

The Troubled Birth of the "Biotech Century": Global Corporate Power and Its Limits

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Transnational corporations (TNCs) are powerful drivers of change in the global food system.¹ Nowhere is this more clearly evident than in the field of agricultural biotechnology. The development and commercialization of genetically modified (GM) crops is the fastest technological revolution that has ever occurred in agriculture. In less than two decades, from the 1970s to the 1990s, genetically modified organisms (GMOs) have moved from laboratory research through field testing to commercial production, and since the mid-1990s the global GM planting area has grown at an average rate of 10 percent annually. Led by the US firm Monsanto, a small number of powerful biotechnology firms have set out to reshape global markets for key commodity crops such as soybeans, corn, and canola, with more GM crops (e.g., rice, wheat, potatoes) in the pipeline.

At first sight, agribiotechnology seems to provide ample evidence of overwhelming corporate power in the global food system. But a closer look at the emergence of the GM food business reveals a more nuanced and complex picture. Indeed, the growth of agricultural biotechnology has not been straightforward, and has been met with resistance from consumers, food producers, retailers, farmers, and regulators. In Europe, the majority of consumers rejected GM food when it became available for the first time in 1996, and opposition to agribiotech has also sprung up in Latin America, Africa, and Asia. In the developing world, many countries are still weighing the pros and cons of adopting GM technology in their agricultural systems, and some have even turned down offers of GM food aid despite food shortages. GM food became one of the bêtes noires of the antiglobalization movement of the late 1990s, and continues to ignite heated public debates on how to control the power of TNCs such as Monsanto. In Europe, a system of precautionary GMO

regulations has been put in place to carefully test and monitor the environmental and health risks of GMOs, and other nations have also created their own safety regulations and laws. At the international level, a treaty on safety in GMO trade, the Cartagena Protocol on Biosafety, has entered into force, despite opposition from powerful business groups and a coalition of agricultural export countries led by the United States (for an overview of the global politics of GM food, see Falkner 2007a).

Measured against the industry's ambition and rhetoric of transforming global agriculture (see Williams, chapter 6, this volume), it is fair to conclude that "the agricultural biotechnology revolution appears to be a mixed success to date" (Andrée 2005, 135). While it is still early in the history of this new technology, the troubles that have afflicted the GM food revolution raise interesting questions about the power of business in global food governance and in international political economy more generally: Does the ongoing expansion of global GM crop production support the widespread claim that global corporate power is out of control and that social and political actors are failing to direct and shape technological innovation? Or does the worldwide mobilization of anti-biotech forces and the creation of stringent biosafety regulations at national and international levels suggest that social and political checks on international business and technology are working? Does the temporary closure of major European and Asian agricultural markets to GM food products demonstrate that global political space exists in which at least some degree of control over corporate power can be exercised?

This chapter seeks to engage with these questions by focusing on the political agency and power of corporations in the international politics of GM food. It examines recent cases of contestation that have slowed down, or at least redirected, the seemingly unstoppable march of biotechnology. This chapter focuses on the role played by tensions and conflict within the corporate sector: between biotech firms on the one hand and food retailers, agricultural traders, and farmers on the other; and within the biotechnology sector itself. By examining business conflict in the evolution of agricultural biotechnology, the chapter aims to contribute to a better understanding of the globalization of the agrifood system and the complex role that corporations play in that process. Business conflict, it is argued, serves to limit the power of the corporate sector and opens up political space for other actors to shape the future of agribiotechnology.

In discussing corporate power in agrifood governance, this chapter builds on the tripartite framing of power as outlined in the introductory chapter by Clapp and Fuchs. It goes beyond this framework, however, by positing the need to focus on the divisions that exist within the business community. Discussions about the relative influence of states, corporations, and societal actors in global governance tend to view corporate power as an aggregate phenomenon, contrasting it with public or social power. Of course, few analysts would naively presume that business is always united in its approach to global governance. But without an explicit acknowledgment that the business community is (potentially) fragmented, and that dynamics of corporate competition and conflict shape the involvement of corporate actors in international politics, the study of global governance would miss out on an important driving force of global change. The aim of this chapter, therefore, is to connect the discussion of business in global governance with the study of business conflict, thereby laying the ground for a neopluralist perspective on corporate power.

The analysis proceeds in four steps. The first section introduces the rise of agricultural biotechnology and gives a brief overview of the emergence and transformation of the biotech industry. The second section sketches the neopluralist perspective that informs the analysis in this chapter, with a special focus on the business-conflict model. The third section introduces three case studies of how business conflict has shaped the path of biotechnological innovation and commercialization. The fourth and final section summarizes the key findings.

The Birth of the "Biotech Century"

Modern biotechnology allows the targeted manipulation of genes in living organisms, which in turn has opened up a vast range of commercial applications in several industrial sectors, from pharmaceuticals to agriculture and environmental remediation. Agriculture emerged as an important focus of biotechnological innovation in the 1980s, as a growing number of small and medium-sized companies were experimenting with different uses of recombinant DNA techniques in plants and animals. Genetic engineering has allowed scientists to insert desirable traits into living organisms or to make plants resistant to pests, drought, herbicides, or other environmental stresses. Several different GM plants have since been developed, most notably soybeans, cotton, corn, canola, and rice.

The global market for GM crops is valued today at over \$6 billion (Davoudi 2006), and is second only to medical appliances in modern biotechnology.

The early development of agribiotechnology was led by small and medium-sized companies, many of which had been spun off from research institutes and universities. Over time, with costs of research and commercialization rising rapidly, small biotech firms were gradually taken over by larger life science companies that sought to integrate agricultural and pharmaceutical applications. By the 1990s, the highly fragmented nature of the early biotechnology industry thus gave way to a more consolidated sector with a small number of large industrial players, concentrated in North America, Europe, and Japan.

As GMO innovations were moving from laboratory tests to field trials and commercialization, the process of industrial consolidation took on a new dynamic. From the mid-1990s onward, when the first GM crops were being grown on a commercial scale, a wave of mergers and acquisitions paved the way for a different industrial landscape that saw only a handful of large biotechnology firms dominate GM crop development. The United Kingdom's Astra and Sweden's Zeneca, two large pharmaceutical firms with stakes in agribiotechnology, merged in December 1998 to form the new company AstraZeneca. Only a year later, in December 1999, AstraZeneca and Novartis, the Swiss pharmaceutical producer, decided to spin off their respective agricultural and agribiotechnological businesses and merge them to form Syngenta. And in April 2000, Monsanto and Pharmacia & Upjohn completed a merger of their pharmaceutical operations and created a separate company focused on agribiotechnology, under the name of Monsanto. A key factor behind this wave of mergers was the desire to achieve synergies particularly in the pharmaceutical sector and to broaden the application of genetic engineering techniques to other areas (Fulton and Giannakas 2001).

But the creation of Syngenta and Monsanto with a sole focus on the crops business also suggested that the agricultural and medical sectors were increasingly going their own ways. Against the background of a worsening public climate for GM crops in the late 1990s, combined medical and agricultural biotech firms were keen to separate out the different social, political, and economic risks involved in biotechnology and shield medical applications from the public controversies that began to engulf agricultural firms (King, Wilson, and Naseem 2002).

A different motivation lay behind the second wave of mergers that saw DuPont acquire Pioneer Hi-Breed in 1997, to become the world's largest seed company. Monsanto had kicked off this wave when it decided to take over DeKalb in 1996, and followed this up with further acquisitions in the late 1990s, including Holdens, Delta & Pine Land Co., Asgrow, and Agracetus (Joly and Lemarié 1998). Both DuPont and Monsanto pursued these acquisitions as part of a broader strategy of integrating crop development, agricultural production, and seed distribution. This, they hoped, would give them greater control over the entire seed and agricultural business and would put them in a strong commercial position as the sole suppliers to farmers in key markets. The industry is still far away from this vision but has already achieved oligopolistic control over the supply of key GM crop varieties (e.g., soybean, cotton) in countries such as the United States and Argentina (on the latter, see Newell, chapter 9, this volume). Today, after a process of continuous industry consolidation, less than a handful of companies control the global market for GM crops, with Monsanto being by far the dominant player. In 2005, GM crops were grown on an estimated 222 million acres around the world. Monsanto's GM crops accounted for more than 90 percent of the total biotech acreage, followed by the next largest biotech companies, Syngenta, Bayer, and Dow/Du Pont (Davoudi 2006).

Despite a decade of year-on-year growth of GM crop cultivation, the biotech revolution has so far failed to spread worldwide. The global GM crop area has grown steadily for the last ten years, at an average annual rate of around 10 percent. Still, the majority of all commercially grown GM crops can be found in only a handful of countries: the United States, Argentina, Brazil, Canada, and China (James 2006). The United States alone accounts for over half of the world's GM crop production. In contrast, large agricultural markets such as India and China are continuing to debate whether to allow large-scale commercialization of the full range of GM crops that are currently in use. And many of the key import markets, such as the European Union (EU), Japan, and Korea, have put in place stringent import regulations, including GMO labeling requirements and partial or outright bans on GMO imports. Moreover, in many countries where certain GM crops have been authorized for commercial sale, consumers and food retailers are refusing to buy or stock GM food products. The position of importing countries concerned about GMO trade has been further strengthened by the entry into force of the Cartagena Protocol on

Biosafety, an international treaty aimed at ensuring that countries have the right and the capacity to subject GMO imports to risk assessment and to impose precautionary import bans if necessary (Gupta and Falkner 2006).

It would seem, therefore, that the arrival of the "biotech century" (Rifkin 1998) is anything but a straightforward story. Agricultural biotechnology has encountered serious resistance in key markets and has been subjected to increasingly stringent regulations despite an initially favorable regulatory environment in the industrialized world. To understand this crooked path of biotechnological innovation and adoption, we need to consider the role played by different actors—political, societal, and economic—in the shaping of the technology's political-economic environment. Within this field of political contestation, the tensions and conflict between different business actors have played a particularly important role, for they have opened up political space for other actors, most notably environmental nongovernmental organizations (NGOs) and consumer groups, to seek to influence the course of biotechnological commercialization. In the following section, I briefly introduce the notion of "business conflict" as an analytic tool for the study of corporate power, before examining three cases of business conflict in agricultural biotechnology.

Business Power and Business Conflict: A Neopluralist Framework

Economic globalization is generally considered to have strengthened the position of corporations in the international political economy. Most analysts would agree that the combination of greater global economic integration and the spread of liberal market-oriented policies have enhanced the legitimacy of the global corporation and provided it with greater room for maneuver. Assessments of corporate power vary widely, however. For some, corporations "rule the world" (Korten 1995) while state authority is "in retreat" (Strange 1996). Others point to the continuing resilience of the nation-state and international institutions (Hirst and Thompson 1996) and argue that globalization is dependent on a supportive political environment (Waltz 2000).

Part of the problem with debates on business power in an era of globalization is that they have often been conducted at too general and abstract a level. Particularly problematic has been the tendency to force such discussions into the straightjacket of a "zero-sum game," in which

rising business power is seen to result in the decline of state power and autonomy. That globalization has changed the environment within which states and firms operate is widely acknowledged. But whether it has resulted in a wholesale transfer of power from public to private actors is less clearly evident. For example, existing trends toward the privatization of global governance (Cutler, Haufler, and Porter 1999) do not necessarily support the broader claim that private power now trumps public power. It can be argued, instead, that private authority is closely linked to, and embedded in, the wider political framework provided by states (Falkner 2003).

Moving beyond the dichotomous positions that have characterized the early debate on globalization would allow us to develop a better understanding of business power—of its nature and sources, as well as its limits. Business may play a more prominent role in an era of globalization, but exactly how business power plays out internationally, and how it affects global governance, is a less straightforward story than either hyperglobalists or globalization skeptics suggest. We need an analytic perspective that views business power in its issue-specific context, as a historically bounded, contingent, concept.

Neopluralism offers this perspective (for a fuller exposition, see Falkner 2008, chapter 2). It acknowledges that business power can take on different dimensions—relational, structural, and discursive—but argues that these need to be contextualized and studied in specific policy domains. Due to their central role in the global economy, business actors may be in a privileged position, vis-à-vis states and nonstate actors, but this alone does not allow them to determine international policy outcomes. The existence of countervailing forces, both in the corporate world and beyond, limits business influence overall. Such forces can be found in the resilience of state power and the proliferation of transnational societal actors, but most importantly in the heterogeneity of the business sector itself. The neopluralist perspective directs our attention to the complex interplay between different actors in global governance, and particularly to the potential for divisions and conflict within the business sector. Neopluralism argues that the diversity of business interests, combined with the persistence of business conflict, constrains business power in the international system and renders global politics open-ended.

That the business community is not always united in its approach to international politics is hardly a novel insight, even though structuralist approaches in the field of international political economy have tended to

downplay its significance. Existing approaches that focus on the domestic sources of international politics have long argued that business should not be seen as a monolithic bloc with a pre-given interest. Sectoral differences have been shown to have a profound effect on trade policy in leading industrialized countries (Frieden 1988; Milner 1988), for example, and other divisions among business actors have had a direct or indirect impact on international politics (see the contributions to Cox 1996).

The insights of the business-conflict-model are particularly relevant to the study of international environmental politics, and global governance more generally. For business conflict arises whenever international policies or regulations cause changes to existing market structures or create new markets, and thereby cause differential effects on individual business actors. Several lines of conflict can be identified with regard to international regulation, norm settings, and regime building:

- *Between international and national firms* International firms are more likely to favor international rule setting and to support efforts to harmonize different national regulations at the international level than their national counterparts are.
- *Between market leaders and laggards* Technologically advanced firms may derive a competitive benefit from international regulation vis-à-vis other firms that would face higher costs of compliance.
- *Between firms at different points in the production or supply chain* Producers and users of regulated goods may have different interests with regard to the form and content of regulation, and firms operating at the consumer end of the supply chain often face different pressures and demands compared to those more removed from consumer markets.

The specific nature and form of business conflict will depend on the circumstances of the particular issue at hand and the industry or industries concerned. To delve deeper into the potential for business conflict in agribiotechnology, we therefore need to consider in more detail the network of corporate actors that are involved in the research, development, growing, processing, and sale of genetically modified crops and food.

Business-Conflict Formations in Agricultural Biotechnology

A useful starting point in the study of business power and business conflict is to identify the production chain, or supply chain, that links different economic activities in the production, distribution, and sale of a

certain good or service. In an age of economic globalization, such production chains are usually transnationally organized, involving producers, traders, and retailers operating in different national locales and across national boundaries. The concept of "production chain" (Dicken 2003, 14) or "commodity chain" (Gereffi and Korzeniewicz 1994), often also referred to as "production network" (Levy, 2008), signifies that different corporate activities are functionally integrated so as to form an international economic network. Such chains or networks can be found in a wide range of economic sectors, from automobiles, aircraft, and computers to textiles and consumer electronics.

Gereffi (1994) distinguishes between two types of networks: *producer-driven networks*, in which multinational corporations centrally control the production system across the entire production chain, as is the case in technology-intensive industries (e.g., Airbus, Siemens); and *buyer-driven networks*, where large retailers and brand-based trading companies play a key role in managing decentralized corporate networks in different national markets (e.g., Wal-Mart, Nike). While this distinction is overly simplistic when compared with the often-complex reality and variety of international economic networks, it helps to identify key structural features of the global economy. Production-chain analysis highlights the international integration of modern industrial production, points to structures of power within the corporate sector, and identifies points of access for social forces that seek to change economic behavior in the global economy.

The global production chain of GM food (see figure 8.1) contains a large number of corporate players from the biotechnology, farming, commodities trade, food production, and retailing sectors. Viewed from the consumer end of the chain, the GM food chain appears to be a buyer-driven production network, where large food retailers exercise considerable influence over the sourcing and production of food products. Such buyer-driven food networks are usually nationally or regionally organized, based on national or regional patterns of retailing and consumption. At the same time, however, we can also view the GM food chain from the producer end, where producers and distributors of GM seeds have undergone a process of industrial concentration. As mentioned earlier, the producer end of the chain has recently seen a trend toward more centralized control by biotechnology firms, with agricultural and biotechnology companies developing an integrated model of seed production and marketing.

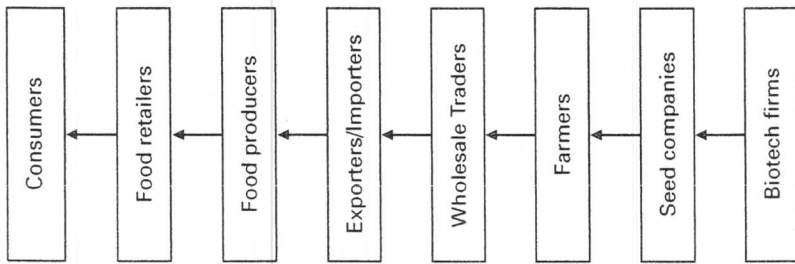


Figure 8.1
The global GM food chain

But efforts to extend corporate control over the GM food chain have largely failed. The highly fragmented farming sector and the diversity of national and regional agricultural markets pose serious barriers to the further integration of the GM food chain from both ends. Neither food retailers nor seed producers have managed to establish full control over the global production and distribution of GM and non-GM food.

What is interesting to note here is that GM food is part of a long production chain that is transnationally organized and that combines different types of corporate actors with diverse interest structures. This in turn offers multiple entry points for social and political actors to seek to influence the production of and trade in GM food products and to form political alliances with corporate interests that are not necessarily aligned with the strategies of the biotechnology industry. As Schurman

(2004) has shown, environmental campaign groups have exploited these so-called industry opportunity structures contained within the GM food chain to press for global change. The following three cases studies seek to demonstrate how such business conflict has shaped the evolution of biotechnological commercialization and have provided major points of contestation over the future of biotechnology in food production.

Three Business-Conflict Formations in Agribiotechnology

Biotech Firms versus Food Retailers

Civil society protests and consumer opposition have severely dented the commercial prospects of biotechnology, particularly in food production. Public unease about genetic engineering surfaced for the first time when GM crops were being developed and field-tested in the 1980s. After the first GM food products became available in commercial quantities in the mid-1990s, antibiotech campaigns erupted in Europe but also in other parts of the world (Bauer, Gaskell, and Durant 2002). Most governments responded by introducing new, or strengthening existing, safety regulations and in some cases even introduced bans or moratoriums on the commercialization of GM crops and food. The United States and Canada were notable exceptions to this trend, and North American consumers generally show much greater acceptance of GM food products. But in many parts of the world, including some of the major import markets in Europe and East Asia (e.g., Japan, Korea), GM food is largely absent from people's daily diet. Rather than transforming global agriculture and food production, as some early biotech pioneers had hoped, GM products have to date conquered only certain segments of the global food market.

While civil society protests and consumer anxieties were a major factor behind the biotech industry's growing troubles, their impact can only be understood if we consider how divisions within the corporate sector have provided the antibiotech movement with important access points to the global product chain. For it was the food retail sector that came to play a critical role in the early demise of GM food in Europe and East Asia, by amplifying consumer concerns and imposing restrictions on GM content in food products. Supermarkets led the worldwide movement toward labeling GM food products, which many governments have since come to mandate through legislation. In Europe, for example, supermarket chains introduced voluntary labels and even eliminated all

GM content from their own-brand food products, even though none of these actions were required by law. Large supermarket chains used their market power over food manufacturers and suppliers to demand the identification, and in some cases elimination, of GM content in food production and distribution, which in turn sent strong signals further down the chain to agricultural traders and farmers. By responding to antibiotic protests and consumer concerns in this way, supermarkets thus raised the hurdles for broader market acceptance of GM food.

Supermarkets have been able to exert this influence because of their increasingly dominant position at the buyer end of the food chain. The overwhelming trend in the European food retail sector has been one of greater concentration, growing market share of own-label products selling under retailer rather than manufacturer names, and increased coordination between retailers and suppliers along the supply chain (Loader and Henson 1998, 32). Leading food retailers have built up a strong position of trust among consumers, particularly with regard to food safety, which enhances their market strength *vis-à-vis* suppliers but also makes them vulnerable to any form of reputational risk. On issues of critical importance to consumers, therefore, food retailers have tended to emphasize transparency—for example, by providing information on food ingredients through labeling schemes (Loader and Henson 1998, 33).

The short-lived history of GM food in Europe started in 1996, when the first cans of GM tomato puree went on sale. In February, two of the United Kingdom's largest retailers, J Sainsbury and Safeway, offered the clearly labeled GM variety next to non-GM products. Against the background of recent food scares such as over bovine spongiform encephalopathy (BSE, also known as mad cow disease), retailers were keen to ensure that new food technologies would be accompanied by appropriate consumer information (Nunn 2000). But this strategy was under threat from the arrival of new GM crop varieties in the global food chain. The US industry was the first to introduce GM varieties of soybeans and maize to commercial production from 1996 onwards, causing concern among European retailers that these varieties could find their way into the European food chain without the full knowledge of the retail sector. In 1997, European retailers, therefore, called on US commodity suppliers to create segregated distribution channels for GM and non-GM food, so as to prevent accidental commingling. Because this would have caused significant additional costs to US producers and traders, European

demands for a dual distribution system were simply ignored. Amidst growing consumer unease and uncertainty regarding a proposed Europeanwide GM food labeling scheme, British food retailers and manufacturers then took the initiative and produced their own labeling code in November 1997. In doing so, the UK retail sector not only preempted legislative steps but also went beyond the measures that were being debated at the EU level. Whereas the EU's draft labeling scheme included references to food products that "may contain" GM content, the UK retail sector's code opted for a more unequivocal form of labeling that indicates that a product "contains" GM content.

Labeling was only a first step, and was unlikely to assure concerned customers. As headlines of "Frankenstein foods" offered a glimpse of what threatened to become a major public relations dilemma for food retailers, some supermarkets decided to distance themselves more clearly from biotechnology products. Iceland, a relatively small retailer with only 1.6 percent of total UK grocery sales, announced in March 1998 that it would eliminate all GM ingredients from its own-label grocery products (Loader and Henson 1998, 33). Sainsbury followed this move in July 1999 and became the first large British supermarket to claim that it had eliminated all GM content (mainly GM soy protein) from its own-brand products. The food retailer worked with more than 1,000 of its suppliers to ensure that only certified non-GM crops would enter the supply chain. Other major British supermarket chains, such as Tesco and Marks & Spencer, were also taking steps to eliminate GM foods from their shelves (Reuters 1999). Under pressure from activist groups, leading supermarkets in Britain, Ireland, France, and Italy then sought to coordinate their efforts and formed a consortium to increase their leverage *vis-à-vis* GM soy producers (Milmo 1999). They all took voluntary action to eliminate GM content from their food range and put pressure on their suppliers to do the same, or at a minimum to identify all GM food content in the production and distribution chain.

To some extent, European supermarkets acted preemptively, in anticipation of a European directive on GMO labeling (Novel Food Regulation), which had been delayed due to internal disagreements within EU institutions and eventually came into force in 1997 (Loader and Henson 1998, 33). But the main impetus for the introduction of voluntary GM labels, particularly in the United Kingdom, was the fear that rising anti-biotech consumer sentiment would dent the retail sector's reputation for food safety. Ironically, opinion polls conducted before GM food labels

began to appear in the United Kingdom showed no strong opinion on either side of the GM food debate. According to a Food and Drink Federation opinion survey in 1995, "Only a small proportion [of consumers] indicate that they definitely would/would not buy GMO-containing food products if they were available" (Loader and Henson 1998, 31). Because concern over hostile consumer reaction, however small, was the retail sector's main concern, many large supermarkets went beyond existing regulatory requirements and eliminated all GM content from own-label products. As a consequence, by 2005 twenty-seven of the thirty top European retailers had adopted a policy of excluding GM ingredients from products in their European or main markets (Greenpeace 2005).

Despite being initially open-minded about GM food products, leading European supermarkets ended up hastening the demise of GM food in Europe. The lack of unity between biotechnology firms, agricultural producers, and food retailers has thus dealt a severe blow to industry hopes for a global rollout of GM food. Due to their economic size and exposure to reputational risks at the consumer end of the food chain, food retailers have played a central role in relaying consumer preferences and societal values to food producers, traders, and farmers. In doing so, they may amplify and even distort such preferences and values. In any case, food retailers have a pervasive influence over agricultural practices further down the commodity chain. Crucially for the case of GM food, this influence extends across national boundaries into different farming sectors around the world, causing food producers and traders to seek refuge in strategies of regional market differentiation and segregated distribution. Business conflict has thus led to an increasingly segmented, and ultimately more limited, global market for GM food.

Biotech Firms versus Farmers and Traders

While food retailers transmitted antibiotech consumer sentiment down the GM food chain, it was farmers and agricultural traders that took key decisions on whether to adopt particular GM crop varieties offered by biotech companies. In agricultural markets that are sensitive to the purchasing power of food retailers, those decisions have played an important role in directing the pattern of GM crop cultivation. There are, of course, a variety of reasons why farmers may choose not to adopt GM crops. The higher price of buying a combined package of GM seeds and herbicide treatment may act as a deterrent, and farmers may be doubtful about the long-term economic benefits that can be derived from

new and more expensive GM crops. They may also object to the growing dominance of a small number of biotech firms that are increasingly controlling the production and distribution of key seeds. Moreover, they may want to avoid being shut out of export markets with GMO restrictions in place. All these factors have played into farmers' decisions on GM crop cultivation around the world, but it was particularly the latter—the impact of negative consumer reactions and supermarket restrictions—that have come to block the further spread of GM food crops.

A prominent example of how farmer resistance can slow down or temporarily stop the commercialization of GM crops—even in the heartland of the biotech revolution, the United States—is the case of the planned introduction of GM wheat. In 2002, Monsanto submitted applications in Canada and the United States for regulatory approval of Roundup Ready wheat. Only two years later, in 2004, the company was forced to withdraw these applications and publicly declared its intention to stop research and development (R&D) of GM wheat. While this withdrawal may be reversed in the future, the dramatic turnaround in Monsanto's strategy nevertheless demonstrates the impact that consumer preferences, when combined with business conflict, can have on global agriculture. As Olson (2005, 164) put it, "Because of unwavering market rejection of genetically engineered wheat among most international buyers, and because of dogged grassroots opposition from farmers, rural communities and consumers, Monsanto has temporarily corked the genetically engineered wheat genie in the bottle." To understand how this was possible, we need to examine the specific political economy of wheat, and particularly the tensions between the biotechnology industry and wheat farmers and traders in North America.

After its first success with GM soybeans and corn, which captured about 90 and 50 percent market share in the United States respectively, Monsanto shifted its R&D efforts to the next generation of GM crops. In the late 1990s, it was leading the race to develop GM wheat and began to prepare the commercial rollout of a genetically modified version of the high-value hard red spring variety, which is popular with flour mills because of its higher protein content. Monsanto's herbicide-resistant wheat was to be sold in conjunction with its Roundup herbicide, based on the similar agrichemical model of Roundup Ready canola, soybeans, and corn. Hoping to repeat the economic success of earlier GM crops, Monsanto in 2002 sought regulatory approval for the commercial

planting of GM wheat in the United States and Canada, and submitted similar requests to regulatory authorities in other countries, such as Japan and South Africa (AP 2004).

By this time, regulatory applications for new GM crops had attracted the attention of environmental campaigners and were starting to meet with resistance from wheat farmers and traders. Farming organizations in Canada and the United States expressed their concern about the negative impact the new crop variety would have on wheat markets. Their objections were based on fears that Monsanto's Roundup Ready wheat might create "super weeds" that would become immune to certain herbicides, and that weed management would become more complicated and costly. They also feared dependence on Monsanto's increasingly monopolistic position in the supply of seeds. Most importantly, wheat farmers with a large exposure to export markets argued that the introduction of GM wheat would cause the loss of important export markets in Europe and Asia because supermarkets there were unlikely to stock GM products.

The growing rift between the biotechnology industry and wheat growers became all too clear when market studies conducted in the early 2000s pointed to persistent resistance to GM wheat in foreign markets. In 2000–2001, eight of the top ten importers of North American hard red spring wheat were based in Asia and Europe, and the overwhelming majority of large buyers in Japan, Korea, China, and the European Union had publicly declared that they would not purchase GM wheat or GMO-contaminated conventional wheat shipments, even if such varieties had passed the regulatory process in their markets (Olson 2005, 157–158). As a representative of Japan's Flour Millers Association, which mills about 90 percent of domestic wheat, stated in 2001: "Under the circumstances, I strongly doubt that any bakery and noodle products made from genetically modified wheat or even conventional wheat that may contain modified wheat will be accepted in the Japanese market. World wheat supply has been abundant in recent years, and I don't see why we have to deal with modified wheat. . . . I believe the production of modified wheat at this time will be a very risky challenge for U.S. producers" (Cropchoice 2001).

Economic studies of the short-term economic impact of GM wheat introduction confirmed the fears of many farmers. Iowa State University economist Wisner warned in his widely noted 2003 study that consumer hostility to GM foods in Europe and elsewhere posed a serious economic

risk to American farmers if GM wheat was introduced commercially. Even if production of GM and non-GM varieties were to be segregated, the possibility of accidental commingling and GM contamination would put export sales at risk. With the loss of markets in Europe and Asia, excess American wheat production would quickly lower producer prices and thus make the adoption of GM wheat economically unviable (Wisner 2003).

The political economy of wheat posed a peculiar problem for the biotech industry. Because wheat is grown primarily for food production and human consumption (unlike soybeans and corn, which are predominantly processed into animal feed or intermediate products such as oils), it is much more susceptible to antibiotech consumer attitudes. Also, American producers grow a much smaller share of global wheat production (8 percent in 2002) and therefore face much stiffer international competition in export markets. If US wheat production were to switch to GM varieties, US wheat exports could easily be replaced with non-GM supplies from other producer countries. And finally, US wheat farmers had already experienced a long-term downward trend in their global market share, down from nearly 50 percent in the 1970s to just over 20 percent in 2001 (Wisner 2003). All these factors combined to heighten the threat of losing important export markets.

Sensing growing resistance among North American farmers, Monsanto set up a Wheat Industry Joint Biotech Committee in 2001 to seek a consensus with the farming community on how to introduce its GM wheat variety. At the same time, it set the period of 2003–2005 as the window for commercial introduction of GM wheat while assuring farmers that such a decision would depend on market acceptance for the biotech crop (Fairchild 2002). But concerned wheat producers were actively seeking moratoriums and even bans on GM wheat commercialization in those states with the highest stakes in wheat production, such as North Dakota and Montana.

To be sure, not all wheat farmers were opposed to GM wheat. Those producing primarily for the domestic market have remained open-minded about the potential commercial benefits of biotechnology. The wheat farming sector was not united on this question, with the National Association of Wheat Growers (NAWG) being more sympathetic to GM crops and the US Wheat Associates (USWA) voicing the concerns of exporters (Bernick and Wenzel 2006). But in the end, the divisions within the farming community and strong lobbying by exporter interests, who

account for over half of the American wheat market (Wisner 2004 17), made it impossible for Monsanto to fulfill its pledge to create a broad market consensus before commercializing GM wheat.

Opposition to GM wheat commercialization ran particularly high among Canadian farmers, who are more dependent on export markets than their US counterparts. The Canadian Wheat Board actively lobbied regulatory authorities not to allow the planting of Monsanto's new crop and in May 2003 appealed directly to the company to withdraw its application for regulatory approval. The Canadian farmers' stance was based almost entirely on an economic rationale. Because of the danger of commingling of GM and non-GM crops and the high costs of segregated production and distribution systems, wheat growers feared the loss of access to high-premium markets abroad, greater uncertainty in international farm trade, and higher costs for farm management and grain handling (Johnston 2003).

By 2004, it had become clear to Monsanto's executives that their strategy of building a consensus among North American farmers had failed. Not wanting to further antagonize the farming community, the company announced in May that it was delaying plans for the commercial introduction of Roundup Ready wheat and that it would redirect its R&D efforts toward other crops such as corn, oilseeds, and cotton. Executive Vice President Carl Casale declared that "as a result of our portfolio review and dialogue with wheat industry leaders, we recognize the business opportunities with Roundup Ready spring wheat are less attractive relative to Monsanto's other commercial priorities" (Burchett 2004). Monsanto has since worked hard to persuade North American farming associations to support in principle the commercial introduction of GM wheat at some future point (Bernick and Wenzel 2006), but has had little success, particularly with Canadian farming associations.

Monsanto's failure to introduce GM wheat in North America, the most receptive market environment for GM crops, is a prime example of how business conflict along the product chain has offered antibiotech forces important access points to shape the future of biotechnology. Such "industry opportunity structures" (Schurman 2004) emerged in a number of areas, wherever GM commercialization threatened to increase the costs of crop management, storage, and distribution, and particularly where it would cause the loss of export markets with GMO import restrictions or labeling requirements in place. In China, for example, exporters of soybeans and soy-based products to Japan, Korea, and the

EU have lobbied the government against the start of commercial production of GM soybean varieties in the country, out of fear that commingling and accidental GM contamination of shipments abroad would close off foreign markets (Falkner 2006). In similar fashion, Indian rice exporters have resisted plans to test and introduce GM rice to Indian agriculture. In November 2006, the All-India Rice Exporters' Association called for an immediate end to all field trials of a GM rice variety developed by Monsanto-Mahyco, for fear of losing its position as the world's third largest exporter of basmati rice (Parsai 2006). Consumer resistance and environmental protest are of course the root cause of the industry's difficulties, but in all such cases it is business conflict that enabled antibiotech movements to shape the commercial future of emerging GM crops.

Business Conflict within the Biotech Sector

So far, the focus has been on tensions between biotech firms and other corporate players in the global GM food chain. This is in line with traditional business-conflict studies in international political economy, which emphasize cleavages between different industrial sectors, particularly between domestic and more internationally oriented sectors (e.g., Frieden 1988; Stant 1996). In international environmental politics, such interindustry conflicts are common where regulations have distributional effects between industries that cause pollution and those that provide environmental solutions (e.g., fossil fuel versus renewable energy industries in climate change; see Falkner 2008, chapter 4). But business conflict can also emerge within an industry—for example, between technological leaders and laggards, or between dominant players and new entrants to a given market. Can similar intraindustry divisions be found in the biotechnology sector?

At first glance, the answer seems to be no. All biotech firms share a common interest in promoting the use of biotechnology in agriculture and in removing regulatory barriers to technological innovation. They may be locked into fierce economic competition when it comes to developing new products, capturing market share, or seeking regulatory approval for their own products, but their basic political outlook on larger questions of biotechnology governance can be expected to be similar. Indeed, a decade of commercial GMO production and nearly two decades of international biosafety politics suggest that the divisions within the biotech sector have been less pronounced than those between

the biotechnology sector and other sectors involved in the GM food product chain.

Yet, certain fault lines within the biotech sector did emerge in the context of the international negotiations on the Cartagena Protocol on Biosafety. One potential source for business conflict could be found in the different outlooks and lobbying strategies of US versus European biotech firms, though such differences never seriously threatened their common lobbying position. The other, more significant, cleavage existed between the different economic and political strategies of agricultural versus medical biotech firms, which came to undermine the structural power of the biotech sector overall. None of these cleavages developed into a full-scale business-conflict constellation, although the growing disengagement between the agricultural and medical sectors was to have a lasting effect on the strength of the business lobby in the international negotiations.

Let us consider regional difference first. US and European companies developed distinctive environmental strategies in the past, as has been noted in the international politics of climate change and ozone layer depletion (Levy and Newell 2000). How important were such transatlantic differences in the biosafety negotiations? Participants in the Cartagena Protocol talks have attested to some regional variation in the lobbying role of biotech firms. While US corporate representatives were more confrontational in defending their antiregulatory stance, European lobbyists tended to strike a more conciliatory note and were more willing to consider some form of international regulation.² This impression was shared by environmental NGOs who participated in the biosafety negotiations. Richard Tapper (2002, 271), an advisor to the Worldwide Fund for Nature, remarked that European biotechnology representatives "were more open to constructive dialogue than some of their US counterparts." European negotiators likewise commented that they encountered a more hostile lobbying stance by US industry representatives than by their European counterparts. This was partly a question of lobbying style and cultural differences, but also reflected different regulatory pressures and relations with home governments.

But did these regional differences in lobbying translate into a significant business conflict? Were US and European biotech firms divided by fundamentally different political strategies? There is little evidence to support such claims (see Clapp 2007). The main reason for this is the high degree of internationalization in biotechnology that has helped to

blur regional differences between individual companies, in terms of both global commercial strategies and industry structures. All biotech firms operate in a global market. They have developed similar biotech products, have sought regulatory approval for their GM crops in the same markets, and have faced the same political constraints. While they have needed to adjust their strategies to local and regional conditions, they have nevertheless maintained the same overall strategic outlook. Levy and Newell (2000, 14) are therefore right to argue that, "despite procedural and institutional influences on the way businesses have pursued their interests and different degrees of exposure to social and political concerns about GM foods, biotech companies in both Europe and the United States have maintained similar positions."

The global biotech industry structure, which is characterized by growing internationalization of research and development, has also rendered regional differences less relevant. The series of mergers and acquisitions described above has led to a dramatic concentration of agribiotechnology in the hands of only a few European and North American firms. Even though these firms retain strong links to their domestic markets in the United States, Germany, and Switzerland, in fact R&D, field testing, and commercialization of new crops are highly internationalized. European biotech firms such as Syngenta and Bayer have a strong presence in the North American market and are in close competition with Monsanto in overseas markets. Because of this high degree of industrial internationalization, it makes only limited sense to speak of Bayer and Syngenta as representing "European biotechnology" when it comes to international biosafety politics. Indeed, as a US industry lobbyist remarked, "There was no European industry position as such" in the negotiations on the Cartagena Protocol.³

Regional differences may have played only a marginal role, but sectoral differences within the biotech industry had a more profound effect on the international process. During the 1990s, the reorganization of the biotechnology industry led to a growing separation of firms focused on either agricultural or medical applications of genetic engineering, which in turn led to the emergence of divergent political strategies. One of the key contributing factors to this growing divergence was the varying levels of public resistance that different forms of biotechnology faced. As anti-biotech sentiment against GM food—but not GM pharmaceuticals—came to pose a growing commercial threat, companies that straddled both these sides of biotechnology began to disentangle their respective

businesses so as to separate out the different political risks attached to food and medicine. This process took off in the late 1990s and culminated in two large mergers that transformed the industrial landscape: Novartis' and AstraZeneca's decision in 1999 to combine their agricultural business in the newly formed but separate company Syngenta; and the merger of Monsanto and Pharmacia & Upjohn in 2000, which led to the creation of a separate agribiotech company under Monsanto's name.

The growing separation of agricultural and medical biotechnology was clearly visible in the biosafety negotiations. Pharmaceutical companies had only a limited interest in the international process and lobbied mainly to have GMOs for pharmaceutical purposes excluded from the biosafety protocol (Marquard 2002). Rather than working together with agribiotech firms and forming a united industry front, the pharmaceutical industry focused solely on limiting the scope of the protocol to exclude the medical sector. Representation by pharmaceutical firms in the negotiation was limited in any case, and many of their representatives departed early from the final negotiation round in January 2000, once it was decided that pharmaceutical GMOs would not be covered by the protocol. The disintegration of agricultural and medical biotechnology in the late 1990s thus severely undercut the overall lobbying effort of the industry. It made it easier for the European Union to champion precautionary biosafety regulations on agricultural GMOs despite its continued support for biotechnology in the medical area (see Falkner 2007b).

In this way, business conflict among biotech firms came to play a significant role in the international political process. While regional differences were less important to the overall lobbying position of the industry, the growing separation of agricultural and medical biotechnology severely restricted the industry's overall influence. With its larger pharmaceutical allies departed from the international negotiations, the agribiotech industry increasingly had to rely on links with agricultural trading firms to fight burdensome regulations in the emerging biosafety regime.

Conclusion

The much debated arrival of the biotech century has begun to transform major industrial sectors, including agriculture, where it provides new avenues for crop development and integrated crop management. But

despite the hopes of early industrial innovators, the adoption of modern biotechnology has been much slower in agriculture than in the medical sector. Genetically modified crops have run up against widespread resistance, by consumers, health and environmental campaigners, regulators, and farmers. A few GM crops (soy, corn, canola) have been introduced in a small but growing number of countries (especially the United States, Canada, Brazil and Argentina). Especially in Europe, Asia, and Africa, however, consumer hostility and environmental protests have dented the biotech industry's global ambitions. The worldwide GM crop area may be expanding and new GM crops are being developed, but key food markets remain largely closed to these developments. Of course, it is still early in the history of modern biotechnology, but the uneven adoption of GM crops around the world holds important lessons for the study of corporate power in global food governance.

As the analysis in this and in other chapters has shown, social protest and consumer preferences are potent forces that shape global agricultural markets. Antibioeth sentiment has been on the rise since the mid-1990s and has led to the closure of major markets to GM food products. But to understand why social protest has had such a powerful influence over commercial agribiotechnology, we need to focus on the nature of the global GM food chain and the sources of friction and conflict within it. Because business has been divided on how to assess the economic benefits and risks associated with GM crops and whether to label GM content in food products, antibiotech forces have been able to exploit these divisions and create barriers to the further commercial introduction of GM food. The biotechnology industry has found it difficult to persuade certain farming sectors and food retail businesses of the benefits of its novel products. Despite their success in vertically integrating crop development and seed distribution, leading companies such as Monsanto have been unable to penetrate major agricultural markets. In short, business conflict has frustrated the global ambitions of the biotech industry, despite its seemingly unstoppable push for a biotech revolution in world agriculture.

That latent divisions between different business actors have developed into full-fledged business conflict is largely due to the rise of antibiotech sentiment and protests. Societal and political actors have actively sought to exploit the potential for business conflict and have amplified divisions within the business sector. Business conflict has opened up opportunities for more effective social and political contestation and has provided

antibiotech forces with levers of influence over the direction of GM crop commercialization, thus creating a more open-ended and indeterminate path of biotechnological development. In this sense, business conflict limits business power overall, whether structural, instrumental, or discursive. Whether such contestation enhances the possibilities of global food governance for sustainability depends on other factors, however. Business conflict merely creates political space for society to shape technological innovation and commercial developments in agriculture.

Notes

1. An earlier version of this chapter was presented at the 2007 Annual Convention of the International Studies Association in Chicago. This chapter builds on and extends the analysis in chapter 5 of Falkner 2008.
2. Interview with US biotechnology representative, July 16, 2001.
3. Interview with US biotechnology representative, July 16, 2001.

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