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Dependent Convergence: The Importation of Technological Hazards by Semiperipheral Countries

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**DEPENDENT CONVERGENCE: THE IMPORTATION
OF TECHNOLOGICAL HAZARDS BY
SEMIPERIPHERAL COUNTRIES**

Carlos Eduardo Siqueira and Charles Levenstein

This article complements the substantial body of literature produced over the last three decades on the export of hazards from developed countries to developing countries. After reviewing the central arguments proposed by this literature, the authors add to the debate by focusing on the role of national actors in the importation of these hazards, based on the experience of late 1970s' developments in the petrochemical industry in Brazil. The Brazilian case indicates that social struggles and/or interactions among actors in developing and developed nations determine to what extent hazardous technologies are imported without environmental controls and to what extent their hazardous effects are controlled by these nations. This study suggests that the future development of a more inclusive theory of export-import of hazardous technologies and products should take into account the dialectical relationship established between social actors internal to the exporting and importing countries.

THE EXPORT OF HAZARDS ARGUMENT

For over 20 years, Barry Castleman, alone or with Vicente Navarro as coauthor, has written many articles about the "double standards" in "export of hazards" or "migration of hazards." Their body of work influenced the views of a significant number of public health professionals and intellectuals in the United States and elsewhere (1, 2). In his most recent article on the subject, Castleman defines double standards as follows (3, p. 87):

Companies have on occasion moved entire plants and exported banned products to developing countries, but more often the export of hazards is less obvious unless one is able to make quantitative international comparisons.

There have been many examples where multinational corporations have not been as thorough in controlling industrial hazards in developing countries as

they were in their “home” countries. The most numerous reports of this “double standard” have arisen in connection with asbestos and other ultra-hazardous materials, where substantial control of the hazards would represent a major share of overall costs of production and reduce sales in other ways.

In spite of the evidence provided by some studies (4) that agglomeration economies and other macroeconomic factors are the dominant influence on investor calculations for decisions about company location, we concur with Castleman’s argument that multinationals “on occasion” export ultra-hazardous chemicals to the third world and maintain a system of double standards. A wealth of evidence exists to demonstrate this (3, 5). Among many others, Bhopal is probably the most famous example. Nevertheless, it may be difficult or unreasonable to claim the existence of double standards for cases in which multinational facilities in developing countries are the safest and most modern plants in these countries. Evidence of this can be found in many countries in Latin America, lending some credibility to the arguments put forth by the supporters of free-market economic policies that the globalization or internationalization of the world economy may improve health and safety and environmental pollution in third world countries (6).

Birdsall and Wheeler (7) came to such a conclusion in their study of the relationship between greater economic “openness” and increased industrial pollution in Latin American countries. They suggest that “liberalization of trade regimes and increased foreign investment in Latin America have not been associated with pollution-intensive industrial development.”¹ Relying on Chilean anecdotes and econometric evidence, they claim that “protected economies are more likely to favor pollution intensive industries, while openness actually encourages cleaner industry through the importation of developed-country pollution standards” (7).

It is possible that two contradictory phenomena have occurred simultaneously in Latin America. On the one hand, large transnational companies have exported new and cleaner technologies that allow them to comply with developed countries’ pollution control standards. Once established, they may push host governments to enforce tighter standards than the existing ones so as to gain competitive advantage over smaller companies of the host countries. Export-driven industries in “open” host countries may also be forced to comply with social regulations of developed countries to gain access to their consumer markets. According to Birdsall and Wheeler, this seems to have happened in Chile—an extreme case of laissez-faire economics. On the other hand, pollution-intensive industries may have been exported to less-developed countries in the 1980s as the countries of the

¹ This argument has been advocated by defenders of the North American Free Trade Agreement (NAFTA), Free Trade Agreement—or Area—of the Americas (FTAA), the World Trade Organization (WTO), and other regional trade agreements.

Organization for Economic Cooperation and Development (OECD) made their regulations stricter in the 1970s. The data analyzed by Birdsall and Wheeler also support such a possibility. In turn, these authors claim that pollution-intensive industries (capital- and material-intensive industries) have enjoyed protection in Latin America despite being heavy polluters. Thus, “pollution havens” would be found in protectionist rather than open economies.

Beyond the arguments related to different political and ideological positions, study methodologies, and views of economic development, empirical data from different industries, countries, and periods seem to provide evidence for opposite arguments. This is probably why neoclassical and Marxist economists as well as right- and left-wing politicians can use empirical evidence to back either free trade or fair trade, globalization or national autonomy, “open markets” or “protectionism.” In short, the migration of hazards argument is a good example of a hotly contested terrain between the corporate and labor/community interests in developed and developing nations.

Three Paths for the Migration of Hazards

In an excellent updated discussion of the migration of hazards, Karliner (8) summarizes three paths of migration of hazardous industries from the North, the locality of most developed or industrialized countries, to the South, where the vast majority of the less-developed or industrializing countries are located. He calls them the Pollution Havens, Package Deals, and Marlboro Men paths.

In the *Pollution Havens* path, the relocation of production and migration of hazards are due to strict environmental standards. Transnational corporations (TNCs) relocate their operations, export their products, or send off their hazardous waste to the South primarily to avoid environmental regulations in the North. Examples are the continuing export-oriented manufacturing of pesticides banned or unregistered in the United States or Europe, such as DDT, DBCP, chlordane, butachlor, heptachlor, and methylbromide (9); the continuing production of leaded gasoline in many developing countries (such as by Dupont in Mexico until 1992) after the ban in the United States; and the production and export of asbestos to Latin America after it was banned or highly restricted in the United States and other developed countries (10, 11).

In the *Package Deals* path, TNCs move their operations to the South because they are offered a package that includes the following comparative advantages of relocation: lax environmental regulations and poor enforcement, low wages, and no unions. The best examples are found in the maquiladora factories on the Mexican side of the Mexico-U.S. border. These assembly-line plants, owned by many U.S.-based corporations and now totaling over 3,000, have created what some American environmentalists and health and safety activists consider to be the worst cases of environmental pollution in the Americas (12, 13).

Economic globalization is the driving force for the migration of hazardous industries to the third world along the *Marlboro Men* path. Corporations set up factories in countries of the South to export back to their home markets (export platforms) and to sell their products elsewhere. The products include cigarettes, polyvinyl chloride piping, cars, cornflakes, and several lines of consumer products. The tobacco industry migration coincided with a process of saturation, stagnation, or decline of sales in developed countries, in part due to health concerns and regulations. The chlorine, automobile, and nuclear industries appear to be following a parallel strategy.

Levenstein and colleagues (14) refined Castleman's arguments by submitting that because of increased international competition during the 1970s, U.S.- and European-based TNCs spread their activities across the globe, setting up production facilities in many developed and developing countries. These corporations invested heavily abroad, looking for new markets and places to produce with lower wages, less regulation, and less taxation. Thus, for most transnational or multinational industries, the export of jobs, capital, and hazards is related to capital expansion on a global scale. Stricter occupational health and safety or environmental control standards in developed countries play only a small role in this process compared with cheaper labor, lack of or reduced tariffs, fewer barriers to trade and investment, and tax incentives in developing countries. Campbell (15) also asserts that the ascendancy of the global corporation was one of the major features of globalization at the end of the century.

On a more fundamental or structural level, it seems that today's challenge is to analyze the process of economic globalization or expanded capital reproduction at the global level and its repercussions on local work and community environments. These traditionally local issues are now closely intertwined with economic decisions that follow a global logic. The global assembly line is the ultimate example of this process. For example, an auto plant is no longer a local plant because investments in production facilities and manufacturing are driven by global markets. A single car may now be assembled in several different facilities located in different countries. Each part of the production process may be carried out in a different country to obtain competitive price advantages. Thus, local environmental or occupational health problems derived from such production processes become part of a global scenario—as do the solutions to these problems.

Theoretical Framework for the Export of Hazards Argument

Castleman and Navarro's export of hazards, migration of hazards, and double standards arguments may help explain some of the structural trends that determine the practices of TNCs in developing countries. Their perspectives are useful for regulatory and technological comparisons between plants owned by multinational companies in developed and in developing countries. For example, in the aftermath of the Bhopal disaster such comparisons showed wide discrepancies in

environmental safeguards between the Union Carbide plants in Bhopal, India, and in Institute, West Virginia.

The theoretical framework underlying the double standards and export of hazards arguments seems to spring from an economic development paradigm—the structuralist approach to dependency perspectives proposed by Gunder Frank—that sees countries divided into divergent economic development stages, closely related to their levels of industrialization and economic development. According to this framework, countries are either developed or underdeveloped, industrialized or industrializing, with some countries in intermediate stages, commonly called newly industrializing, emerging, or semiperipheral countries. Developed countries, also called the core, the center, or metropolises, unilaterally determine what happens in economically *dependent* developing countries, also called the periphery (16, p. 185).

The world capitalist system structurally determines the international division of labor, whereby core countries export technologies and capital, and peripheral countries export raw materials and in some cases consumer and durable goods. By the same token, developing countries import technology and capital, and metropolises import primary products (food and raw materials) and cheap manufacturing products. The imperialist metropolises develop this international division of labor and accumulate capital from it. As technology changes and the organization of capitalist expansion changes, developing countries are assigned different tasks in this division of labor.

Following the logic of this approach, TNCs, as major organizers of capital expansion from the metropolises to the periphery, would export hazards from developed to developing countries whenever needed for the process of capital accumulation in the former countries. Less-developed countries would become pollution havens owing to their subordinate role in the world economy.

From the perspective of public health scholars in the developed countries, the center exports hazardous technologies to peripheral or semiperipheral countries,² which have to import these technologies because of their subordinate role in the international capitalist economy. Progressive and even mainstream public health intellectuals in the United States, Europe, and Latin America have focused most of their attention on the export side of the underlying export-import relationship that is always present in such economic transactions. These intellectuals have studied and correctly criticized the export of hazardous technologies, products, wastes, and factories to developing countries, which accept them as a trade-off for much needed and desired industrialization. These investigators have found many cases

²The use of the term *semiperipheral* here is derived from the classification proposed by the post-dependence world systems approach that, in the words of Petras, “sought to describe the development of capitalism in terms of a stratified, functionally inter-related global market containing three levels (a core, a semi periphery and a periphery), and to trace historically the mobility of nations within what is dubbed a single capitalist world economy” (17, p. 40).

in which the controls applied to such technologies in peripheral countries are divergent from similar controls adopted in the center (11, 14).

In summary, Castleman and Navarro have proposed arguments that may correctly explain the many cases in which TNCs export hazards to developing countries without adequately protecting workers and communities. It is worth emphasizing here that most of the international literature mentioned above is based on criticizing the *export* of hazards from the perspective of the center, whose TNCs are blamed for the deleterious and immoral export of known hazards to dependent countries. But these arguments fall short of explaining other cases in which the nation-state and national actors in developing countries are the major forces behind the creation or *importation* of the hazards. The next section adds to the international literature on double standards and the migration or export of hazards to developing countries. It addresses the gap in this literature by (a) examining the importation side of the export-import relationship and (b) focusing on the viewpoint of social actors in the importer country.

THE OTHER SIDE OF THE COIN: IMPORTATION OF HAZARDS BY DEVELOPING COUNTRIES

The Export-Import Dialectic

From a methodological perspective it is apparent that any process of export or import of goods and technologies between two countries is composed of at least two sides: a country that exports and a country that imports. To understand the process of export of hazards from developed to developing countries or the import of hazards by developing countries, one has to look at both sides of the relationship. If this dialectical reasoning is correct, then it is also correct to assume that whenever TNCs based in developed countries—without doubt national actors in these countries (18)—export known hazards to dependent countries, the latter participate in the transactions by accepting the hazards through the action of other national actors, typically government and business representatives. The opposite scenario is also true: when a developing country decides to import a hazardous technology from a developed country, national actors in both countries broker the transaction. These relationships become more complex when one adds the role of other social groups, such as labor, communities, and political parties, on both sides.

Thus one must consider several vantage points or perspectives in analyzing the transfer or migration of hazards between a developed and a developing country: on the one hand, the perspectives of national actors in the exporter country; on the other, the perspectives of national actors in the importer country. Only a few studies published in developed countries have described the combined or contradictory perspectives of actors in the importer and exporter countries, in particular the role of subordinate classes in dependent countries in shaping the technological

controls adopted to reduce or eliminate workplace and community exposures to hazardous chemicals.

Theoretical Framework for the Importation of Hazards Argument

We relied on a different theoretical framework as one basis for our analysis of the importation of hazards. We grounded the study on the historical-structural approach to dependency perspectives proposed by Cardoso and Faletto. This approach leads to a view of dependency within the context of local social struggle. An economic system is dependent when “accumulation and expansion of capital cannot find its essential dynamic component inside the system” (quoted in 16, p. xx). Class struggle between popular movements and ruling classes at the national level plays the most important role in determining historical events in these countries. According to Cardoso and Faletto, their approach “is both structural and historical: it emphasizes not just the structural conditioning of social life, but also the historical transformation of structures by conflict, social movements and class struggle. Thus our methodology is historical-structural.” They continue (quoted in 16, p. x):

structural analysis of dependence aims to explain the interrelationships of classes and nation-states at the level of the international scene as well as at the level internal to each country, [whereas] dialectical analysis of that complex process includes formulation of concepts linked to the effort to explain how internal and external political domination relate to each other.

The logic of world capitalist accumulation and imperialist penetration in developing countries is very important—as proposed by the structuralist approach—but it does not mechanically or by itself determine their economic and political development. On the contrary, the interests of foreign capital may at times be internalized by local groups and promote national development. Cardoso and Faletto agree with the notion that capitalist development in the periphery is conditioned by the world economy, but they concentrate on the particular countries rather than on the general world economy. They focus on the inter- and intra-class struggles taking place on the periphery and submit that these struggles had significance for both local and world capitalist development. Moreover, the dependent state is viewed as a bourgeois mechanism for appropriating local resources for capital export and a mechanism for establishing and maintaining bourgeois hegemony. The economic development in the periphery is seen as conditioned by crises and developments in the world system, but the dependent state is primarily responsible for organizing the internal market and the local accumulation of capital.

Methodological Aspects

We applied this historical-structural theoretical framework to understanding and explaining environmental and occupational health policy developments in the Brazilian petrochemical industry between the 1970s and 1990s, between the end of Brazil's "economic miracle" and the neoliberal hegemony. We particularly focused on the history of Cetrel, the waste management and environmental protection company of the Pólo Petroquímico de Camaçari (Camaçari Petrochemical Complex) in the state of Bahia, the largest petrochemical complex in the southern hemisphere, and compared it with the history of the Gulf Coast Waste Disposal Authority (GCWDA), a similar company located in the Bayport Industrial Park in Texas.

The detailed contexts for the origins, evolution, and current status of occupational and environmental policies adopted in these two companies throughout the last two (in Brazil) or three (in the United States) decades are described elsewhere (19). Here it suffices to say that we used the in-depth historical case study methodology to describe, analyze, and compare the historic and political-economic contexts of the Bayport and Camaçari complexes as well as GCWDA and Cetrel. We next summarize the main features and lessons learned in the Brazilian and U.S. case studies, which strongly support the broader approach proposed above.

Role of the Brazilian State in the Importation of Petrochemical Hazards

According to Evans (20), the Camaçari Petrochemical Complex was an outcome of former president General Ernesto Geisel's II National Development Plan. As an offshoot of the Brazilian "economic miracle" of the late 1960s to early 1970s, this long-term economic development plan set out to develop the nation's infrastructure in order to turn Brazil into a "developed" country within a short time frame. The "basic inputs" industries such as the petrochemical and capital goods industries were targeted as high priorities for investment in import-substitution industrial infrastructure. The Pólo was located in Bahia as a result of an economic development strategy that favored regional development and industrial decentralization and promoted the import-substitution of essential products and the expansion of nationally owned industries. This developmentalist strategy assumed that the creation of a large industrial structure in the northeast would not only polarize (the Portuguese word *pólo* means "pole") the economic growth of the poor Brazilian northeast upstream and downstream from the complex, but also provide the country with petrochemical goods. As a result, Brazil would reduce its economic dependency on foreign countries for these much needed goods. However, in order to achieve this result the Brazilian state needed to create "strong entrepreneurial structures" supported and leveraged by the state apparatus.

Evans also argues that a state-sponsored local bourgeoisie was created through the initiative of state bureaucrats who directed the investment of around \$2.5 billion to guarantee local private capital participation in the planned petrochemical development. The state oil monopoly company, Petrobrás, through its subsidiary Petroquisa, coordinated a triple alliance between foreign, local private, and state capital to establish joint ventures in the production of second-generation chemicals. Petroquisa also organized Copene, the petrochemical refinery of the Camaçari Petrochemical Complex, selected the sources of technology, and chose its own partners in the undertaking. A variety of federal agencies, in particular the old National Bank for Economic Development, backed the local private investment with low-interest loans, tax subsidies, fiscal and economic incentives, market and pricing protections for the products, and feedstock supply at prices below international market prices.

This quite decentralized state apparatus successfully bankrolled the local bourgeoisie, transforming local capitalist structures without using typical “free-market” competition among capitalists. The Brazilian state forcefully pursued a strategy of cooperation with selected local and national private capital along the lines of “managerial capitalism.” Private and state capital became tightly integrated in a *tripé* (meaning “tripod”) with foreign capital. Foreign capital was invited to participate in the *tripé* as a way of allowing Brazil to gain access to capital and technologies not available domestically, “at a time when there was a confluence of interests between the goals of the dominant class, the nationalist interests of the state bourgeoisie under president Geisel, and the interests of a number of international chemical giants, mainly German and Japanese, who were looking for new investments in the Third World” (21, p. 186). Thus, the intrinsically hazardous petrochemical industry was introduced in Brazil mainly through the actions and decisions of the Brazilian military dictatorship, in association with segments of the Brazilian bourgeoisie. The working and middle classes did not have a seat at the table. Multinational companies also played a minor role in the decisions about this industrial development. One cannot but see this process as an importation of hazards by the elites of a semiperipheral country, whose leaders saw the hazards as a necessary evil, a price to pay to promote industrialization in the strategic petrochemical sector. In fact, a former Brazilian minister, Fabio Yassuda, once said that the Pólo was an example of socialist planning in a capitalist economy.

As part of this planning, the state of Bahia created Cetrel in the late 1970s, aiming at mitigating and controlling the negative environmental impacts of petrochemical production. Ashford (22) calls this strategy secondary prevention, based on the analogous Leavell and Clark prevention paradigm. State of Bahia managers and professional bureaucrats in charge of environmental affairs (mostly sanitary engineers) believed, since Cetrel’s inception, that the management and treatment of industrial wastewater was the state-of-the-art technology to control future industrial water pollution. They claimed, after visiting GCWDA and Europe

several times in the 1970s, that Cetrel adopted the best hardware and software available in developed countries to build its industrial wastewater treatment plant. The hardware (plant equipment) was nationally made, and the software (how to operate the plant) was based on U.S., in particular GCWDA, and European models.

Exemplifying Castleman's reference to the importance of "hazardous thinking" (3), these professionals believed that Brazil had to import the best available control technologies to control the occupational and environmental hazards created by the infant petrochemical industry. The installation of state-of-the-art end-of-pipe pollution control technologies in Bahia would prevent the serious environmental pollution crisis that had already occurred in the birthplace of the Brazilian petrochemical industry, the Pólo de Cubatão, São Paulo, in the mid-1970s. Yet, within a decade of operation of the Camaçari Complex, reality proved their hopes wrong. A severe water, soil, and air pollution problem was detected by the Environmental Impact Assessment done before expansion of the complex in the late 1980s.

Role of Labor Unions in Controlling Petrochemical Hazards in Bahia

Cetrel was the first site where employees became sick. As a result of exposure to high levels of benzene and other solvents that evaporated from the industrial wastewater treatment basins and tanks, some employees developed leukopenia and solvent-related acute symptoms. By 1987 the recently organized Sindae, the union or *sindicato* that represented state water and wastewater treatment workers, led Cetrel workers in their struggle to control the chemical exposures and compensate over a dozen employees diagnosed with leukopenia. This first benzene crisis at Cetrel started to uncover the reality that petrochemical workers become ill if exposed to the chemical substances used in petrochemical production, even when these workers are involved in the tail end of the production process—the treatment of industrial wastes.

Given their conservative nature, the political forces that dominated the Brazilian state at the time made a quite limited intervention in this crisis, contributing mostly to investigating the situation through a Health Hazard Evaluation performed by the regional office of Fundacentro, a federal agency similar to the U.S. National Institute for Occupational Safety and Health. Business representatives inside the state apparatus tried to cover up the results of the evaluation. Middle-class labor allies inside the state leaked the information that allowed Sindae to organize the rank-and-file against the bad working conditions and destabilize the particular aspects of petrochemical production that generated diseases at Cetrel.

The Cetrel crisis was a small conflict, a kind of rehearsal for a second and much more serious benzene crisis, because management control over the production processes prevented workers from getting information about benzene and other chemical exposures. Acting as an indirect boost to Sindae's fight, Sindiquímica,

the militant petrochemical workers union, had already shaken the foundations of the existing authoritarian regime in the Camaçari Complex when the union shut the whole complex down for about 20 days in 1985. The young and still inexperienced fraction of the working class in Bahia started to exercise its collective power at the same time that the Brazilian transition to a democratic regime gained steam. Sindae's political pressure on Cetrel managers and state agencies led to the elimination and reduction of occupational exposures to toxic chemicals in the late 1980s to early 1990s. In the mid to late 1990s Cetrel gained international recognition for its model environmental policies and procedures when those were certified by the British BS-7750 and the International Organization for Standardization (ISO) as compliant with the ISO 14001 environmental management system requirements.

In 1990, however, a second and very serious health crisis took place in a company called Nitrocarbano, a benzene processing facility, and spread to all other benzene producing and processing facilities in the Camaçari Complex. An occupational health physician and a plant operator at Nitrocarbano died within a three-month period. Benzene exposures became the "sentinel" for a much broader spectrum of chemical, physical, and safety hazards related to petrochemical production. The three main actors in the political economy of occupational disease—businesses, the state, and labor—started to openly and aggressively flex their muscles, in the process learning how to deal with new health and safety matters that had broad political, economic, and social implications.

It was after about ten years of operation of the Camaçari Complex that the conflict regarding health and safety in the work environment fully arose. By the time of the second benzene crisis, labor, management, and the state already had enough experience to enable them to exercise their class capacity at the local and national levels. The Nitrocarbano battle manifested the tactics and strategies of an all-encompassing and dynamic "war of positions." Reacting to the wide repercussions of the death of the occupational physician, these three social actors brought their local and national organizations to bear on the solutions to the crisis, probably driven by strategic calculations about the impact of the crisis on their future power.

Organized labor led an aggressive and successful local and national media campaign to change business behavior and promote change in work environment policies in the Camaçari Complex and elsewhere. Arguably, Bahia became the epicenter of a larger national work environment crisis, whose origin was also related to high benzene exposures in the Cosipa steel mill in São Paulo. Bahia's now left-of-center state administration intervened at the local level, through the action of progressive state bureaucrats and organized labor allies within the state apparatus, to force business to control hazardous exposures in the work environment. At the federal level, three cabinet members of the conservative administration of President Fernando Collor went to Bahia to soften the bad publicity generated by the death of the company doctor.

Petrochemical businesses initially staged defensive actions of denial and refusal to accept the unfavorable circumstances. As the crisis developed, the previously comfortable business hegemony controlling health and safety conditions in the complex showed clear signs of fracture, at least judging by media coverage and poll results. Petrochemical and chemical businesses reacted strongly to this fissure, with a large public relations campaign and a series of actions to neutralize labor with “objective,” “scientific” answers to the work environment crisis: they commissioned expensive epidemiological studies, invested large amounts of money to persuade civil society that they knew how to control the hazards, and implemented engineering controls and monitoring programs to evaluate work environment hazards.

Cetrel was privatized in the early 1990s and its limited role in managing and treating industrial wastewater changed to an extended role in environmental protection for the whole complex. It added air and solid hazardous waste treatment and monitoring systems to its policy menu. Thus it switched from a waste management company that dealt with the petrochemical wastes of over 50 companies to an environmental protection company that deals with all sorts of environmental issues directly or indirectly related to petrochemical production, such as environmental education or preservation of the local fauna and flora.

From the beginning of this second benzene crisis it became clear to the actors that a permanent solution to the benzene crises demanded significant changes in Brazilian regulation of benzene, involving a wide range of issues such as benzene tolerance levels, medical surveillance, and workplace monitoring. The resolution to these legal aspects was accomplished in the mid to late 1990s by the tripartite benzene agreement, a negotiated compromise that represented a new standard-setting process in Brazil, whereby the three major players in the Brazilian corporatist regulatory environment—the state, labor, and business—built a long-term cooperative venture to update the old benzene standard.

The Texas Counterpart

The Bayport Industrial Park, where GCWDA is located, is on the edge of Upper Galveston Bay in Pasadena, Harris County, Texas. It was developed in the late 1960s by a real-estate development subsidiary of Exxon called Friendswood (now Exxon) Land Development Company. The industrial park is surrounded by the urban communities of La Porte, Clear Lake, Shore Acres, and Pasadena, about 20 miles south of Houston. Exxon developed the initial infrastructure for the implementation of a large industrial park whose industrial wastewater would be treated at the Bayport treatment facility. Thus, the wastewater plant preceded most of the facilities that came to the Bayport Industrial Park. By 1974, the park had about ten operating companies.

The political economy of the Bayport Industrial Park may be characterized as an example of capitalist planning in a capitalist economy, for several reasons. First, it is a petrochemical complex composed of privately owned, small and medium-sized plants with an average of 75 to 100 workers, mostly producing second- and third-generation petrochemical products. Second, the park is but one complex in the largest oil and petrochemical production area in the world, the Gulf Coast region, in a state where about a quarter of the world's chemical production took place in 1990 (23). Since World War II, the state of Texas has built a vast industrial infrastructure for oil and petrochemical production in the region, which includes a network of pipelines, ports, cargo terminals, a rail system, and access to feedstock and customers of chemical and petrochemical production. The Bayport complex may also be described as one of the links in the Gulf Coast chain of petrochemical production. Third, as the largest source of chemical raw materials and energy in the United States, Texas has developed regulatory and tax environments friendly to petrochemical businesses. Not only have the oil, chemical, and petrochemical industries been a major part of the state economy for at least five decades, but corporate hegemony of the oil, chemical, and petrochemical industries is also solidly established in political, social, and cultural matters. In addition, the regional expertise in environmental regulation, engineering, construction, and waste treatment and disposal adds to Texas's attractiveness to international petrochemical businesses. Finally, the Bayport complex is an offshoot of the booming economy of Texas in the late 1960s to early 1970s, which set off another wave of industrial concentration of petrochemical companies in a resource-rich and wealthy region of the United States. Well-developed economies of scale favored concentration of petrochemical production in the Gulf Coast. Given the overall pro-business environment in the state, the installation of the initial group of facilities in the Bayport Industrial Park should be seen as a result of market-driven corporate planning that tried to take advantage of optimistic forecasts for specific petrochemicals, such as polypropylene, as well as competitive advantages resulting from location and economies of scale.

Gulf Coast Waste Disposal Authority

The GCWDA is an almost 30-year-old firm born from Texas's intervention to control free-market failures that had generated a regional environmental crisis—the serious pollution of Galveston Bay. Yet, one can see the “visible hand” of corporate planning in the formerly Exxon-owned Bayport plant. The GCWDA is part of a much larger petrochemical region including several hubs of petrochemical production that are neither integrated nor centrally planned. It has managed the wastes of at least three smaller petrochemical complexes, located in Texas City, Bayport, and the Houston Ship Channel, composed of subsidiaries of large multinationals and mid-sized plants.

GCWDA is a small firm, its growth closely associated with the business cycles of the petrochemical industry in Texas and therefore resulting from internal market conditions favorable to the U.S. oil and petrochemical sectors. Nevertheless, it has been affected by the international business cycles of the petrochemical industry, since most investments in the local petrochemical industry are driven by long-term capitalist planning. Because of the nature of the production processes and the configuration of the three petrochemical complexes mentioned above, GCWDA has never had to confront a major work environment and environmental crisis.

This Texas counterpart to Cetrel operates in a social environment where labor is weak and workers are for the most part non-unionized (24). There is a loose network of business leaders that only get together when legal crises develop, such as the U.S. Environmental Protection Agency's requirements for pre-treatment guidelines for industrial wastewater. The apparent organizational weakness of business, however, may be explained by the oil and petrochemical industry's long-established and consolidated hegemony in Texas: business organizations only appeared on the political scene when significant threats arose. In the "Oil and Petrochemical Republic of Texas," the interests of these industries have for decades been portrayed, and mostly accepted by the average citizen in the state, as the general interests of the people of Texas. In the 1970s local communities and environmental groups mounted a strong resistance against the treatment in their backyard of the wastes generated by this industry, but never challenged the industry's control of production decisions.

CONCLUSION

The history of the Camaçari Complex and of the struggle of petrochemical workers in Bahia to control work environment exposures to hazardous chemicals suggests that the working class has a fundamental role in determining the "history" of imported hazards after their introduction in developing countries. It shows that, as happened earlier in many developed countries, organized labor and its allies are the most important actors in determining to what extent these hazards will be controlled by businesses and the state.

In short, a comparison between the evolution of GCWDA and of Cetrel indicates that the latter has evolved into a company broader in scope for a constellation of structural and historical factors briefly mentioned here and detailed elsewhere (19), not the least of which has been the militancy of Sindiquímica and Sindae in Bahia. This major difference between the two cases helps explain why the role of subordinate classes in shaping occupational and environmental controls was more pronounced in Bahia than in Texas. It could be argued that the problems in Bahia, such as the benzene crises, were larger and required more civil action to solve than did those in Texas. Yet, the important lesson here is that in the 1980s petrochemical workers in Bahia developed stronger

organizational resources to counter the negative impact of imported technological hazards. Their collective action created the momentum for the state to intervene, forcing companies to control their emissions, either voluntarily or under state mandates. As petrochemical companies implemented these pollution controls, what we call “dependent convergence” became consolidated, to such an extent that Cetrel received international corporate recognition for its environmental management system. In other words, despite the “dependent convergence” between Cetrel and GCWDA in the 1970s and 1980s related to the adoption of industrial wastewater pollution control technologies, in the 1990s Cetrel may have surpassed GCWDA to converge with the best in the business of petrochemical waste control.

The Brazilian case differs from the typical multinational-driven pattern of export of hazards. On the one hand, the local petrochemical industry developed under the auspices of a tripod coalition that implemented import-substitution economic policies. Technological hazards and controls were clearly imported from developed countries. A similar situation may also have occurred in many other state-driven heavy industries in Latin American and Asian countries, such as Venezuela, Mexico, and South Korea. On the other hand, the Brazilian case shows that subordinate classes will always play a significant role in the struggle to control the hazards created by highly polluting industries, if they are able to put pressure on the state to regulate emissions to the work and general environment. Democracy seems to be an essential condition for this to happen. Social and economic disruption from restructuring of industry, especially unemployment, can undercut the political power and political will of organized labor.

As economic globalization guided by neoliberal free-market policies became the norm at the turn of the century, labor in Bahia lost much of the power to influence and shape work environment controls and the Brazilian state has withdrawn from the economic and regulatory scene by privatizing the formerly state-owned companies. Concentration and internationalization of capital are quickly emerging in Bahia. There are reasons to believe that this trend is also occurring elsewhere in the world, facilitating the “free migration” of hazards to developing countries without much resistance or counter-pressures. Despite this recent unfavorable scenario, research on situations involving the negative impact on workplace health and safety and the environment of trade between developed and developing countries should still take into consideration different sides and perspectives, from social actors of both developed and developing countries, and social struggle.

Now, more than ever, there are several visible political and economic interests to reckon with when analyzing the health and safety impacts of the neoliberal wave of multilateral trade agreements (such as the North American Free Trade Agreement and the World Trade Organization) that are paving the way for the global migration of hazards. Although the identification and interpretation of these interests may require grassroots international cooperation and solidarity,

there is no better way to develop a much needed dialectical, inclusive, and thus comprehensive picture of the political economy of the international migration of hazards. This is the direction that future research must pursue.

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