Common Market. The internationalization of both the German market as well as German industry over the past three decades helped to erode the home base of German industry, the formerly well-protected, largest European economy which was both the hothouse for cartelization as well as the launching pad for

forays into the export markets. When domestic and international markets merged, old-style German corporatism lost its rationale and transformed itself into the much more subtle and less rigid corporatism of today.

Any attempt to understand the mentality and rationale of German management for most of this century has to depart from the formative years in the late nineteenth century when a united Germany under Prussian rule set off to become the dominant economic player in Europe, turning many of the advantages of its natural resources as much as the size of its domestic market to its profit. The background against which this development took place was the emergence of the American model prevailing over British practice, which had dominated the earlier phases of industrialization. As one German historian of technology, Joachim Radkan, has recently stated: "After 1870 a good part of the German history of technology can be delineated as a succession of thrusts of Americanization, but also of justification of German tendencies by American models, adaptation of American technology to German conditions and counteractions against this 'Americanization.'"

For about a century – from the 1870s until the early 1970s – American technology was the much admired and imitated example for German entrepreneurs and engineers. The American model had superseded the English, as American industry or, rather, the "American system" took the lead over the old "workshop of the world" and henceforth set the standards of industrial practice worldwide. In spite of many derogatory remarks and reservations against "Americanization" – which mostly meant a specific way to organize production processes *and* design products – American production technology kept being the largely undisputed model until the early 1970s, when a euphoria for Japan created a new focus of attention, more among German industrialists than among German engineers. The "justification of German tendencies by American models," the "adaptation of American technology to German conditions," and also the "counteractions against 'Americanization,'" however, indicate that German industry did not experience a simple imitation of American practice. On its way from the United States to Germany, American technology and business organization did change notably to become an integral part of something clearly different – the German manufacturing enterprise.

SETTING THE STAGE, 1870–1918

Late nineteenth-century German industry still bore the marks of early German industrialization, with railways having been the leading sector

and their backward linkages having shaped the structure of manufacturing industry. The iron and steel industry together with heavy machine building had benefited most from the rapid completion of the large German railway network, and by the mid-1860s both were well equipped to cover virtually all domestic demand. Coal, the energy basis of both the railways and the heavy industries, and a passive giant among enterprises rather than a driving force, was in ample supply and could be mined at cheap prices in several mining districts of the newly formed empire. Reliance on abundant hard coal was to become a pillar of German industrial strength until well into the twentieth century and a linchpin of business strategies among many of the most successful firms. At the same time it became the foundation of a distinctly German company structure which had its roots in the market conditions and institutional arrangements of the empire.

Coal, iron, and steel

Most visible was this pre-1914 world in the German heavy industry's (coal, iron, steel) rapid development toward a *technological* vertical integration – a vertical integration from coal to the finished product which *physically* linked the various stages of production, notably by direct gas and heat interchanges. Like most vertical integration it was started to reduce transaction costs. The incentive to integrate backward into coal mines was particularly strong after the formation of the all embracing RWKS (Rhenish-Westphalian Coal Syndicate) in 1893.

At the other end of steel production, agreed-upon output quotas for the home market ran into conflict with the earlier strategy of increasing throughput in the works following the American model, which had led the German steel managers' efforts in the advent of mass steel production in the 1870s and early 1880s. As was to become the case in other industries as well, steel managers had to square the circle of combining American-style mass production with the limited demand of the German market. The only outlets for plants driven to capacity irrespective of cartel quotas were export markets, which soon became a kind of safety valve for an industry striving for cost-cutting process innovations to compensate for fixed price inflexibility on the factor markets at home.

Cartels and tariffs quickly changed their character from granting protection to an infant industry to becoming an aggressive means for dumping exports so plants could run to capacity in times of slackening domestic demand. Only in the export market did German companies eventually compete among each other, as much as they did with their foreign rivals.

Steel was the pioneering industry in creating this typical German strategy of market avoidance and protection at home while simultaneously engaging in massive export spurts at what were frequently "dumping prices." A stabilizing factor for this "organized capitalism" was provided by the German banks, which had both directly invested in and heavily lent to the steel industry and from time to time put pressure on "undisciplined" companies to maintain cartel arrangements. Through these occasional policing operations in the industry, the banks protected their loans as much as the investment of the majority of their industrial clients.

Defensive investment to protect cartel quotas and wide-flung internalization of the earlier stages of production to circumvent artificially high cartel prices frequently led to a poor allocation of resources. On the other hand, it gave the industry a much longer time interval to plan for the use of plant and raw material sources. Since factor markets were largely imperfect, profit squeezes were to be solved in terms of engineering. Whatever the production costs of a mine or blast furnace, its product *had* to be processed. Engineers, not purchasing agents, were called on to minimize the cost of factor inputs at every stage of production.

With sophisticated networks of by-product recovery and gas and heat exchange, the extra costs of autonomy in a cartelized market were recovered to some extent at least by engineering a constant and well-controlled flow of materials from the pit head to the industrial steel consumer. Cartel quotas in this instance guaranteed that the very delicate balance of the principle of multiples between these physically interlocking stages of production was not disturbed.

The myth of the technological superiority and outstanding productivity of the German steel industry before and after World War I stems largely from these technological manifestations of market avoidance, run by mostly autocratic leaders helped by lawyers specialized in cartel negotiations and surrounded by a middle management overwhelmingly staffed by engineers. In making cartels legally enforceable, the German judicial system helped to prevent American-style trust building and to protect employment in many suboptimal plants. It comes as no surprise, though, that socialist and eventually Communist politicians saw the German heavy industries as a privately planned model for the centrally planned economies they were set to create.

Only a few companies managed before 1914 to advance into the more diversified markets of heavy engineering and – in the single case of Krupp – shipbuilding. The dominating pattern in the heavy industries was

"industrial columns," or "dukedoms" as they were also frequently called, growing out of a mountain of coal in the Ruhr district and Upper Silesia. Money did not go into horizontal mergers but was sunk into coal mines.

Chemical industries

The major chemical companies, the IG Farben forerunners (Hoechst, Bayer, BASF), with an annual coal consumption equal to a steelworks were also drawn into this pattern. To secure the supply of their most important raw material and to circumvent the all-encompassing Rhenish-Westphalian coal cartel, they acquired mines of their own. The outstanding international success of the German chemical industry, however, was much more a result of its ability to turn academic research quickly into marketable products and establish an early lead in expanding fields such as dyestuffs and pharmaceuticals, where the value-added was conspicuously higher than in the old chemical processes for the production of soda, calcium chloride, and sulphuric acid, all of which had been developed and dominated by British works earlier in the century.

In the chemical industry more and earlier than in any other, the exceptionally well established German system of higher technical and scientific education bore fruit. Conceived as a means to catch up with Britain in the absence of a large industry which could provide for training on the job, the science faculties of the universities and the newly established Technische Hochschulen (technical universities) turned out great numbers of academically educated scientists and engineers. Although the majority of graduates went to government and local administration positions rather than to industry until well into the second half of the nineteenth century, an abundant supply of these crucial carriers of R&D was available when it was first needed by early science-based industries like organic chemistry.

In the German *Farbenindustrie* it was not the brilliant individual but a large number of highly qualified chemists who *systematically* synthesized new variations of established basic combinations along theoretically determined paths and thus established early technological leadership. According to Carl Duisberg, the director of Bayer, the laboratories in the chemical industry were a place where one would find "not a trace of a flash of genius" but numerous well-organized and rather tedious research programs for a great number of academic chemists, who had given Bayer 2,000 different dyestuffs on the eve of World War I. Admittedly there was absolutely no need for 2,000 dyestuffs, but with these Bayer together with

BASF and Hoechst, where similar numbers were achieved, had a firm grip on every conceivable composition of hydrocarbons, firmly shielded by a wall of patents and tacit knowledge. Between the turn of the century and World War I, Germany's share of the world's synthetic dyestuffs production amounted to approximately 80 percent.

If an increasingly wide variety of end products which did not directly compete with each other saved the chemical industry from much of the inflexibility suffered in steel and coal, with basic chemicals like alizarin cartels were indispensable in the eyes of management to guarantee profits. The collapse of the alizarin convention for a short time in 1883 resulted in one of the very few profit squeezes suffered before World War I.

With growing diversification, a clear demarcation of "fields of interest" became more important than cartel agreements. The individual companies would agree not to invade each others' product families and, at the same time, try to achieve a "fair" distribution of the overall market shares in advanced chemical products. The institutional outcome of this cooperation was the establishment of the *Interessengemeinschaften* (IG) (community of interests), pools where shares and profits were exchanged and production lines agreed upon. Between 1904 and 1908 a duopoly was formed, which after the war eventually merged into the IG Farben. The same path was followed in pharmaceuticals where another Interessengemeinschaft, the Pharma-IG, was created in 1905 comprising all important pharmaceutical producers, with the one exception of Schering of Berlin.

It was a lucky hit, which turned into probably one of the greatest windfall profits ever, that many pharmaceuticals happened to be closely related to artificial dyes in their chemical composition. The same research facilities and strategies could thus yield sophisticated products in two very promising markets at the same time without anything like proportional additions to cost. Entering into pharma products was research-driven and not an explicit strategy from the beginning. The enormous success of these scientific "by-products" not surprisingly helped to strengthen further the position of scientists within the industry. Much more than sales managers they were seen as the true money-makers and the most foresighted when it came to decide on policies. This heavy R&D bias was also reflected in the composition of top management, which was overwhelmingly being recruited among the companies' own academic chemists. In fact only in the 1980s was the first nonchemist appointed to the top position of one of the three major companies.

It was to be stressed, however, that the outstanding performance of

the German chemical industry before World War I was largely limited to the science-based field of dyestuffs and pharmaceuticals. Only here could the abundant academic input be turned into a competitive edge, while more large-scale operations for simpler products were performed as successfully in other countries. Mass-produced research at all levels of the company rather than the mass production of staple goods was the strength and strategy of the German chemical industry.

Not surprisingly, though, it was in the interest of the German chemical companies that the backwardness of their main rivals be maintained and technology kept secret. Foreign direct investment therefore was only undertaken when trade barriers or patent regulations or both made exports difficult. In the United States, the German chemical industry set up production facilities after important patents had expired in that market, which was second in size only to China. A major incentive to embark on foreign direct investment in the American market was to compete against former employees of the German dyestuffs industry who joined the competition in the United States or set up their own companies after the turn of the century. Before that time, the major German companies were not interested in establishing their own production facilities in the United States, let alone accepting the offers of partnerships made by American firms. In 1899 Carl Duisburg refused "to sell our American patent rights and our technological experience for a mess of pottage of 10 million Marks." In successfully launching Aspirin and other brand names with the omnipresent Bayer cross, Duisberg expanded the company's marketing efforts to gain a strong position in the American market, alongside other German pharmaceutical producers like Merck.

While convincingly contributing to the technology-centered mentality among industrial management in Imperial Germany, the chemical industry was exceptional in not resorting to American models for its operations and plant layout. Enjoying all the first-mover privileges, the German dye and pharmaceuticals industry saw itself and was very much regarded abroad as the model. "Americanization" was to come here only after World War I had wiped out most of its worldwide monopolies and for the first time exposed the German industry to open competition on an equal footing.

Engineering

A less conspicuous though equally successful strategy of combining the input of academic engineering with an industrywide systems building

effort was pursued by some of the major machine builders. Since engineering and machine building, unlike organic chemistry, was essentially a mature industry already in the late nineteenth century, the German companies had to make their way on the home and international markets against a well-established foreign competition. As soon as they had managed to meet domestic demand in the 1870s, they set out to take the American practice of mass production to Europe very much like the steel industry did at the same time. What Alexander Holley and Andrew Carnegie were to the steel managers, Pratt & Whitney and Brown & Sharpe became to the engineering and machine building sector.

Most helpful to the transfer of technology, both of hardware and of plant organization, was the Prussian army. In the wake of the Franco-Prussian War of 1871, it embarked into a crash program to replace its outdated rifles and for this purpose imported turnkey rifle factories from the United States, encouraging private enterprise to do the same if it was interested in large contracts. As in heavy industry, the 1870s marked a reorientation from British practice to the American model, with gun manufacture from interchangeable parts being the point of departure.

There were also attempts by private companies, like the Berlin Loewe Co., to run a copy of a Singer sewing machine factory, but demand in Germany did not yet support the numbers that had to be produced to work at a profit, and the whole plant was eventually converted to gun manufacture. Loewe, who then set up its own machine tool department, together with some Saxon machine tool builders became the pioneer of the "translation" of American metalworking practice to the more limited German markets. Two strategies were eventually designed at the turn of the century to achieve this end. The state and the war effort in World War I again played a crucial role in its widespread acceptance among manufacturing industries.

First, the standardization of parts, initiated in the United States, was no longer applied to just a single product or firm. Building mostly on the "Loewe norms" – that is, the internal standards of the Loewe firm, which emerged parallel to other factory standards as of the 1890s – the industry during the war agreed on what was to become an ever more sophisticated national system of standards. Interfirm standards were needed to allow for wartime mass production with an industry that was still dominated by medium-size firms. National norms were institutional devices to make growth and mergers of individual firms less exigent in the pursuit of cost reductions. They successfully performed some of the functions corporate management had to fulfill in other countries and allowed for a traditionally decentralized industry of medium-sized firms eventually to dominate large sectors of the international market.

The success of this system of standards (Deutsche Industrienorm [DIN] and the norms for electrotechnical devices by the Verband Deutscher Elektrotechniker [VDE]) made for an invaluable competitive advantage for German industry in this century, and is surely the most lasting and widespread form of German technology export so far, creating decades of path-dependence in favor of German products. It ensured a degree of interproduct compatibility unrivaled by any other system of standards at the time. This standardization of often used parts and materials created the possibility for *different* products to use a certain number of *uniform* parts, that is, making use of the advantages that large-scale production offered on a smaller scale. Again Loewe was a pioneer in this field in creating already in 1905 a new division: the "norm-factory" where multipurpose components which could be made part of many different products were manufactured.

Second, instead of a mere imitation of specialized American machines for which – despite standardization – only a limited market existed, their qualities were transferred to universal machines by using them as a carrier for all sorts of additional devices. These additional devices, through their modular design, were what eventually turned the basic tool into a specialized machine. Yet, depending on the accessories added, it became a different machine every time, so that despite higher costs for the basic tool, the amount of capital tied up in a variety of special requirements was less than would have been the case for a corresponding number of one-purpose machines. German machine tools were designed for longer depreciation periods and smaller series than their American models, while still performing the same functions. With this unique combination of flexibility and mass-production capability, they constituted both a remarkable export success for the German machine tool industry in Europe and Asia as well as the backbone of a manufacturing industry that did not yet have markets as capable of absorbing huge numbers of uniform products as in the United States. The German machine building industry thrived on midrange equipment for midrange markets, while still getting most of its ideas from the other side of the Atlantic.

Until the turn of the century American machines were meticulously and shamelessly copied. It turned out, however, that the somewhat harder European cast iron to be machined on these lathes required a redesign

rather than a mere copy if the machine tools were to last. Insufficient experience with modern American machine design was now compensated for by theoretical – and especially mathematical – penetration of the machines' operational principles. It was a kind of reverse engineering that was performed on them. German industry was able to employ its greatest strength, its highly developed technical universities. Eventually this enabled the engineering and machine tool industry to more than merely catch up with technical developments abroad, as was registered with some surprise by the American *Iron Age* in 1911: "In fact, one meets with some undoubted improvement over American designs, due to characteristic Teutonic thoroughness in reducing all calculations to mathematical certainty."

Unlike the machine tool industry, heavy engineering was highly concentrated. This was largely a consequence of its roots in the German railway boom. Locomotive makers like Borsig, Schwartzkopff (BEMAG), HANOMAG, and Körting are notable examples. Together with Humboldt, DEMAG, and MAN, they formed what was the strongest national group of heavy engineering firms in Europe, covering a scope of products unrivaled anywhere else. Selling to markets all over the world these companies had elaborate networks of highly trained sales representatives, often academic engineers, who would help industrial clients in the pursuit of tailor-made solutions to location and product-specific plants. Coengineering with their customers frequently seems to be a more appropriate description of these sales representatives' activities than marketing. Theirs was not a mass market. Their comparative advantages lay with the greatest possible diversity of small-batch, high-value products where intangible assets ranked highest. They were brokers of the abundant engineering expertise in Germany and stood at the outset of what was to become the German profile in manufacturing through the twentieth century: technology-intensive investment goods based on superior craft skills and academic training. Heavy engineering was the field where the conspicuous weakness of the majority of German manufacturing enterprise – mass marketing of consumer goods – did not come into play, while its traditional strengths, such as superb technical education, could be fully turned to its advantage. If heavy engineering was impressive by international standards, it did not contribute correspondingly to the transformation of German industry toward mass production and consumerism on a scale that compared equally favorably to its neighbors.

Electricity

If there was one industry in Imperial Germany where the adoption of American technology went hand in hand with the adoption of an American way of management, it was the electric power industry. Unlike the other major industries dealt with already, it was created with a future mass market and its potential in view. It was the first large industry in Germany where solutions were sought in aggressive marketing and not in technology in the first place.

The roots for this noticeable departure from the early German model of the industrial enterprise can almost be traced back to a single outstanding personality: Emil Rathenau, founder of the AEG, and an outsider and ardent admirer of American technology and management principles at the beginning of his career. After two failures to introduce American technology to Germany, Rathenau managed to acquire the Edison-patents ahead of all competitors.

Rathenau then entered into a contract with Siemens, the largest manufacturer of electric equipment who had worldwide operations in the telegraph industry. Siemens would manufacture all the equipment other than the mass-produced light bulbs, and Rathenau would keep these and the exclusive rights to run power stations. Not surprisingly this unlikely alliance broke apart and gave rise to the AEG (Allgemeine Elektrizitäts-Gesellschaft = General Electric Company) which was controlled by Rathenau and within only three years had a greater business volume than Siemens. Under this pressure the latter also went public and was converted from a family business into a joint-stock company to follow suit on the expanding and capital hungry market for electric power.

Electricity came at a time when the financial resources of most towns were strained by the additional needs of sewerage, solid pavements, hospitals, schools, and the like for a quickly growing population. Only a few cities were rich enough to afford a power plant on top of all that. The answer to the problems of financing electrification in this situation was the *Unternehmergeschäft*. Led by the AEG, German electrical engineering companies like Siemens, Helios, Union, Lahmeyer, and the German branch of BBC created their own market by founding local and regional electrical power, tramway, and lighting companies or by taking over and "electrifying" existing ones in Germany as much as in Spain, Italy, Russia, Latin America, and elsewhere. These new companies then were obliged by

stipulations in their articles of association or more subtle arrangements to buy their electrical engineering equipment exclusively from the mother firm, the *Unternehmer*, in this guaranteeing a well-protected outlet for many years to come.

The setting-up of a great number of energy-producing and -distributing companies, however, did create financial problems for the mother firms advancing all or most of the capital. They were left with a growing volume of equity capital and bonds in their portfolios against dwindling resources of liquidity. A solution to this problem was found via the creation of financial holding companies with the help and the financial backing of the great banks. These holdings took over the shares of the new public utility companies created by the electrical engineering producers; they held these titles in their portfolios during the period of construction and initial development of the electric power companies, eventually issuing bonds in order to guarantee the further inflow of long-term capital at stable interest rates.

Once the investment had "matured," yielding a profit, part of the equity capital could be mobilized and sold to the public, while the financial holdings kept only a minority share sufficient to guarantee control. In a slightly modified form this pattern was applied equally to the development of industrial users of large electric power plants, like the aluminum industry or the producers of calcium carbide. Here again the electrical engineering manufacturers triggered new activities by actively engaging in the creation of these new branches of industry which were later taken up by bona fide chemical producers.

Almost every one of the major electrical engineering companies had its own financial holding. There were separate holdings for overseas activities and of course many subholdings in the individual countries and even regions. The most spectacular of these was the AEG's 1898 creation, the Deutsch-Überseeische Elektricitäts-Gesellschaft (German Overseas Electricity Company), with a capital stock of 150 million marks and an additional 108 million marks in bonds, the largest of all German corporations operating abroad.

In spite of a very elaborate network of holdings and subholdings, however, the electrical engineering manufacturers engaging in the *Unternehmergeschäft* did take a great risk and many of them failed to protect their liquidity. The result was a major credit crisis in the industry in 1901 in Germany, as a result of which only AEG and Siemens were strengthened, having absorbed or absorbing within the next few years most of their

competitors – and their respective holdings. Siemens and AEG then continued to hold their truce and respect each other's territory. More than any other new industry before, the German electrical engineering industry developed into a multinational business from the very beginning. The stability of the dominant and leading company, the AEG, seemed unassailable very much because of its firm international embeddedness. In an agreement with the American General Electric, which bore resemblances to the Treaty of Tordesillas (1494) between the kings of Spain and Portugal who decided to partition the world amongst themselves, the two largest electrical engineering manufactures of the world agreed on respective spheres of interest where they would take care of the rest of the competition. It was a worldwide Interessengemeinschaft somewhat along the institutional lines in the German dyestuffs industry.

At the last shareholders meeting before the war, Emil Rathenau was confident that "political unrest and wars in Europe" would do only little harm to the company's business since "a substantial part of our customers is spread all over the globe." Together with the big three of the chemical industry and some specialized manufactures in the then high-tech industries like Linde (refrigeration), Zeiss (optical instruments), and Bosch (electrical engineering equipment) or the Metallgesellschaft (nonferrous metals), AEG and Siemens were global players by 1914 with sufficiently extended networks and nontangible assets worldwide to even survive the havoc the disastrous war wrought on the German industry's international trading position. During the war, however, most industrialists entertained dreams of expanding the negotiated environment of the domestic market into a German dominated *Großraumwirtschaft* where private industrial planning would eventually be substituted for unpredictable competition on all relevant markets. If German industry had successfully learned to compete abroad before World War I, it had only done so out of necessity and full of contempt for the irrationality and unpredictability of the invisible hand.

THE ABORTED REFORM MOVEMENT, 1918–1933

German industry came out of World War I in a deplorable shape. Markets, patents, and direct investment had been lost abroad, together with technological leadership in many fields. In addition, the scare of socialism was haunting industrialists ever since 1918 and made them susceptible to

authoritarian solutions on the labor front, as long as they would not threaten their renewed export efforts to break out of the straitjacket of import substitution abroad and the contraction of both domestic and international markets. Everyone yearned back to the golden years before World War I with a negotiated environment at home and open markets abroad. This had been the world for which the German industry was made – in terms of plant as much as in terms of organization and institutions. The few years of economic and political stabilization in the second half of the 1920s were not sufficient to put German industry back on its feet. They do show, however, the ways it would have tried to go if there had not been the upheaval of the Nazi years. And these ways, again, looked very American in many respects, while at the same time the doctrine of cooperation at home still held sway.

The 1920s saw a continued and intensified admiration of American industrial enterprise, the American way of manufacture, and large-scale operations in general. It was accepted for the first time that the ongoing protection of a great number of individual companies through cartel arrangements stood in the way of recovery and international competitiveness. The rationalization of German industry, which had already begun at the turn of the century with the move toward standardization and by-product recovery, now went beyond this predominantly technological dimension and included horizontal mergers and wide sweeping diversification.

At a time of intensified international competition and vastly inefficient use of many of its own resources, the major companies of the chemical and of the steel industries in 1925 merged into huge trusts, the IG Farben and the Vereinigte Stahlwerke (United Steel Works) respectively, the latter being explicitly framed along the model of U.S. Steel. Even industries which were dominated by medium-size firms where economies of scale were not so obvious saw ambitious schemes of large-scale production like the Vereinigte Werkzeugmaschinenfabriken (United Machine Tools Factories), a combination of four major machine tool makers. The costly parallelism of a suboptimal plant protected through cartel arrangements was no longer carried by the shrunken domestic demand. All these were mergers of desperation, however, rather than an optimistic departure for a new managerial world. Management's reflexes still opted for cartellization, both national and international, whenever possible. The numerically overblown boards of directors – IG Farben started with eighty-three, Vereinigte Stahlwerke had fifty-two – testify to the unease of these mergers

as much as to the weakness of central management. There was nothing "lean" and efficient about these newly created giants.

Potent outsiders to this process of horizontal concentration tried to diversify their production and push their product line closer to the market, again continuing a prewar strategy as in the case of Krupp and the GHH, the two notable bystanders of the United Steel merger who went instead into heavy engineering, including the manufacture of trucks. The GHH in this case even left the traditional center of heavy industry in the Ruhr through its merger with the South German engineering firm MAN, the pioneer of diesel engines.

A third important path toward concentration was followed in the energy sector, where mixed enterprises for electricity and gas supply were being created. Fostered by the wartime policy to use the vast lignite deposits of West and Central Germany for electricity generation to relieve the hard coal mines of the Ruhr, new giant corporations grew out of these new power plants with the help of many city councils. The most powerful among them remained the Rheinisch-Westfälische Elektrizitätswerke (RWE), a creation of the twenty-eight-year-old Hugo Stinnes in 1898.

Stinnes, a wealthy coal merchant before the war, had been the most ambitious trust builder in the early 1920s. His enterprise, the Siemens-Rhein-Elbe-Schuckert-Union, which fell apart upon his death in 1924, comprised coal mines, steelworks, power plants, and the Siemens-Schuckert electrical engineering company, plus a great number of service sector activities from hotels to cinemas and newspapers. It was mocked that Hugo Stinnes could spend his life without resorting to outside resources. The collapse of his empire was very much welcomed by public opinion as having been built on inflationary money and megalomania, although it was not bigger than the technologically more homogeneous giants that were created a year later. In the end, its degree of diversity and the hostility of many of the takeovers were still clearly beyond what was acceptable to the German business community and the public at large. Stinnes's way of empire building was very much the kind of "Americanization" to cause counteractions and strong resentment.

The acceptable merger was one which also lent itself to technological rationalization to create a larger "organic" entity, a notion that had come out of the technocratic planning staffs of the war. Although these horizontal mergers in chemicals and steel were market-driven, they still did not signify the wholehearted acceptance of market signals as the overriding business principle, and management structure still represented production

plant rather than product marketing. If there were signs that the German economy would move toward a more consumerist model, the very few years of optimism and rapid growth in the late 1920s were too short to bring about the change of mentality toward a consumer-market-oriented management.

Even in new markets like the automobile, the inability of most German manufacturers to turn their high engineering standards and the evolving system of norms to their advantage is striking. Despite a plethora of new and old car manufacturers, who produced either flimsy or overengineered models, American cars were imported in great numbers. Ford even began to assemble cars in Berlin in 1926. The only truly successful German maker in the 1920s was Opel, which had shamelessly copied a French Citroën, which again was the result of André Citroën's transfer of American ideas to France. The mass-produced Opel was the first private car to be built according to the DIN-norms. And if the mechanized assembly line in Rüsselsheim was less than fifty meters long, the Opel "Laubfrosch" (tree-frog), as it was affectionately called because it was only available in light green in the beginning, made Opel the largest manufacturer in Germany with a market share of 40 percent. Not surprisingly this was the most attractive German company for GM when it took the company over from the Opel family in 1929. Opel had already had a prewar record of American-style mass production, going from sewing machines to bicycles, of which the company was the largest German manufacturer.

All these first hesitant steps into a modern consumer society came to a halt in the wake of the Great Crash of 1929. With unemployment rapidly rising, consumer markets collapsed, pulling all other industry behind them. The inflexibility of "organic vertical integration," the pride of German engineering and management, made itself felt very painfully now and wrought havoc among the most modern plants in the chemical and steel industries. It was a lesson in the limitations of private planning and engineering rationality. In 1932 the United Steelworks were only saved from bankruptcy through tacit nationalization by the central government. Majority ownership went to the Reich for some years without its interfering in the company's policies. "Scientification" and "organic integration" on the largest scale had visibly run aground as soon as market stability and predictability could no longer be negotiated.

IG Farben was also close to bankruptcy in these years since it had sunk its money in the erection of a huge hydrogenation plant to produce oil from coal at a time when oil prices on the open market fell dramatically.

The failure to cut loose from the once all dominating coal-base of German industry proved almost fatal to the company. The technology for the refining processes had come through an R&D agreement with Standard Oil. This had been the first time for half a century that the German chemical industry had to turn to foreign help for a major new product line. It was a sign that the science-intensive strategy had its limitations when bulk production rather than product innovation was the issue. Chemical engineering, the new approach to mass-produce chemicals, like most mass-production technologies, was developed in the United States and had to be imported.

Reform of strategies and structures in both of these pillars of German industrial strength in the past – like in many other branches that were drawn to their pattern – was overdue. But instead came Nazism with its autarky policy and command economy to substitute negotiation for competition once again.

AUTARKY AND *FÜHRERPRINZIP*, 1933–1945

In Alfred D. Chandler's *Scale and Scope*, "the details of the relationships between decision-makers and local and national government bodies . . . have been left to historians of business–government relationships." This, however, is difficult to maintain in the case of German industry and it is most certainly no longer feasible when it comes to dealing with the major German companies after the Nazis' rise to power. Ever after 1933 the "internal history of the central institution of managerial capitalism" becomes a highly politicized affair with decisions on company strategies being strongly influenced or even dictated by government. Politics to a large extent became internal to the companies for the twelve years of Nazi rule and to some extent also to the twelve years of reintegration to the international markets after World War II.

The timespan 1933–1945 is a period of paramount importance in its own right, as much as the background against which the most influential managers of the transition in the postwar era saw their strategic alternatives. The often conjured "Americanization" of German industry in the 1960s was performed by men who had had their first experiences and their formative years during the Nazi dictatorship. If one is not aware of what the constraints and what the facilitations for management were in these years, it is difficult to estimate properly the scope of mental changes that this generation experienced.

With the Nazi's rise to power, trade unions and competition, being seen as the most destabilizing influences on corporate planning, were to be quelled from the very beginning. "Fair profits" were guaranteed in all government contracts, and industrywide cartels to safeguard existing companies, whatever their competitive merits, were being made compulsory. Irrespective of cost, the German economy was to be transformed for the war effort, making autarky the overriding principle. With wages frozen and labor heavily policed, the necessary savings could be enforced. Even if it is an exaggeration to claim that a clear rift ran through German industry with a pro- and anti-Nazi camp, it is still safe to maintain that there was more skepticism on the side of the export-oriented industries like chemicals and electric engineering because of the effect this policy would have on foreign trade, while the heavy industries with their continuous labor troubles looked forward to some form of tough, cost-saving rules. In addition rearmament and autarky were expected to strongly favor coal and steel.

One of the main "achievements" of the Nazis' autarky policy was in fact to block the conversion from hard coal to oil among German industry as much as the economy at large. In doing so, it petrified the technocratic mentality that had grown out of the pre-1914 cartels at a time when markets were just about to get ever more diversified. Overall thermal efficiencies and closed circles of by-product recovery and processing would continue to be guiding lines of investment rather than marketing opportunities. Ideas of an "organic economy" and forms of corporatist anticapitalism would win ever more support among management – especially middle management – itself. A most notable example of this regressive development, which cut off a modernization and internationalization of corporate structure that was already well under way, is the IG Farben, the board of which had seen the Nazi's rise to power with much apprehension since the party's first electoral successes in 1930.

Within months, however, this skepticism gave way to a deeply felt relief among a large group of management when Carl Krauch managed to sign the *Benzinvertrag* (gasoline treaty) on behalf of the IG Farben with the new regime in the fall of 1933. With prices being agreed on more than triple of what was paid on the international markets the Benzinvertrag was a first of a number of agreements that would turn IG's lingering hydrogenation plant into a guaranteed profit center and make it the cornerstone of autarky for the automobile and air war to come. Hydrogenation was firmly tied to government planning and thus gradually made

independent of central board decisions. Although having been very welcome at the time, it also was one first inroad of government policies into the company's authority over its own operations.

IG Farben then was a model of a vertically and horizontally integrated combine dominating a whole industry by its own weight as much as by its more than fifty semiautonomous dependents. A most important characteristic of its management structure for the Nazi years to come was its "decentralized centralism," as it was called officially or the "Habsburg model" as it was more appropriately known to insiders. Details of production and research were left to the individual factories, which were jealous of their autonomy. Although IG's chairman Carl Bosch between 1929 and 1932 had tried to introduce a more effective organization to monitor the great number of firms' activities from the top by creating three major *Sparten* (branches), IG's directors never developed a strong interest in each other's domains. The IG remained rather polycratic with ad hoc cooperation among the units if necessary. In the late 1930s even minutes and balance sheets were not available in toto to the board's members but rather only the part that referred to their personal responsibility. Allied dukedoms rather than a commonwealth seems to be an appropriate description of the IG's internal power relations. Since the concern controlled its own general meetings through multivote preferred shares held by its subsidiaries, there was little in the way of a self-aggrandizement of the units' captains.

The outcome of this situation was an ever closer cohabitation of the Sparte 1 (hydrogenation) strongman Krauch and the Nazi government along the lines of autarky policy creating major rifts right through IG Farben. While Sparte 2 (dyes/pharmaceuticals) more or less went on like a private capitalist enterprise in a (cartelized) market environment, Sparte 1 (which also included nitrogen!) became part of a totally administered national production facility. For this part of IG Farben, the boast in the party's paper, the *Völkischer Beobachter*, in 1936 was correct: "National Socialist economic policy corresponds to the technical age. It lets capitalism run as the motor, uses its dynamic energies, but shifts the gears."

The polycratic structure of the concern allowed many plant managers to make their own deals with the military and government agencies without any authorization from the top and frequently resorting to well-engineered official "orders." This was by no means unique to the IG Farben but became a threat to the authority of many executive boards, with owners eventually being dispossessed if they did not abide by the

party's strategic decisions. On the eve of World War II, the Nazi Party had acquired such a dominance over the economy that "one can scarcely speak any longer of any sort of equal relations or even of the existence of a still intact sociological unit called 'industry.'"

The way toward this all-encompassing control of industrial enterprise had already begun in the early years of the Nazi's rule with mandatory cartels all over industry that would substitute party-monitored negotiation for markets. Together with the legal enforcement of the *Führerprinzip* (principle of authoritarian leadership in industry) in bodies representing the interest of industry, it provided the command and control structures for the party to govern the allocation of resources and the material output of production. The party preferred, however, not to intervene directly in management as long as it could "convince" executives that joining the bandwagon of rearmament and autarky would be in the long-term interest of their companies. The one exception to this continued preference for the protection of private enterprise was the racist "Aryanization" policy, the expropriation of Jewish entrepreneurs for the benefit of politically loyal "Aryans." While the overall effect of this policy on the fabric of private German industry was very limited, it gave rise to a number of spectacular forced concentration processes like the absorption of the Czech-based Petschek coal empire by Friedrich Flick, the most successful and infamous parvenu in the heavy industries. On the whole, however, established industry's cooperation in this process was less than enthusiastic and the Nazi Party itself was to become the greatest devourer of industrial prey in its pursuit to acquire its own industrial basis in the economy.

The latter policy dates from the time of the four-year plan of 1936, which was meant to put German industry on a war footing within four years and brought about another intensification of autarky policies. With the German steel industry being reluctant to process poor domestic iron ore instead of rich imported ores from Sweden to the point where this came close to open sabotage, the Four-Year Plan organization began to build its own steelworks in central Germany. The plant was designed by the American engineering firm Brassert and was intended eventually to become the largest steel plant in the world, named after the party's second figure, Hermann Göring. Its construction had been given priority over all investment schemes in the private industry, in this effectively blocking their further expansion in the presence of rising demand. American-style large-scale operation was to guarantee the Hermann-Göring-Works all available economies of scale. Needless to say it was the most hated

enterprise among the established companies and that it was never finished, and therefore could never dominate steel making in Germany, was felt as a great relief in the Ruhr district.

It was different with the party's second project. Close to the Hermann-Göring-Works, another huge Nazi enterprise was erected whose product no German company had been prepared to turn out. It was the Volkswagen Works and, like the steel plant, it was designed by American engineers according to the best American practice of mass production. Crucial advice was given by Ford engineers and Henry Ford in 1939 was eventually awarded the Schwarzer Adlerorden, the highest order the Nazi Party would give to foreigners. The Volkswagen works were meant to use steel from the Hermann Göring works, thus establishing a powerful industrial combine which would give the Nazi Party additional leverage to control both steel and car production in Germany.

The Volkswagen (people's car) was part of the Nazi program for mass motorization and complementary to the construction of the *Autobahnen* (highway system), although both were in the first place intended to help the war effort. Private car manufacturers had refused to build the Beetle, which they considered to be of poor design with little potential vis-à-vis foreign and domestic competition. There had been a number of alternative "Volkswagen" prototypes by makers such as Mercedes-Benz which came closer to today's design of compact cars. In the end, however, it was the outsider Ferdinand Porsche who won Hitler's personal approval. With the erection of the largest car plant on behalf of the Nazi Party, mass motorization was effectively taken out of the private sector, even if this plant turned out military vehicles exclusively during the war.

In these two schemes the Nazi Party was going to perfect what for decades had been the German engineering community's dream and, through its dominance of many companies' boards, the dream of a large group within German management as well: the American way of manufacture in a perfectly controlled environment, a technocratic economy par excellence. If this was clearly not the rule in German industry, it was a focusing point of a decades-old strategy of German industrial enterprise that saw itself very much in contrast with values held in Anglo-American business, while unconditionally admiring its superior productivity and uniformity.

In the Nazi economy of the immediate prewar years, the German industrial enterprise came closer to this ideal type than at any other period in its peacetime history. The war then saw again the by-now-familiar

concepts of *Großraumwirtschaft* from World War I which were embraced with less unequivocal enthusiasm, however, since most of the bounty was to go the Reichswerke Hermann Göring and its SS. Senior management hardly put up with the straitjacket imposed on it from government as much as from its own enthusiastic, technocratic staff. The vulnerability of entrepreneurial autonomy in a strongly regulated environment was one of the lasting lessons of the Nazi years and, among a substantial group of managers, contributed to the reorientation after World War II when once again, as in the days of Emil Rathenau, modernizers and traditionalists fought over the course of German enterprise culture.

OUT INTO THE OPEN, 1945–1990

After World War II the Western Allies under the leadership of the Americans forced West German industry to end its autarky program and dismantled the two huge concerns of IG Farben and Vereinigte Stahlwerke. While their call for open competitive markets was received with bewilderment, they met with little resistance as to the reestablishment of managerial autonomy vis-à-vis the state.

In 1945 industry was, once and for all, disillusioned with state intervention in its affairs. The state's main task in the eyes of managers, stemming the tide of socialism, was now taken over by the American military government who soon was seen as a shield against not only communism but against both British Labour politics and French "planification" as well. Their antisocialist fervor made the Americans very popular, while the anticartel and deconcentration policies at the same time were understood to be a frontal attack on the strength of German industry coming close to a but-mildly-concealed Morgenthau plan for the deindustrialization of Germany. German industry after 1945 wanted to go back to the golden years of the pre-1914 situation. An unregulated market was the last thing it had hoped for. Still, this was the way economic policy under Allied control and later under the liberalistic minister of economics, Ludwig Erhard, was to go.

With American and European governments accommodating to the view that a strong West German industry would be the linchpin of every Western European security system, manufacturing enterprise quickly overcame most of the allied postwar restrictions and could embark on an almost unimpeded expansion from the early 1950s on. At a first glance most of this decade looked like the reestablishment of the pre-1914 scenario with

heavy industry dominating and chemicals and engineering following suit, while other important industries like textiles remained fragmented and uninfluential. Collusive arrangements reemerged and administered prices were widespread in spite of all anticartel legislation. American technology once again was wholeheartedly embraced while propagators of consumer-oriented American business practice were met with contempt. The productivist ideal still held sway among German management – at least among those who were seen by public opinion as the protagonists of the *Wirtschaftswunder*, the "economic miracle." Unlike its competitors West German industrial management was still dominated by academically trained engineers and scientists rather than traders and economists.

Under the surface, however, the whole fabric of pre-1914 style cooperation lost its two important foundations: coal and the protected consumer market. With the end of the autarky policy, the West German economy's delayed conversion to oil eventually gathered momentum in the 1950s. At the same time the strong demand for consumer goods and the traditional subordination of German consumer goods industries encouraged efficient traders in the absence of strong protectionism to establish long-term import relations with low-wage economies. Apart from the consumers, the beneficiaries of this development were the producers of investment goods and technologically sophisticated consumer durables who could almost uninterruptedly resume their prewar position as Europe's workshop. In absorbing great quantities of consumer goods and raw materials from its neighbors machinery imports from West Germany were much easier to finance than American products, which had dominated the market in the immediate postwar years.

All "Americanization" of both consumer markets and management styles notwithstanding, the traditional prominence of producer goods industries in West Germany was therefore strengthened rather than weakened by the unfolding new pattern of competitive advantages among European manufacturing enterprise after World War II. West Germany became a consumer society along American lines without developing a correspondingly strong consumer goods industry. It paid for much of its consumption with investment goods. Since low defense commitments and allied restrictions in arms-related R&D prevented an early full-scale recovery of high-tech industries, West Germany's revealed competitive advantage for medium-technology areas had its roots in this fundamental transformation during the 1950s, which became visible only in the 1960s. It is important to stress, however, that this transformation was as politically

desired and engineered by government as had been autarky in the 1930s. West Germany's integration into GATT and the EEC were powerful instruments to reverse the earlier tide of protectionism and force industry to find its place on the international markets. To whatever extent compromised in the end, the degree of laissez-faire policy chosen by the West German government was unparalleled by any other European administration and contributed substantially to the reorientation of management practices in West Germany.

In the 1960s West German industry began to adapt its structure to its reformed strategies. A wide-sweeping diversification and divisionalization movement set in. While in 1960 only about 20 percent of diversified firms had a divisional structure, in 1970 such firms were almost 70 percent. A powerful agent in this reorganization of West German industrial enterprise was American consulting firms, above all McKinsey, who helped West German management in its deliberate attempt to Americanize the structure of its enterprise. Like all earlier "Americanizations" before, however, this new wave was also shaped along German traditions of technology-centered, cooperative enterprise culture. In the same years horizontal mergers and acquisitions dominated clearly over vertical acquisitions. Thus the very important change in the West German fiscal legislation in 1968 from a tax on turnover to a value-added tax did not cause but rather confirmed and strengthened a development that was well under way. Under the old tax system vertical integration was strongly favored for tax reasons alone since it broke the cascading effect of the turnover tax which was due for every market transaction between firms. With the new value-added tax, which was already widely used in the other EEC states, this incentive for vertical integration was eventually abolished and the tax system brought in line with the now prevailing business strategies. It is important to stress, however, that it was the competitiveness of the open market, especially when tariff protection against EEC members fell in the late 1960s, rather than the fiscal legislation that brought about the reorientation toward diversification and horizontal expansion.

A potent outside agent in the eventually successful attempt to break up the closed-shop mentality among German industry was foreign companies investing in what was for many years the fastest growing market in Europe. Since foreign investors did not go into old industries, their impact was biased toward cars and chemicals rather than steel and coal and helped to produce a skewed distribution of American principles among

West German management. Simplifying the point, one could say: the more coal-based an industry was, the more hostile was its management to free-market competition, and the greater the share of FDI on a market sector, the quicker was this branch to adapt American strategies of diversification, horizontal mergers, and competitiveness. Between these two poles, a continuum spread out from the center of gravity, which moved ever further toward the American model without totally embracing it.

Coal and steel

Closest to old-style corporatism was the deconcentrated steel industry. Although there was no desire and certainly no pressure from the market to reestablish the Vereinigte Stahlwerke in a first reflex to regain managerial autonomy, most companies began to integrate backward again in the early 1950s. For a few years it looked as if the self-sustained vertical columns of the Kaiserreich were to reemerge, although the product specialization introduced by the Vereinigte Stahlwerke remained largely undisputed. With cheap imported coal and oil in the wake of the Suez crisis, however, the very foundations of this "renaissance" were quickly undermined: it did not pay any longer to own coal. For the first time in the history of German heavy industry home coal was a liability rather than a strength. In the 1960s the steel companies were eager to get rid of their coal mines as quickly as possible and incorporate them in the Ruhrkohle AG, a holding company which was subsidized and controlled by government.

The federal government's own holding of mining interests inherited from the dissolved Prussian state, the VEBA, had by then already moved away from coal and into oil refining, strengthening its position on the energy market rather than integrating forward. Having been owners of a large hydrogenation plant in the Nazi years, the prerunners of VEBA had all the necessary expertise in oil processing. With the end of autarky, they eventually had to wind up one side of their activities anyway, and in the event they did opt for oil. VEBA which also comprised the Prussian state-owned electric power network was eventually privatized in two steps in the 1960s and 1980s and is today Germany's largest energy concern with a strong engagement in petrochemicals as well.

Having completely redirected their strategies, the major steel makers during the same years tried to grow horizontally or – even better – to diversify their activities to the extent that these companies today make less than half their turnover in steel and continue to reduce this share.

Important fields of diversification were trading, heavy machine building, and, since the late 1970s, electronics. A more intensive merger movement, however, only set in at the end of the 1960s when the burden of coal had been successfully shifted to the shoulders of the Ruhrkohle AG.

With their steel operations, however, these companies' investment policies and – since the outbreak of the protracted steel crisis after 1974 – prices are under control of the ECSC (European Coal and Steel Community), which created European cartels during the 1970s and thus became one of the few reminders of the pre-1914 traditions, with the important qualification, however, that the ECSC is monitoring the decline rather than the growth of this industry. To some extent nationalization and protectionism in neighboring countries more than the West German steel managers themselves contributed to the revitalization of old-style corporatism in European steel. After ailing coal mining, which was dramatically reduced by government in all European countries, steel continued to be the most politicized of all industries. Given this degree of political control of steel making, it comes as no surprise that foreign direct investment in steel was virtually absent after World War II.

Chemical industry

Much quicker to shed their coal past were the IG Farben successors. Already in the 1950s these companies began the conversion of their technology toward oil-based plants. This was the end of vertical integration backward into coal as well as the end of isolation from the international raw material markets. Beginning with the early 1953 contract between Shell Oil and BASF joint petrochemical ventures were established in West Germany from the 1960s which helped to foster a closer cooperation between the IG Farben successors and major Western corporations. The presence of mostly American foreign direct investment further contributed to the unequivocal break with the industry's protectionist traditions.

Access to the world markets and international operations were the linchpin of the IG Farben successors' strategies. The price to be paid was dependence on British and American oil companies for supplies. This, however, compared very favorably with the strangling hydrogenation liaison with the Nazi Party and – as a side effect – saved the West German chemical industry from any serious attempt of supranational control through a body like the ECSC. Dependence on foreign markets for both raw material supplies as well as markets was to become the characteristic

of the West German chemical industry. The end of autarky was like getting rid of a millstone around the neck and paved the way back to entrepreneurial autonomy, which was ever so much more promising through the stunning increase of demand for chemical products in the years to come. The growing integration of the major West German chemical producers into the capitalist world economy was more than justified in the eyes of its managers by production and profit records in many successive years.

All the successes in a free-market environment notwithstanding, the IG Farben successors were reluctant to engage in outright competition among each other. Not unlike the steel industry they developed areas of product specialization which were also respected during the horizontal merger movements. Bayer dominated in synthetic rubber and, more recently, polyurethane, pharmaceuticals, and speciality chemicals. BASF has emphasized basic petrochemicals, fertilizers, and data tape (video, audio, and some computer activities). Hoechst has its strongholds in synthetic fibers and dyestuffs. This collusive action or rather nonaction does not, however, go so far as to reactivate cartel traditions. Seeing themselves as global rather than European players, the IG Farben successors have fended off any attempt to solve the problems of excess capacities in Europe through "crisis cartels" like those in steel. They rather continue to rely on their strength in research. More than 22 percent of all research expenditure in West German industry in 1988 was undertaken by the chemical industry, which devoted more than 6 percent of its turnover to this end. Since the West German university system continued to turn out great numbers of academic scientists and engineers, and since the great numbers of refugees from East Germany had above-average qualifications, supply of R&D personnel was always abundant compared with that of neighboring countries.

Automobile industry

The positive impact of FDI on the competitiveness of West German industry was even more striking in the case of electronics and the automobile industry, both of which had a very important foreign-controlled percentage, which made a fallback on cartel arrangements and the like virtually impossible.

The automobile industry which was gravitating around the state-owned Volkswagenwerk in the 1950s eventually became the showpiece of free-market managerial enterprise in West Germany. At the same time it was

the industry with the strongest competition from American subsidiaries, the GM-Opel and the Ford companies, which between them always held a quarter to a third of the West German market.

The Volkswagenwerk was left with the state after the British military government had failed to find a commercial buyer for it. Like the German car industry before the war no one in the trade believed that the idiosyncratic Beetle had any market prospects. Eventually, however, this odd vehicle turned out to perform very much what Hitler had in mind, achieving the mass motorization of Germany. Relying on the relatively large domestic market, the plant's potential for achieving outstanding economies of scale as had been envisaged by the Ford planners in the 1930s could be turned to its advantage. The Beetle became West Germany's Ford Model T and one of the country's greatest export successes, making good for its odd appearance by superb engineering and low price, both of which were largely owed to the rigidity of its Fordist roots.

Very much in line with the new doctrine of private enterprise, the federal government already in the 1950s made preparations to privatize the company. In 1960 60 percent of the shares were sold to the public in small allotments. The withdrawal of the state was definitive. No government support was made available for Volkswagen when the company faltered in 1974 after the Beetle's success had run out and the oil-crisis hit most car makers. At the time Volkswagen was in the middle of a costly transformation process from a one-product company to a multidivisional as well as multinational car manufacturer with a wide range of models from minicars to light commercial vehicles. Through this process Volkswagen absorbed a number of less successful makers in West Germany before it embarked on its European expansion in the late 1980s with the acquisition of SEAT of Spain and Škoda of Czechoslovakia. Together with a number of overseas subsidiaries from South America to China, this eventually made Volkswagen the most transnational of all European car manufactures with more than 30 percent of its operations located abroad. Volkswagen today is the largest European car manufacturer and ranks fourth worldwide.

In the West German car industry only two other makers survived the concentration process of the 1960s and 1970s: BMW and Daimler (Mercedes)-Benz both of which are operating in the niche of up-market, high-tech cars and are selling them very successfully worldwide. In 1989 they ranked fourteenth and fifteenth in the world automobile league table as to numbers of cars produced. In financial terms, however, they would

undoubtedly rank much higher. In fact, Daimler-Benz is by now Germany's leading taxpayer and, with a turnover of close to 100 billion marks, the country's largest corporation. It is equally Europe's largest manufacturing company only surpassed by the Royal Dutch Shell (Oil) and the Italian financial holding IRI.

Like Volkswagen before it, Daimler-Benz embarked on a massive diversification program in the 1980s. While Volkswagen was very unfortunate in its acquisition of Adler-Triumph, a producer of office equipment, and eventually backed out, Daimler-Benz seems determined to continue on its way toward a widely diversified "technology-concern," as it labels itself. Through mergers Daimler-Benz has become Germany's dominating aeronautics manufacturer and its number two in electrical engineering equipment by absorbing the AEG or, rather, what was left of it after a disastrous failure in the early 1980s. To defend its car exports to the American market, Daimler-Benz is about to erect an assembly plant in the United States. Volkswagen closed its American plant years ago and now supplies the American market from Mexico.

BMW also has a U.S. car plant under construction and with the recent acquisition of Rover achieved a remarkable diversification and internationalization of its production range. Unlike Daimler-Benz, BMW continues to rely much more on car manufacturing in its expansion. Still, it has also begun to diversify since the 1980s in a similar fashion in going into jet engine production, where a joint company with Rolls Royce has been created. This again puts BMW in direct competition to Daimler-Benz, recalling both companies' pasts as foremost aircraft engine producers during World War II.

The stunning success of BMW, which was close to extinction in the 1960s, is often quoted as one of the strongest arguments in favor of a continued technology-bias among German industry at large and car manufacturers in particular. In pursuing a single-minded strategy of high-tech car design, BMW managed to climb to rank twenty-eight among European industrial enterprises leaving old war-horses like Krupp, MAN or Metallgesellschaft behind.

In fact, all three German car manufacturers rely first of all on their engineering reputation and much less on competitive pricing or innovative marketing, in this reflecting a century-old tradition among German industrial enterprises that has mellowed but not subsided. The difference in the market approach of the two American subsidiaries in Germany continues to be conspicuous. Nevertheless GM-Opel and Ford have been

as successful in warding off Japanese competition in the absence of any trade restrictions on the West German market.

A noticeable shift toward a more aggressive marketing behavior among the three West German makers occurred only in the 1980s when they started to invade the once well-respected market segments of each other, with BMW offering luxury cars in the Mercedes class and both Mercedes and Volkswagen extending their fleets into the BMW stronghold of high powered compact limousines. In this they moved further away from the traditional domestic policy of German industry than, for example, the equally internationalized chemical companies. As to their international position, this competition on the domestic market seems to have strengthened rather than weakened them.

Electrical engineering and electronics

A very different story at the same time was the electronics industry, where especially in the subgroup of consumer electronics West German manufacturers failed miserably to hold their own. A thriving domestic industry still in the 1960s, with new tycoons like Max Grundig and well-established brand-names like AEG's Telefunken, was almost completely in foreign hands at the end of the 1980s. The only major German producer today is Blaupunkt, a subsidiary of Bosch which has its strength in automobile components. One of the most important products of Blaupunkt, in fact, is car radios. Grundig has been taken over by Philips; Telefunken, Saba, and Nordmende went to the French Thomson; Wega is now part of Sony; SEL was acquired by Nokia of Finland. This great number of now foreign subsidiaries still leaves Germany with the biggest consumer electronics industry of Europe, underlining the inability of German management to deal profitably with this mass market. The development of consumer electronics is indicative of the peculiar strengths and weaknesses of German management culture: as soon as color television became an ordinary bulk product with no exciting technological potential, German-style management lost its grip over it. Since West Germany was still turning out about one million color TV sets annually in the late 1980s, much more than any other West European country, the problem lay clearly on the side of management and not of labor and location.

Almost totally absent from the market of consumer electronics is Siemens, Germany's most successful electric manufacturer and currently sixth among European industrial enterprises in terms of turnover and first in

terms of employment. Siemens until very recently was a model of the pre-1914 constellation with a large protected home market taking about half of its output and giving it the strength for impressive export successes in technology-intensive investment goods. Siemens's almost symbiotic relation with the state-owned telecommunications sector guaranteed the company long-term stability and a basis from which new technologies and their potential on the international markets could be explored. An early hope was nuclear power plants, for the production of which Siemens had joined forces with its only serious domestic competitor, the AEG. Their joint Kraftwerk Union was meant to export West German nuclear power plant technology, which was developed with enormous state subsidies for the West German market in the first place. With the nuclear technologies market collapsing and AEG being wound up, Siemens again concentrated on its traditional stronghold, the telecommunications systems, where it was very successful in developing a digital exchange that helped the company to defend its share of about 10 percent of the world telecommunications market. At the same time Siemens sought the cooperation of Philips and IBM to enter the microchip market, which it eventually did on a larger scale in the late 1980s.

Earlier attempts by federal government to develop a microchip industry through massive subsidies, much of which was given to the unfortunate AEG, had failed. Unlike Siemens AEG had lost a large part of its operative units behind the iron curtain and never recovered from this blow. In its attempt to catch up with Siemens, the company overstretched its resources and finally collapsed in the early 1980s. Siemens on the other hand always followed a very careful policy in finding promising new fields in which to invest its enormous revenues. With billions in liquid assets, it was a running joke in the German trade press for many years that Siemens in reality was a bank which ran an electrical engineering enterprise. With deregulation in German telecommunications well on its way and foreign competitors queuing up to take their share in this rich market, Siemens is now making every effort to globalize its operations further and catch up with the major microchip producers. Having won a virtual monopoly in postwar West Germany, it is now forced back into open competition in all of its markets.

Germany's second independent electrical equipment manufacturer and currently twenty-fifth among European industrial enterprises, Bosch, never enjoyed the protection of a regulated domestic market and therefore was much earlier to meet international competition with a highly diversified

production program. Struggling out of its dependence on Volkswagen in the 1950s, Bosch managed to transfer its skills from electrical car components to a wide range of sophisticated electromechanical products and a large series of precision engineering products like fuel injection for diesel engines. In its expansion Bosch, unlike AEG, always avoided "Siemens territory," ending up with a production program in electrical equipment that is complementary to Siemens's. So a Bosch subsidiary is, for example, producing TV cameras and studio equipment while Siemens is taking care of the telecommunication side of TV. Its high competence in electronics notwithstanding, Bosch never seriously entertained the idea of entering the market for semiconductors, leaving this field undisputed for Siemens.

Engineering

While it remains to be seen whether Siemens manages to bring profitable, large-scale microchip production to Germany, the actual application of microelectronics was a source of continued export successes of the West German machine-building industry, putting it on par with the car producers and ahead of all other branches. Like the car industry machine building is a highly competitive and export-oriented sector with no protection of the domestic market other than EEC regulations. But in contrast to the car industry it is one of the least concentrated sectors among German industry. Even if there are some large companies like Klöckner-Humboldt-Deutz (KHD) and the diversified steel makers Krupp, GHH, and Mannesmann, all of which have their emphasis on engineering rather than steel today, machine building continues to be dominated by specialized medium-size companies. Even the larger companies like the previously mentioned ones to a certain extent fit into this pattern, as they do not turn out large series of uniform product but specialize in very heavy machinery like rolling mills, mining machinery, drying plants, steel ovens and the like.

In sidestepping Japanese competition in high-volume production of standardized equipment and concentrating on craft-skill intensive, small-batch production of tailor-made solutions, the West German machine-building industry could build on its long-standing tradition of flexible specialization. The modular design of machine tools having been a stronghold of German machine building since the turn of the century came back strengthened with computerized numeric control. Although ever more of

the basic numeric control (NC) components were imported from Japan since the 1970s, they were adapted to a great variety of individual tasks and ended up in small-series batches, which made for two-thirds of West German machinery output.

While Japanese manufacturers excelled in bringing down the costs of a given machine design, the West German producers typically would do better in meeting their industrial customers' very specific requirements making a high-price product a profitable investment in the end. Since this demand pattern persisted on the markets for investment goods, the West German machine-building industry, cyclical fluctuations notwithstanding, managed to thrive during the Japanese rise to the top during the 1970s and 1980s. It adds to the by-now-familiar picture of sophisticated technology that does not lend itself so well to mass production being to the competitive advantage of German industrial enterprise. With heterogenous products, craft skills, and product innovations continuing to dominate a substantial share of the world market, the machinery industry could prosper without protection and without the concentration experienced in car manufacturing and electrical equipment. Engineering, more than the other branches of manufacturing industry, contributes to the German economy's appearance as having a position of unrivaled breadth on the export markets. It is a huge variety of different sophisticated products rather than a few market strongholds, such as the notable exception of automobiles, that characterizes the most export-oriented industry among the major economies to date.

A PROFILE LOST IN INTERNATIONAL UNIFORMITY?: GERMAN ENTERPRISE CULTURE IN THE 1990s

With its strength in cars, machines, and chemicals and its emphasis on craft skills and product rather than process innovation, the German industry was entering the 1990s in which the rules of the game were newly defined with the integration of the bankrupt East German industrial structure and the removal of the last trade barriers in the EEC. Never were there as many new horizons and as many foreign competitors to German industry at the same time. With markets in Europe, both West and East, again vastly extended and regulation everywhere on the retreat, old-style German corporatism is about to lose the last remnants of its once cherished pre-1914 fabric. With the convergence of market size and the degree of deregulation between America and Europe, industrial structure and

management values on both sides of the Atlantic seemed to have converged beyond distinction as well. German top management, which was a stronghold of engineers and scientists for more than a century is being taken over by economists. The balance of the three-pronged investment is eventually being tipped toward the traditionally underdeveloped marketing side to come in line with the demands of an open consumer society.

All the outlined developments toward an American-style industry structure notwithstanding, the business culture of German managers until the present continued to bear traits of cooperatism. This was not only true for their conflict-evading way of handling labor-relations with the trade unions, but also among themselves. Aggressive competition and hostile takeovers went largely counter to their values. Even if the visions of an "organic economy" were left far behind, most German managers continued to see more than just the book value in a company. With long in-house careers and a great part of top management having been trained as academic engineers or scientists, organic and technocratic views of manufacturing enterprise were always being kept alive. On the level of the executive board this attitude was reflected in a collegial management tradition which did not lend itself to competition among board members. The performance-related share of German managers' compensation is typically much smaller than in American firms and not necessarily tied to his division's performance exclusively, in this again strengthening collegial management as well as a feeling of responsibility for the long-term stability of the whole firm.

Powerful agents for stability after World War II as much as before World War I were the great banks. Their policy was not one of conflict but rather of consensus with and among industry, establishing what has been referred to as "Rhenish capitalism," the prosperity of large enterprises under the protection and sometimes even tutelage of the big banks on both sides of the Rhine. Not only did the German universal banks provide long-term capital for industry but they took a strong interest in industrial enterprise itself through extended ownership of capital and their acting on behalf of a great number of private shareholders. German company law permits the representation of share-capital by the bank where it is deposited, an option taken by the majority of petty shareholders. This gives the major banks virtual control over a large number of companies and makes them the natural clearinghouses for conflicting interests in industry, as well as giving them frequently the decisive vote in appointing senior management or forging new alliances or mergers. Tacit

cooperation between banks and industry with the banks frequently effectively insulating troubled industry from the state and acting as an agent of concentration has become a linchpin of stability in German industry and a viable alternative to the kind of government intervention pervasive among Germany's neighbors.

If a clear convergence toward the structure of American enterprise could always be observed over the past century, differences did persist in the field of management culture and institutions until the present. Whether they will survive the current rough tides of intensified competition on the larger European market and exposure to overseas competitors, however, remains to be seen.

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Bibliographical essay

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The recent English language literature on other important industries like engineering and electronics is scattered at best and readers are referred to the more general literature cited here, which will deal with these industries. The early history of electricity generation is admirably dealt with by Thomas P. Hughes, *Networks of Power, Electrification in Western Society, 1880–1930*, Baltimore: Johns Hopkins University Press, 1983. A very stimulating account of engineering after World War II are chapters 5–7 of Gary B. Herigel, *Industrial Constructions. The Sources of German Industrial Power* (Cambridge: Cambridge University Press, 1995).