7 HETEROGENEITY AND CHANGE IN ENVIRONMENTAL STRATEGY: TECHNOLOGICAL AND POLITICAL RESPONSES TO CLIMATE CHANGE IN THE GLOBAL AUTOMOBILE INDUSTRY

David L. Levy and Sandra Rothenberg

The formulation of strategy is generally treated as a rational process of matching corporate capabilities to market demands. But this does not always account well for the heterogeneity observed in corporate strategies toward complex environmental issues such as climate change. In this chapter, we propose that strategy is often developed in light of expectations and assumptions concerning a firm's internal competencies and the external market and nonmarket environments. These expectations, we propose, are shaped by institutional forces at multiple levels, including the firm, the national industry, the global industry, and the specific environmental issue. In particular, we argue that collective interpretations about the nature of and solutions to climate change constitute important drivers of strategy, and these collective interpretations are molded and contested within institutional fields.

In addition to providing a fresh perspective on corporate environmental strategy, this chapter makes a number of contributions to institutional theory. First, we reject a strict dichotomy between the influence of the institutional environment and the competitive environment, as corporate perceptions of market trends are themselves subject to institutional construction. Second, we argue that tensions and political contestation across the complex terrain of interpenetrating and nested fields give rise to heterogeneity and change as integral features of institutional fields rather than difficulties to be explained away. Finally, we suggest that

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the institutionalization of specific notions of economic interest is closely related to the institutionalization of particular perspectives on environmental science.

Automobile companies exhibit considerable variation in their strategic responses to climate change. U.S. companies responded relatively early to the issue, aggressively challenged the need for emission controls, and have invested in a range of long-term technological approaches to emission reductions without committing to production vehicles. European companies, by contrast, have been less engaged in public debates about climate science, have accommodated regulatory demands for significant emission reductions, and have invested in more incremental, short-term improvements to conventional internal combustion engine technology. The different economic and market environments in each region offer only a partial explanation for these divergent strategic responses. There are also differences within regions; Ford, for example, has been more outspoken than General Motors (GM) against mandatory emission controls. We argue that these strategic differences can largely be explained in terms of the construction of perceptions of economic interests, which occurs in particular institutional contexts.

In the theoretical section of this chapter, we outline three primary mechanisms by which institutional processes might lead to heterogeneity rather than conformity. We then describe the strategic responses of the automobile industry in the United States and Europe to the climate change debate, and analyze these responses in light of the theoretical issues discussed earlier. We conclude with a discussion of the dynamics of institutional change and highlight some issues for future research.

METHOD

We adopt a case study approach to explore the climate strategies of the two major American automobile manufacturers, GM and Ford, and two European companies, Daimler-Chrysler and Volkswagen. The auto industry is significant because of its contribution to greenhouse gas (GHG) emissions and its political salience in the global warming debate. Moreover, the industry's stance on the issue is less obviously determined by economic circumstances than is the case in the coal or renewable energy sectors. As a result, managers have a degree of strategic discretion and institutional pressures are more likely to be prominent. The responses in the United States and Europe are sufficiently distinct to provide a basis for examining the reasons for this variation.

Data were collected from a series of interviews in the United States and Europe with twenty-four senior managers in companies, industry associations, govern-

ment agencies, and environmental nongovernmental organizations (NGOs). Interviews were conducted with a cross section of firm employees, including environmental staff and those in strategy, product development, marketing, and R&D. Some interviews, particularly with ex-employees that focused on more historical data, were performed over the phone using a semistructured interview format. For additional information on industry involvement with climate policy, records of industry comments on the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report were reviewed in their entirety.

THEORETICAL BACKGROUND

Institutional theory suggests that corporate perspectives on climate change are likely to be premised upon views of climate science, expectations of regulatory responses, and the market potential for mitigation technologies. These perspectives are mediated by the institutional environment, including competitors, industry associations, consumers, NGOs, regulatory agencies, and the media (DiMaggio, 1988; Powell and DiMaggio, 1991; Scott and Meyer, 1994). The application of the institutional approach to strategy builds on the idea that markets are socially constructed and embedded within broader political and cultural structures (Callon, 1998; Granovetter, 1985). Eisenhardt and Brown (1996: 187), in a study of a technology-based firm, concluded that "the firm's strategy was critically shaped by the institutional context of industry fads that came and went over time." Overall, however, the institutional approach is not well developed in the strategy literature.

Oliver (1997) contends that uncertainty increases the influence of the institutional environment and reduces the impact of economic and competitive factors (the "task environment"). Given the high level of uncertainty concerning climate science, technological and market developments, and policy responses, car makers cannot easily make a rational, objective calculus of their economic interests and appropriate strategic responses, and might therefore be more subject to institutional pressures. The sharp distinction between institutional and economic explanations breaks down, however, under closer examination. A more useful theoretical approach avoids this dualism and recognizes that economic calculations of interests always embody assumptions that are more or less certain and are constructed in broader social contexts (Callon, 1998). The problem is not that investment decisions are taken under conditions of risk, for which many techniques exist (Dixit and Pindyck, 1994); rather, planning scenarios contain assumptions and predictions about research and development costs, technological developments, consumer behavior, competitors' reactions, and regulatory responses that

are shaped by organizational fields and are not stable over time. Indeed, we encountered firms with very different market perceptions which, nevertheless, held their respective views with some conviction.

Institutional theory generally predicts convergence, or isomorphism, among organizational actors, though several writers have recognized the need to account for heterogeneity and institutional change. According to Oliver (1996: 171), "firm heterogeneity is explained, at least in part, by variation in the degree of connectedness between firms and their institutional environment." It has also been argued that weak institutional fields, which exert little pressure on firms, will also give rise to heterogeneity (Scott and Meyer, 1991). These views presume that the institutional environment is fixed and static, and that organizations only vary in their degree of embeddedness and conformity with it.

Extant accounts of institutional change point to substantial disruptions or shocks in the external environment (Fligstein, 1991; A. Hoffman, 1999), or to changes in the balance of power among field actors (Greenwood and Hinings, 1996; Oliver, 1992). The problem with the exogenous approach is that it ignores the potential for dynamics to be driven endogenously, and, indeed, for such endogenous change to affect the external environment. But the endogenous approach is also problematic, as it does not explain the change in the balance of power, which is itself a function of the specific configuration of an organizational field.

Here we offer a perspective in which multiple sets of practices and discourses coexist and compete across an untidy and ill-defined terrain of overlapping and nested institutional fields, giving rise to endogenous dynamics. Three specific arguments are developed to account for heterogeneous corporate perceptions and strategic responses. First, institutional discourses and practices do not pass undisturbed across organizational boundaries. Each company interprets the institutional environment through a unique lens, a product of its history, organizational culture, and market positioning. A history of conflictual relations with regulatory agencies or of unsuccessful ventures with low-emission technologies, for example, predicts how its external discourses and practices are imported and rearticulated.

Second, organizations often operate within multiple, overlapping institutional fields, belonging to various industry associations or national cultural and regulatory contexts, creating divergent pressures (Alexander, 1996; D'Aunno and Sutton, 1991; Holm, 1995; Kempton and Craig, 1993). Ford, for example, until the end of 1999 was a member of the Global Climate Coalition (GCC), the leading industry association opposed to mandatory curbs on emissions of greenhouse gases.

General Motors also was a member of the GCC, but it joined an initiative of the World Resources Institute called "Safe Climate, Sound Business," putting it in touch with other companies more open to change on the issue. Both companies have subsidiaries in Europe exposed to very different political and cultural institutional environments. Instead of a unitary field with a monolithic set of practices and discourses, organizations are thus situated in complex, fragmented fields with imprecise boundaries, providing repertoires of practices and discourse within which they can exercise some agency and choice.

A third explanation for heterogeneity is that even a single organizational field can sustain multiple competing discursive forms. The global automobile industry can be considered to be a single organizational field with nested national subfields. Scott (1994: 206) has argued that institutional fields are less defined by their geographic boundaries and more by cultural and functional boundaries: "Organizations are in the same field if they take one another into account, regardless of the geographic propinquity. In this way, the field conception emphasizes the possible importance of distant, nonlocal connections among organizations." By this reasoning, the emerging climate change regime itself constitutes an organizational field at the issue level, with intense and frequent interactions among various actors, which intersects with the industry field. Environmental NGOs and fossil fuel companies compete for institutional legitimacy and influence in the issue-level field, with neither group achieving complete domination of the field. Diversity in an organizational field can thus result from the interaction of related subfields, enabling ideas and practices to migrate across porous and ambiguous field boundaries and challenge established forms. Bansal and Penner (Chapter 13) describe how the use of recycled newsprint varies in the publishing industry, and is related to differing management perspectives on the feasibility and importance of recycling. These divergent perspectives derive, in turn, from the managers' experiences in other social and cultural contexts.

Competing perspectives on the costs and value of environmental management provide another example of competing discourses. Many companies still adhere to the traditional notion that environmental regulations are inherently costly, but many others are embracing the discourse and practices of environmental management, termed "eco-modernism" by Hajer (1995), which asserts that incorporating environmental concerns into business strategy can generate "win-win" outcomes. As Milstein, Hart, and York point out (Chapter 6), these competing claims cannot be resolved through empirical analysis and are perhaps better viewed as alternative ideologies or discourses (Rothenberg and Zyglidopoulos, 2001; Levy,

1997). In the climate case, the Global Climate Coalition has advocated the more traditional discourse while the Pew Center for Global Climate Change has argued the more optimistic "win-win" approach.

These three explanations for heterogeneity are derived from viewing institutionalization as an ongoing but incomplete *process* (DiMaggio, 1988), during which an organizational field can sustain more than one set of practices and norms. The process is never complete because of the "leakage" of competing institutional forms from related fields and because subordinate institutional behaviors are rarely extinguished entirely, instead remaining active in the margins. Scott (1994) has observed that a single dominant belief system often exists along with a number of secondary or subordinate belief sets. Social movement theory has noted a similar phenomenon in broader social spheres, by which subordinate groups maintain skeletal organizational forms and sustain their ideologies in "abeyance structures," providing the seeds of change when conditions are ripe (Laraña, Johnston, and Gusfield, 1994).

Heterogeneity and change are thus intrinsically linked. The presence of multiple competing institutional forms generates a dynamic process of institutionalization. In turn, this dynamic process, seeded by the emergence of new forms from adjoining fields and the resurgence of previously marginalized practices, ensures that no single institutional form achieves complete domination. Dynamics and instability can therefore be endogenous to a fragmented system of overlapping and porous fields.

STRATEGIC RESPONSES TO CLIMATE CHANGE IN THE UNITED STATES AND EUROPE

Background

Controls on emissions of carbon dioxide (CO_2), released from the combustion of fossil fuels and the main contributor to global warming, would threaten oil and coal companies, as well as industries dependent on these fuels, particularly transportation and electric utilities. In addition, higher energy prices would raise input costs for a range of energy-intense products (Mansley, 1995). Investments in R&D for low-GHG products and processes appear highly risky at this stage, and technologies associated with low-emission automotive products and processes will require radically new capabilities that threaten to undermine industry incumbents (Anderson and Tushman, 1990).

U.S.-based fossil-fuel-related industries responded relatively early to the climate issue, providing time and organizational resources to develop an effective political strategy against emission controls. On the organizational level, the three

major U.S. automobile companies, as well as the American Automobile Manufacturers Association (AAMA) worked largely through the GCC, which was formed in 1990 and represented about 40 companies and industry associations in energy related sectors. Although the GCC was initially a U.S.-based organization focused on domestic lobbying, a number of U.S. subsidiaries of European multinationals also joined and the GCC quickly rose to be the most prominent voice of industry in the international negotiations.

A key component of the GCC's political strategy has been to engage in a public debate over the science of climate change (Boyle, 1998; Leggett, 2000). As part of this campaign, the GCC criticized the review process for the Second Assessment Report (SAR) of the Intergovernmental Panel on Climate Change (IPCC), the group of more than 1000 international scientists charged with assessing the current state of knowledge concerning climate change (Edwards and Schneider, 1997; Gelbspan, 1997; Intergovernmental Panel on Climate Change, 1995). The GCC also emphasized the economic cost of emission controls and commissioned a series of economic studies from a number of consulting organizations (Montgomery, 1995).

The lobbying efforts of U.S. industries were successful in securing political allies in Congress, making Senate ratification of Kyoto a very dim prospect. Federal funding for climate research has been constrained, and the U.S. State Department opposed mandatory international GHG emission controls until 1996. Even after the United States accepted the principle of an international protocol at the Geneva negotiations in July 1996, it advocated no more than a freeze on emissions at 1990 levels, whereas the European Union was pushing for a 15 percent reduction below those levels.

The technological strategies of U.S.-based auto companies were primarily geared toward addressing local air quality, which could be addressed through catalytic converters rather than higher fuel efficiency. The companies were also investing in a range of alternative fuel programs for fleet vehicles. By the late 1980s, any technological improvements on the fuel efficiency front were being more than offset by increasing weight of vehicles and larger engine sizes (Stoffer, 1997). One effort to improve fuel economy was the Partnership for a New Generation of Vehicles (PNGV), launched in 1993 with substantial federal funding and the participation of the three U.S. manufacturers. The objective of this venture was to produce a car that did not sacrifice the capacity, safety, range, power, or comfort of a conventional large vehicle. The assumption that consumers would not compromise traditional attributes of cars placed a heavy burden on radical innovation in motive technologies and in light-weight materials. The U.S. industry response to climate change could be characterized as a long-term hedging strategy based on

the development of radical and expensive technological options without committing large sums to a production vehicle.

Far from having political allies, European firms found themselves in a context in which politicians were looking to the auto industry for substantial early-emission reductions. Germany, with a well-organized green political party, had unilaterally committed to significant GHG reductions during the Framework Convention on Climate Change (FCCC) negotiations in Berlin in 1994 and had pushed the German auto industry association, the Automobile Industry Association of Germany (VDA), into a "voluntary" agreement to reduce CO_2 emissions from new cars by 25 percent. Concerned that these constraints might affect the competitiveness of its national automobile companies, Germany then pushed the European Union to adopt similar measures.

The EU was sensitive to charges that it talked a tough game but lacked the will to implement anything. The European Commission introduced a proposal to reduce average new-car CO_2 emissions from 186 grams/km to 120 g/km by 2005 (equivalent to about 45 mpg). The European Parliament called for even stricter limits, with a figure of 90 g/km being mentioned. European automobile companies avoided direct challenges to the scientific need for GHG controls, with various managers calling any such effort "futile" and "inappropriate." After three years of negotiations, in 1998 the European Automobile Industry Association (ACEA) accepted a voluntary agreement to reduce emissions to 140 g/km by 2008. The agreement included Ford and GM's European subsidiaries, but not Japanese manufacturers (Bradsher, 1998a).

European companies have responded to these pressures by introducing very light-weight cars such as Daimler-Chrysler's SMART car, and investing substantial amounts in a range of technologies from diesel to fuel cells. Daimler has aggressively pursued fuel cell technology, investing $320 million in the Canadian company Ballard in April 1997, and has announced plans for a limited commercial launch by 2004 (P. Hoffman, 1999). European efforts emphasized short- to medium-term emission reductions through weight and size reduction and incremental technological improvements.

The Timing and Context of Climate Change as a Strategic Concern

The U.S. automobile industry responded much earlier to the climate issue than did their counterparts in Europe. Research divisions at Ford and GM had been aware of the issue since the late 1970s, but managers and scientists at both companies recalled James Hansen's testimony before the U.S. House Energy Committee in June 1988 as the catalyst that catapulted climate change onto corporate radar

screens, gaining the attention of the mass media and senior management (Edwards and Lahsen, forthcoming). Ford's climate specialist described his shock at how quickly "climate went from zero to sixty," and the company began sending a representative to IPCC meetings, taking a lead role in reviewing chapters of the IPCC's Second Assessment Report on behalf of the GCC and the AAMA.

It is notable that the U.S. automobile companies paid much more attention to the national media and political events in Washington, D.C. than to the development of scientific concern around greenhouse gases. The President's Science Advisory Committee had discussed greenhouse gases and climate as far back as 1965, and in the early 1970s, two major scientific studies put climate firmly on the U.S. policy agenda (Edwards and Lahsen, forthcoming). Awareness of the issue did not penetrate to boardroom level, however. Surprisingly, none of the managers interviewed recalled the June 1988 Toronto Conference on the Changing Atmosphere, which called for a 20 percent cut in greenhouse gas emissions by 2005, despite the fact that Detroit is closer to Toronto than to Washington, D.C.

Without Hansen's Congressional testimony during a hot summer as a stimulus, European industry did not pay serious attention to the issue until the summer of 1992. Interviewees from European companies mentioned the UNCED conference in Rio de Janeiro as the crucial event that spurred corporate attention. By this time, the Second Assessment Report (SAR) of the IPCC was already under way, leaving little room for European industry involvement.

Corporate responses were also conditioned by the existing regulatory context. In the United States, the primary concern for many years had been local air quality. U.S. industry was already subject to CAFE standards under the Clean Air Act, and the California Air Review Board (CARB) was mandating zero emission vehicles in the longer term. Initially, U.S.-based companies understood climate change as a continuation of this pressure, thus not requiring a major strategic change in direction. As GM's former vice president for research, Robert Frosch, explained, the initial reaction to climate change from product developers was "we're already running as fast as we can in that direction." Helen Petrauskas, a Ford vice president, concurred: "Climate did not require a step function change in strategy."

Over a period of time, companies came to appreciate that many technological approaches involved tradeoffs. Electric vehicles, for example, can account for substantial indirect emissions depending on the fuel mix and efficiency of electricity generation. Similarly, the introduction of catalytic converters in the early 1980s caused a noticeable decrease in fuel efficiency. It was not easy, however, for American companies to shift their technology strategies toward carbon reduction, be-

cause the fragmented regulatory system was still ratcheting up controls on non-GHG emissions while paying no attention to CO_2.

In Europe, by contrast, preexisting environmental concerns about automobiles were more aligned with the strategic challenge of climate change. Instead of a focus on local air quality, concerns about resource depletion and congestion had led to policies such as high fuel prices and investments in public transportation that reduced fuel consumption and vehicle use overall. European innovation efforts were therefore already more directed toward fuel efficiency, and companies were more aware of potential challenges to the private automobile in the broader transportation system.

The Political Environment in the Unites States and Europe

The Congressional hearings on climate change exemplified the adversarial, legalistic courtroom style through which the scientific basis for regulation is developed and contested in the United States (Edwards and Lahsen, forthcoming; Gelbspan, 1997). This contrasts sharply with the approach found in Europe, and particularly in Germany, which is often characterized as more integrated and consensual (Jasanoff, 1991). The governance structures in the United States cause companies engaged in contested policy arenas to make their case in a vociferous and public manner. As GM's Frosch put it, "The Hill works by compromise, so you need to go to the extreme. The more strident one side gets, the more the other side must. It ends up completely polarized." Helen Petrauskas commented, "It doesn't help to have politicians saying that people are dying in Chicago in a heat wave because of climate change. We are forced to be strident to counter that misinformation."

U.S. companies tended to be wary of international regulatory initiatives over which they had little control (Levy and Egan, 1998), whereas European car companies welcomed harmonized emissions regulations at the regional level. A Ford Europe manager explained: "Both the Commission and industry did not want to have a patchwork of regulations and standards. At the end of the eighties, the emissions situation was a strategic nightmare. We wanted harmonization, because otherwise we face the nightmare of managing product mix by country."

As a result of the political and cultural environment in Europe, challenging the scientific basis for regulation was seen as futile. An official with the German environmental ministry said:

> It's not like the United States. Here the companies make some comments in presentations or interviews, but nothing serious because they know public opinion

would be against them. If they would argue in the way they do in the States, it would create an image disaster.

Perhaps reflecting a more general cynicism about business influence in Europe, a representative with the VDA, the German auto industry association, commented that "if the auto industry were to support a specific study, the people would think that scientists were bought by industry and they would not believe them." Regarding negotiations with the EU over automobile emissions of CO_2, a manager in a European subsidiary of a U.S.-based company commented that:

> My boss in Detroit said we should argue about the science and the economics. It was an education process to get them on board. We had to explain that it's not constructive to challenge the science in Europe if we want to influence the debate. Here, the IPCC reports are accepted without question by policymakers. We would be thrown out of the room if we challenged them.

A Ford Europe executive with experience in the United States pointed to differences in the political process that led to this outcome:

> You have to understand the process by which the 120 g/km target entered the debate. In the U.S. there is a long period for public input and delay, and economic interests can be balanced against environmental concerns. Here, there is little balance or accountability. The 120 target was proposed by the EU Environmental Council, which consists of only the environmental ministers of member states. We said that they needed to talk to the economics, finance and labor ministers, but the environmental ministers have power to initiate legislation on their own. The Environmental Council simply said 'this is the target', and other ministers were cut out of the loop. The Environmental Council then tasked the Commission to develop a strategy to achieve the 120 target. The Directorates General for Energy and Industry had little influence.

These negotiations also highlighted the difference between the technocratic policy process in the United States and the lack of technical capacity of the EU institutions. Policy battles in the United States were waged on the basis of detailed technical studies. In Europe, the Commission's demand for a 120g/km standard was not based on any analysis of technical feasibility, environmental need, or economic costs. ACEA commissioned a report from the consultants A. D. Little, which provided technical justification for the industry's position that the target was not feasible in the time frame. One executive summed up the Commission's reaction to the A.D. Little analysis as, "a very nice report, but what are you going to do about the 120 target?"

Perspectives on Climate Science

Most descriptions of industry's challenge to climate science present them as cynical manipulations of the public discourse (Gelbspan, 1997; Leggett, 2000). While there clearly has been a strategic component to corporate political activities in this arena, it is argued here that skeptical perspectives on climate science became institutionalized in the automobile companies, particularly those based in the United States, and these perspectives in turn contributed toward the constitution of perceptions of strategic interest. In other words, perspectives on climate science and economic interests are mutually constitutive.

Ford's Trotman and Chrysler's Eaton were especially vociferous in the early 1990s, through speeches and editorials, in castigating concerns about climate change and emphasizing the high cost of precipitate action in the face of uncertainty. Our interviews revealed that these views were not just those of top management, but had permeated throughout various departments and management levels. One manager at Ford commented, "We have followed the science as a company and we would like to see more science and less hot air! What we'd like to see is good science driving good policy."

Generally, less skepticism concerning climate science was evident among the European companies; a few managers expressed skeptical views, but acknowledged that the debate had moved beyond science. One reason for this might be the different sources of information used by European and U.S. companies. U.S. companies tended to rely on American scientists, including quite a few skeptics. The German car manufacturers primarily relied on German scientists, especially from the Wuppertal Institute, but had also invited in people from Greenpeace, from the German environmental ministry, and Amory Lovins from the Rocky Mountain Institute, an ardent supporter of technological solutions to environmental problems. European companies generally lacked internal scientists who were directly engaged with atmospheric science. Nevertheless, both Volkswagon and Daimler maintained close contacts with local university scientists.

Despite their adherence to the scientific norms of objectivity and independence, the internal scientists in the United States tended toward the skeptical end of the spectrum of legitimate opinion among respected climate scientists (Morgan and Keith, 1995). They all interpreted scientific uncertainties in a conservative manner, viewing them as a rationale for further research rather than seeing the potential for climate shocks from positive feedback or threshold effects. They pointed to the long time frame of atmospheric accumulation of GHGs as a comfortable margin of time for reducing uncertainty rather than an urgent reason for early pre-

cautionary action. These conservative viewpoints appear to be constituted in a subtle process of negotiation with dominant corporate perspectives. As GM's Frosch expressed, "There is social pressure. They are around people who don't pay attention to the climate issue and don't want to hear it. . . . People on the operational side are more conservative." He also suggested that there might be some element of self-selection in terms of who is willing to be a corporate scientist. GM's former chief economist Marina Whitman discussed the pressure to adopt a bottom-line perspective: "There is a need for credibility with the line guys. We were the cost center, they were the profit center."

Managers in different functional areas generally adopted perspectives consistent with their departmental interests, demonstrating the interaction of technological and economic viewpoints. People responsible for advanced automotive technologies tended to see climate change as an opportunity and to accept that it was a serious cause for concern. According to GM's Frosch, "The spirit of the research labs is, we will show top management we can do it—we can change things." Although the R&D people could accept climate change as a problem because they had an interest in developing solutions, others in the organization took a more conservative approach. Managers responsible for product divisions and strategy, for example, were particularly concerned about the high cost of new technologies with little value to consumers.

The implication of this discussion is that corporate perspectives on science are not purely strategic, but are partly based on economic interests. More skeptical perspectives toward climate science became institutionalized within the American companies, which perceived climate change as more of an economic threat; in turn, the companies relied on these skeptical perspectives in anticipating a weak regulatory response and in formulating their R&D strategies. These institutionalized conceptions are not easy to change, and risk becoming an "iron cage" (DiMaggio and Powell, 1983) that constrains consideration of a full range of strategic options.

Perceptions of Market Viability for Low-Emission Technologies

Although the major auto companies are all multinationals and have been active in each other's markets for many years, the management of U.S.-based auto companies displayed a remarkably national orientation to their cognitive maps. In numerous interviews, corporate managers in Detroit, many with worldwide responsibilities, spoke about the difficulty of reducing emissions with gasoline near $1 a gallon, consumers who care little for fuel economy and desire larger vehicles, and a Senate unlikely to ratify Kyoto. These views are reinforced through membership

in industry associations such as the GCC, which are dominated by U.S.-based companies. Ford's and GM's climate teams were both based in Detroit and comprised mainly U.S.-based personnel.

All the companies considered that consumer acceptance was the single biggest hurdle facing innovation efforts, though American companies tended to focus more on current consumption patterns and downplayed the potential for dramatic change. American companies were particularly critical of regulation such as the CAFE standards, which they saw as coming between the company and consumer requirements. Marina Whitman, GM's former chief economist, expressed the widely held view that consumer sovereignty would eventually triumph in the marketplace: "Consumers find a way around regulation. The shift from cars to trucks is an example, as consumers can find features on trucks that have been stripped out of cars."

The impact of low-emission technologies on price was seen as a problem even in Europe. A Ford Europe manager noted that "customers won't pay a premium for fuel economy. It's a mid-level concern for consumers, not in the top three, but not nine or ten as in the United States, where concern for fuel economy is fifteen years away." Companies related a number of experiences in which consumers reacted negatively to cars that pushed the environmental envelope, and these experiences appear to have become institutionalized as conventional wisdom. At GM, the decision to downsize luxury vehicles was commonly referred as the "Cadillac disaster." In Europe, Daimler, Opel, and Volkswagon all had introduced lightweight, fuel-efficient vehicles that had met limited demand.

The barrier to new technology was not just price. Hesse thought that there would need to be substantial changes in infrastructure, usage patterns, and attitudes for the small SMART car to sell in volume. European managers demonstrated a greater awareness that the success of new technologies was contingent on broader social and institutional change. A Volkswagon executive noted that "we are more active in trying to change consumers. You cannot force people to buy certain things, but what we are trying to do is just keep on presenting it to the market, and try to convince people to buy these type of products." U.S.-based companies, by contrast, tended to focus on consumer preferences and infrastructure as fixed constraints. One Ford Europe manager noted that diesel engines were increasingly seen as "hip and green" in Europe, whereas U.S. executives were convinced that American consumers would remember the noisy, dirty, shuddering diesels of the 1970s.

These different perspectives on consumer preferences explain, in part, the differences in innovation strategies. U.S.-based companies were planning a car of the

future that would not require any change in transportation patterns, road infrastructure, or consumer behavior; rather, the burden of emissions reduction would be placed on advanced automotive technologies. This led to a focus on longer-term and more radical approaches to emission reduction, without sacrificing conventional car features. Such efforts were necessarily expensive, generating pessimism about the likely markets for such cars. European efforts, on the other hand, comprised more balanced, incremental investments in short- to medium-term emission reductions. For example, diesel-powered vehicles, which were much quieter, smoother, and cleaner than in the early 1980s, already accounted for 22 percent of family vehicles in Europe compared to only 2 percent in the United States (Bradsher, 1998b) and constituted more than 40 percent of new vehicle sales in 2001. Consumers were expected to play their part in adapting to new types of vehicles and to the changing role of private cars in the transportation system.

Historical experiences shaped company perspectives on the benefits of being a first mover in low-emission technologies. GM, for example, had invested more than $1 billion in its electric vehicle, of which fewer than 1000 had been sold (Lippert, 1997; Shnayerson, 1996). Although a few GM managers thought that the company had gained valuable expertise in electric drive chains, managers generally interpreted the experience as a commercial mistake. Similarly, GM managers felt that they had rushed too quickly to downsize their vehicles in response to earlier oil price shocks. Ford had invested an estimated $500 million in sodium-sulfur batteries, only to abandon the project because of safety concerns. With this shared experience, American companies did not appreciate the advantages of being a first mover.

European companies lacked this history of negative experiences with electric drive chains and viewed GHG emission controls as inevitable. Market prospects were viewed in a more optimistic light, and companies expressed willingness to take some risks to sustain market leadership during a period of technological upheaval. Daimler had taken a strategic decision to be a leader in fuel cell technology. The justification for this decision employed rhetorical strategies as much as any objective analytical framework. Hesse discussed "the need to stay in the driver's seat, to prepare for a future that is not the status quo."

DISCUSSION AND CONCLUSIONS

The case study applies institutional theory to explain the different responses of automobile companies to the challenge of climate change. We argue that strategic choices are based on assumptions and forecasts that arise from an organization's

interactions with its institutional environment. Of particular importance to the climate issue are perceptions about climate science, anticipated regulatory responses, and the technological and market prospects for various low-emission options. These perceptions are formed in light of national environments, issue-specific context, and each company's corporate history and characteristics. Although institutional theory has traditionally been applied to account for conformity and isomorphism, here we provide a new perspective on organizational fields as complex, fragmented systems sustaining multiple discourses and practices in tension and contestation. These fields are intrinsically unstable and demonstrate heterogeneity instead of reaching a static isomorphic equilibrium.

Three explanations for divergent strategies were given. First, institutional pressures were transformed across organizational boundaries. Internal scientists played a critical role in how the climate issue was communicated and perceived within the organizations. Each firm's history influenced the degree to which future technological options were viewed as an opportunity or a threat. Managers in different functional areas generally adopted perspectives consistent with their departmental interests, and negotiation among these departments influenced the final position taken in relation to climate science and technology feasibility.

We also see that the automobile companies existed within multiple and nested fields. The American and European firms encountered the climate issue within institutional environments that varied in two key respects: the timing and context of the emergence of climate change as a strategic concern, and the political environment in each region. As discussed by Delmas and Terlaak (Chapter 15), national legal and political environments help to shape perceptions and expectations. The case illustrates how these perceptions guided political and technological strategies for addressing the challenge of climate change. American companies have, in general, expressed much more skepticism about climate science, have been much more aggressive in challenging the economic and scientific case for mandatory controls, and have been more cautious about the market for low-emission vehicles.

If this were the whole story, we would have a conventional institutional explanation for divergent strategies, based on the existence of two geographically distinct organizational fields. As discussed earlier, however, geographic boundaries are only one dimension of organizational fields. The international auto industry can, in many respects, be considered a single organizational field, which complicates this analysis. All the companies are active in each others' markets, and some of their subsidiaries, at least, are members of the same trade associations. The institutions and negotiations surrounding the climate change issue frequently bring

personnel from the various companies together, suggesting that climate change constitutes an "issues arena" that itself has the characteristics of an organizational field. Within this broader field, there are competing discourses held by different country blocs, industry groupings, and NGOs.

The different national contexts discussed in this chapter can therefore be considered sources for competing normative and cognitive frames within the broader global automotive industry. Indeed, the existence of competing discourses can be observed *within* each region, as a result of the porous field boundaries and overlapping fields. For example, the win-win environmentalist discourse is already well established in U.S. industry (Levy, 1995) and has been adopted by the Pew Center on Global Climate Change, a U.S.-based group of companies that accepts the need for mandatory emission controls. This perspective competes with the more antagonistic view propounded by the GCC.

It would be easy to interpret company pronouncements on climate science as purely strategic behavior, aimed at delaying any regulation of emissions. The case clearly illustrates how actors strive to legitimize their positions by cloaking their arguments in the garb of scientific rationality (Frank, Chapter 2). Some lobbying and public relations activities can clearly be seen as strategic posturing, but the case strongly suggests that skeptical scientific perspectives came to be internalized, particularly in the U.S.-based companies. In turn, these perspectives informed assessments of markets for low-carbon vehicles and hence R&D strategies. Perceptions of science and of economic interests are thus mutually constitutive.

An important implication of the institutional approach developed here is that strategy is not based on a fixed, stable set of economic interests. Competing discourses and practices create field instability. Perceptions of economic interests will shift as companies are exposed to the changing pressures of their institutional environments. For example, companies do not just join particular industry associations in order to pursue a predetermined set of interests; rather, membership in these associations helps to frame and shape corporate perspectives. New organizations such as the Pew Center can therefore play an important role in shifting conceptions of economic interest, leading to a reevaluation of climate science and mitigation technologies.

There is evidence, in fact, that there is an ongoing process of substantial institutional change. By mid-1999 a number of writers had noted an apparent sea change in U.S. industry's stance on climate, as companies began to accept the scientific basis for emission controls and to invest significant sums in low carbon technologies (Houlder, 1998; Nauss, 1999; Newswire, 1999). No major scientific breakthroughs had occurred to explain this change. The Kyoto Protocol in 1997

was clearly a watershed event, but it is unlikely that the international treaty, by itself, affected corporate perspectives and strategies very much; after all, the treaty does not spell out regulatory mechanisms and is unlikely to gain ratification in the United States in its present form. Our research suggests that rather than looking for external shocks, one can explain these shifts in terms of endogenous contests concerning the science of climate change and markets for new technologies. Shifting discourses, competitive responses, and the emergence of new organizations generate a reconfiguration in the broader climate change issue arena. A detailed analysis of these changes is, however, beyond the scope of this chapter.

The study carries a number of implications for managers. The strategies of U.S. companies regarding the climate issue may have been overly conservative because of the institutionalization of skeptical perspectives on the science, a relatively narrow focus on domestic market and regulatory conditions, and a lack of appreciation of the potential for radical change in consumer behavior and the transportation system. Although early recognition of the climate issue in the United States allowed industry to organize effectively, the institutional vehicles created have tended to lock companies into an oppositional stance. In order to break out of this "iron cage" (DiMaggio and Powell, 1983), companies need to ensure that their strategy-making processes are open to a wider range of inputs. The globalization of top management can help ensure that a company is open to multiple perspectives and conditions, and the formation of top-level cross-functional climate teams can assist in this process. Indeed, such processes are already under way at several of the companies studied. Membership in a range of industry associations exposes a company to a broader diversity of perspectives.

The research also bears some important policy implications. If policy makers wish to steer the immense technological, financial, and organizational resources of the private sector toward GHG mitigation, then it is important that policy measures are developed such that they take account of the institutional embeddedness of corporate strategy. Relying on purely market mechanisms, such as taxes and emission trading systems, is likely to prove ineffective in the face of institutional inertia. Fiscal policies need to be combined with measures that address corporate expectations concerning regulation and market development. Engaging the private sector in integrated transportation planning initiatives could assist automobile companies in locating corporate innovation efforts within this broader framework, and provide greater predictability concerning the trajectory of technological evolution, emerging standards, and regulatory priorities.

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