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INTERROGATING THE TREADMILL OF PRODUCTION

Everything You Wanted to Know About the Treadmill but Were Afraid to Ask

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This article is structured to answer a number of questions that have been raised over the years about the origin, structure, and application of the treadmill of production theory. The following questions are addressed: What was the theoretical structure of the treadmill of production? Why does the theory focus on production rather than consumption? Was the treadmill a dialectical or a linear change theory? How has the treadmill theory changed under the growing globalization of production since 1980? Has the treadmill been evaluated empirically? What forces have limited the diffusion of the treadmill in environmental sociology? Is the treadmill more/still useful today for ecological analyses? For social analyses?

Keywords: *consumption; ecological modernization; environmental sociology; production; social movements*

I. ORIGINS OF THE TREADMILL THEORY

What Was the Theoretical Structure of the Treadmill of Production?

The treadmill of production was a theory introduced by Schnaiberg (1980) to address the question of why U.S. environmental degradation had increased so rapidly after World War II. He argued that a growing level of capital available for investments and the changing allocation of such capital investment together produced a substantial increase in demand for natural resources. Essentially, the major changes outlined by the theory were that more capital was becoming accumulated in Western economies, and this capital was being applied to replacing production labor with new technologies to increase profits. These new technologies required far more energy and/or chemicals to replace earlier more labor-intensive processes. New technologies emerged from the organization of scientific and technological research in universities and research institutes, as well as in the new “research and development” departments of large firms. Moreover, unlike the prior use of labor, the new technologies represented forms of sunk capital. To further increase profits, managers of firms needed to increase the levels of production and sustain higher

levels (because worker inputs could more readily be cut back as opposed to fixed costs of machine operations).

The treadmill of production was thus, primarily an economic change theory, but one that had direct implications for natural resource extraction as well as for the opportunity structure for workers. In essence, the “treadmill” component recognized that the nature of capital investment led to higher and higher levels of demand for natural resources for a given level of social welfare (including wages and social expenditures). Each round of investment weakened the employment situation for production workers and worsened environmental conditions, but it increased profits. For workers, this treadmill implied that increasing investment was needed to employ each production worker. For ecosystems, each level of resource extraction became commodified into new profits and new investments, which led to still more rapid increases in demand for ecosystem elements.

Treadmill theory focused on the social, economic, and environmental conditions for *stakeholders* (workers and community residents). Simultaneously, expansion of the treadmill structure enhanced the economic and political power of *shareholders* (investors and managers). Political gains for shareholders included a growing capacity to induce both government and labor unions to support still more investment of this sort, to employ displaced and new workers, and to augment state tax revenues. Over time, this increased political power of shareholders was enhanced by their capacity to obtain still more political support for treadmill expansion through an expanded use of profits for direct campaign contributions. The initial treadmill theory was published in 1980 at the onset of a new era of political conservatism in the United States. New antienvironmental and antisocial policies of the Reagan administration dominated the political landscape and offered little support for the theory of the treadmill among both scholars and activists (see below). Since 1980, in fact, most of those utilizing the treadmill theory in their research have been younger scholars, especially in the global South (see below).

The treadmill theory presented an image of a society running in place without moving forward. It represented a decrease in the social efficiency of the productive system. This decreased social efficiency of natural resource utilization produced a shift towards vastly increased rates of ecosystem depletion (resource extraction) and ecosystem pollution (dumping wastes into ecosystems). Moreover, workers and their families politically supported the expansion of this new capital-intensive form of production. As workers were cast off by the growing treadmill, their major consciousness was that accelerating this new form of investment was necessary and sufficient for “social progress.” Thus, each round of socially dislocating growth generated increased, rather than decreased, social support for allocating investment to accelerating the treadmill of production.

Politicians were induced to provide direct and indirect support for such expansion: They received strong support for doing this from investor-managerial groups. And they received public support from workers and their unions who supported virtually any and all kinds of “economic development.” Although some workers and their unions attempted to resist these processes, even they were under growing economic, social, and political pressure to accept this as the *only* path to social progress, even if reluctantly. Any resistance to this change was labeled as antediluvian, Luddite, old-fashioned, reactionary, and doomed to failure (see below) by a variety of economic and political representatives. Ironically, this rapid growth in support occurred despite considerable doubt about the future of the U.S. peacetime economy after the end of World War II (with fear of a return to the economic

depression of the 1930s). Within 5 years, however, the accumulated savings from the wartime period were mobilized to create vast new infrastructural and manufacturing investments to stimulate production expansion.

Throughout this period of about 1945 to 1960, the promises of unlimited energy (especially atomic energy) and newly accessible mineral and other extractive resources (especially petroleum) led to social and political inattention to ecological limits and unthinking support for unlimited economic expansion. Early 20th-century attention to “sustained yield” (Hays, 1969) utilitarian approaches to land and water were largely dismissed, and emerging pollution problems were not well researched or managed. Waste was mostly moved into the commons, with spillage into water systems, dispersal into air pollution, and dumping in land systems at some distance to cities. These presaged the “limits to growth” (Meadows, Meadows, Randers, & Behrens, 1972) perspective, which emerged in the later 1960s and 1970s. They were largely ignored in favor of attending to economic expansion.

Part of this disattention was facilitated by the growing social class segregation of the population. Middle-class workers, who benefited from the expansion of the treadmill, largely moved to emerging bedroom suburbs. Blue-collar workers, and many craftspeople, lived in cities or small or company towns where they struggled with rising local pollution and community health problems, juxtaposed with their need to preserve their jobs. Although pollution was a negative externality for both white-collar and blue-collar workers, it was geographically and socially removed from many members of the rising educated middle class yet increasingly dispersed into communities of the working class. Middle classes lived upwind and upstream of polluting enterprises. Blue-collar workers were induced and/or coerced to live downwind and downstream or adjacent to community pollution, under the decreased costs of local property and the limited wages of the blue-collar workers. This class-based distribution of residential location insulated production decision makers from the health/environmental consequences of their decisions (Gould, 2003).

Ironically, one of the precursors of the treadmill model was an early argument of Barry Commoner, a socially progressive biologist (and later a Green Party presidential candidate) who helped expand ecological consciousness in the United States. Commoner’s (1977) ecological analysis of declining capital productivity paralleled our own work. This was in stark contrast to the standard economic and managerial focus on worker productivity. Both in the 1970s when Commoner wrote and especially in the current political-economic climate, the obsession with increasing worker productivity has dominated many policies. From the standpoint of the treadmill theory, increasing worker productivity is often associated with accelerating the treadmill—producing still fewer worker benefits from a given rate of natural resource extraction. Indeed, raising worker productivity was the central dynamic of corporate decision making in the initial theorizing about the treadmill of production. The treadmill process aimed to displace many workers—through an increase in physical capital per worker (and hence, potential environmental impact per worker), using profits to raise production technology. The goal was to enhance profitability or return on investment. Inherent in this process was a substantial increase in energy needs and chemical waste discharge, as well as elimination of habitats for flora and fauna. During the period since 1945, habitat destruction has probably been the best marker for expansion of the treadmill (either through resource extraction or waste disposal).

Two outcomes of this emerged for workers. For most, this eventually led to a decline in wages and job opportunities, what Harrison (1994) has termed the “low road to development.” Part of this was accomplished by crushing worker unionization through job blackmail (Kazis & Grossman, 1982). An ever-growing part of this was created by closing U.S. plants and moving to locations in the global South, where labor was substantially cheaper, workers were nonunionized, and workers and politicians were desperate for new employment possibilities for their young populations. From *maquiladoras* in Mexico to sweatshops and intense factory work elsewhere, the rate of return on investment rose substantially. Workers in the United States became more desperate for new investment, as noted above, and workers abroad accepted new employment, which appeared to raise their living standards somewhat. Both increase the potential for higher environmental damage, often by eliminating existing environmental protection, because both also produce greater economic volatility.

Yet there was a smaller class of workers who experienced this process as a “high road to development”—their wages, skills, and careers were enhanced by their incorporation into the new physical (and electronic) technological systems. This included not only workers directly involved in the new production but also a wide range of workers involved in marketing, financial analysis, and customer service. In recent years, however, this high road has become increasingly susceptible to the core logic of the treadmill. For middle-level managers, and educated professionals of all types, there are strong pressures to increase “worker productivity” to sustain corporate profitability by reducing expenses.

Beyond the core logic of the treadmill, this model generally encourages analysts to take into account a range of factors that produce environmental insults as well as understanding how these factors make environmental policy making so complex. The treadmill model underscores the importance of paying attention to dialectics and contradictions in the behaviors of individuals, groups, the state, and industry. When we develop a sociological understanding of the constraints and choices within which individuals and institutions exist, environmental conflicts and solutions become clearer and yet more inaccessible. Although the majority of U.S. workers would like to live and work in safer, cleaner environments, they are unable and/or unwilling to take direct action to achieve these realities. Although most Americans indicate that quality time is an important goal in their lives, they tend to spend more time working every year. Elected officials must maintain their legitimacy with the voting public and secure the “monopoly” powers of the state (Tilly, 1978). But they routinely make decisions that erode state power and public legitimacy. Ratifying free trade agreements, which undermine the ability of nation-states (and subsidiary forms of government) to exercise social control, starkly illustrates this contradiction. Industry needs to secure and maintain the obedience of its workers, but managers engage in practices that violate the social contract and mitigate against worker trust.

The treadmill model also underscored the importance of social inequality, power, and conflict as key parts of the social systems’ effects on the environment. Many scholars simply surveyed environmental attitudes and concern. But treadmill theory offered an analysis of what people thought about not only the environment but also the behaviors of their social institutions, affecting the natural world.¹

Using the treadmill as our tool, we have often taken positions that are unpopular or that run counter to the prevailing consensus on a number of topics. For example, there is a scholarly tendency to celebrate (and overstate) the influence of the envi-

ronmental, antitoxics, and environmental justice movements (Bullard, 1993; Dunlap & Mertig, 1992; Szasz, 1994). In contrast, we have used the treadmill model squarely to face the reality that these social forces were (and remain) at a major power disadvantage vis-à-vis political and economic elites. Indeed, we believe that environmental sustainability/protection around the globe has declined substantially despite the work of these movements.

This sort of "bad news" reporting in scholarly circles is generally unappealing and often frustrating for those of us who would like to believe that both the environment and our societies are moving toward a state of sustainability. The same dynamic applies to the debate between treadmill theorists and proponents of ecological modernization, with the latter adopting a fundamentally upbeat outlook on industrial practices (Garcia Johnson, 2000) despite continued and intensified ecological destruction around the globe. This approach has, at times, met with both acceptance and resistance from activists as well; they have a social investment in reports that the global ecological crisis is serious but also seek affirmation that their actions are having a positive affect on ecosystems.

Why Does the Theory Focus on Production Rather Than Consumption?

Schnaiberg (1980) initially outlined the substantial change in technologies in the third quarter of the 20th century. The newer technologies were inevitably more energy intensive and chemical intensive on one hand and less labor intensive on the other. Capital mobilization for these changes in production technology arose from a substantial postwar economic boom, which led to increased production and profits. Next, these profits were disproportionately used to develop and introduce new physical technologies. However, to amortize the fixed and operating costs of the new technology, production generally had to be substantially increased. In turn, this increased the demand for natural resources, both energy and other. Once in place, the expanded production of the new technologies substantially increased both the volume of production waste and the toxicity of wastes (due to increased use of chemicals).

From the outset, then, the treadmill of *production* focused on decision making in the realm of *production*. Its model of socioenvironmental dynamics emphasizes production rather than consumption. Although consumers may be the ultimate purchasers of *some* of the products of the new technologies, decisions about the allocation of technologies is in the realm of production managers and owners. Decisions about types of technologies, the use of labor, and volumes of production are made outside the realm of consumer decision making. Individuals, communities, states, and corporations can consume only the outputs of a given production technology. The majority of what social systems consume must be extracted from nature (extraction being the leading edge of any production process) and then further processed to generate a final product. Although consumers can accept or reject these products, they have no influence over the allocation of capital to productive technologies. Thus, it is within the production process where the initial interaction of social systems with ecosystems occurs.

Many popular economic theories postulate the responsiveness of supply to demand. Yet it is in the decision to *provide* supply, and the means by which that supply is provided, where social systems and ecosystems first collide. Production decisions may or may not be influenced by anticipated consumption decisions. But the relationship between production and ecosystems, which provide the total stock of potential materials for production, is a direct one. In contrast, the relationship

between consumption and ecosystems is at best indirect. Consumption decisions must be made in the context of previous production decisions as well as prior social distribution decisions.

By recognizing the relationships between economic structure and political power, the treadmill model contextualizes the role of consumer decisions within the material parameters of their political-economic contexts. Consumer choice devolves from (a) the constraints of specific prior production decisions, (b) specific prior economic distribution decisions, and (c) a specific distribution of policy and decision-making power. To place consumption decisions first in our analyses would obscure the power relations embedded in the political economy. Henry Ford's famous "consumer choice" comes to mind: He told the public they could purchase any color Model T they wished "as long as it's black!" "Consumer behavior" studies contain few theories about the power underlying them. Obscuring the distribution of economic and political power serves the discipline of neoclassical economics quite well in its status quo reinforcement functions. It violates the critical analytical and empirical requirements of sociology, however. A key dimension of the exercise of power is the ability to influence, if not dictate, the choices of those less powerful (Lukes, 1974). Individual choices to not consume products generated by powerful actors involve an underlying power struggle between highly unequal contenders.

The mechanisms through which human need and human desire are formed are largely determined by preexisting conditions of production, beyond the basic biophysical needs of humans as living organisms (food, warmth, shelter, social interaction). Desire is socially constructed, and material desires are largely constructed by material producers (Schiller, 1996). The transformation of socially constructed material desire into human need is a result of social processes, which are heavily influenced by those who control production decisions. Contrary to classical and neoclassical economic theories that posit that consumer preferences determine the contour of markets, this consumer behavior was consciously being shaped by industry. The "gospel of mass consumption" was the successful construction of consumer desires not by consumers themselves but by the captains of industry and their collaborators in the advertising sector. Thus, the extraordinary rise in productive output after World War II was complemented by a rise in personal consumption among U.S. citizens.

It may be argued that individual, community, state, and/or corporate consumers may alter or terminate specific forms of production by consumer boycotts. However, these collective victories still do not empower consumers to determine the *means* by which alternatives will be produced or even what alternatives will be produced. Indeed, it is possible that no alternative will be produced, thus freeing consumer capital to be funneled into the consumption of yet other items already made available by producers. In theory, the decision not to consume may terminate the production of specific products. In rarer cases, they may even terminate specific forms of production. Yet there are few if any examples of either of these terminations occurring directly through consumer choice, and only a handful have even been implemented through political pressures exerted by social movement organizations (which are politically organized interest groups of consumers). Even the famous grape boycott succeeded mainly in raising social consciousness about working conditions among farm laborers; it was an economic and political failure.

Again, however, the decision of what *alternative* forms of production will be offered for consumers to choose from is not in the hands of consumers. It remains

with a small minority of powerful individuals (treadmill elites) who are empowered through their access to production capital. Decisions that determine producers' access to natural resource inputs and to ecosystem waste sinks arise from a stratified and politicized society driven largely by:

- producers' access to capital
- producers' access to labor
- producers' assessment of potential liability
- producers' assessment of marketability
- producers' assessment of profitability

Such producer decisions are influenced by the regulations imposed by the state and by negotiations with their labor forces. This is why the treadmill of production model emphasizes the role of nonelite individuals as *citizens* (polity) and *workers* (labor) rather than as consumers (Gould, Schnaiberg, & Weinberg, 1996). It is also why the model emphasizes collective actions (such as those of nongovernmental organizations or social movements) over individual choices/actions. Nonelite treadmill participants alter the nature of social system–ecosystem interactions through pressuring private capital and/or state decision makers to make more proenvironmental decisions in production processes. Much of the limited success in achieving treadmill alteration in the post–World War II era was achieved through social movement pressures. For example, most if not all environmental legislation passed during this time was the result of progressive forces seeking to slow the excesses of treadmill institutions. Similarly, as labor, treadmill nonelites may use their role in physical production to directly induce capital actors to alter their production processes. Organized labor has done so sometimes for environmental concerns or more frequently, because of occupational safety and health concerns associated with ecologically disruptive technologies (Schnaiberg, 1986).

Thus, the treadmill model implies that more democratic ownership and control over production could ameliorate social and ecological problems more than attempts to control rates of consumption or consumer choice of certain products. Consumers can choose Pepsi or Coke or some low-calorie, “green” alternative soft drink. Yet this is largely irrelevant if the ownership and control over all these products is in the hands of producers who are simultaneously displacing workers, taxing the state's resources, and placing great burdens on the ecosystem. Clothing is another “consumption” example. Unless consumers in the North produce their own clothes, they leave producers the appealing option of producing virtually all clothing in sweatshops that exploit laborers and typically produce various ecological disruptions (in both agriculture and transportation). So long as owners are free to invest in low-wage countries (or engage low-wage immigrants in industrial countries), consumers exercise little control over these production processes.

Unfortunately, consumerist approaches to the problem of the treadmill almost never consider the goal of treadmill deceleration. The question of how much we are consuming (i.e., growth) is rarely challenged. The focus is only on changing what goods we are consuming. This is perhaps not surprising, as consumerist approaches are fundamentally about protecting the right to consume as much as they are about corporate and social responsibility. For example, the major recycling campaigns spearheaded by many national environmental groups in the 1980s and 1990s emphasized recycling, itself an environmentally problematic industrial

process (Weinberg, Pellow, & Schnaiberg, 2000). Yet they largely eschewed more socially and ecologically effective practices of reuse and reduction of production. In earlier analyses (Schnaiberg & Gould, 1994, chaps. 9-10; Gould et al., 1996; Weinberg et al, 2000, 164-169), we demonstrated that as long as companies harvest timber at increasing rates (i.e., increases in production), it matters very little whether environmentally conscious residents are recycling their waste (i.e., consumers) because any potential gains from residential recycling are offset by production. This type of analysis preceded and informed research on "commodity chains" by noting the multiple points at which social, political, and economic forces affect each other and environmental protection efforts.

The treadmill model argues that the collective bases of historical success in altering aspects of the political economy arise only through direct or indirect political conflict with state and capital elites. Treadmill nonelites' roles as individual consumers are the "tail end" of the system, not the leading factor. In contrast, their collective roles as citizens and workers offer the potential to alter the production decisions of elites who essentially control social system–ecosystem interactions. The treadmill model at least suggests the need for a more radical restructuring of the political economy. Citizen-workers need to achieve more control over production decisions. In this perspective, prolonged engagement in enduring conflicts with powerful treadmill decision makers may be effective (Schnaiberg & Gould, 2000).

Production is the locus at which we can observe and measure the degree of ecological withdrawals and additions, as well as potential solutions. Yet it is also where industry leaders will fight the most to maintain their autonomy vis-à-vis the state, environmentalists, and labor. Control over production is the critical battleground for industrialists generally and where the waste industry, in particular, drew the line in the struggle over the Resource Conservation and Recovery Act of 1976 (Szasz, 1994). Industry successfully fought to shift federal mandates for recycling outside the production process onto consumers and states in an effort to protect profitability and control over production. Globally, industry leaders engage in a range of actions to ensure this control, from relocation to avoid unionization to the use of private and state armies to intimidate, torture, and execute opponents (Gedicks, 2001). For them, production is legitimately the exclusive province only of the owner/management/shareholder class, with virtually no input from other affected parties.

The treadmill is organized under the premise that producers, not consumers, are the major driving factor in the political economy. Consumers, for example, would prefer to be able to purchase environmentally responsible products, but this decision is ultimately up to producers. However, we should never ignore consumer behaviors. Growth in urban pollution has been rising, in part, due to increased vehicle ownership and mileages. These have offset a large portion of the emission reductions gained from motor vehicle controls. This is a classic illustration of the treadmill of production at work. In view of the unforeseen growth in automobile emissions in urban areas combined with the serious air pollution problems in many urban areas, Congress has made significant changes to the motor vehicle provisions on the 1977 Clean Air Act, but the core problem of growth in consumption and production of automobiles is left unchallenged.²

A policy focus on consumption is almost always the easy path: It generally absolves industry and the state of responsibility for a host of problems:

- it leaves production largely undisturbed;
- it fails to challenge the fundamental structure of the industry in question; and
- it often blames poor populations for not engaging in “enlightened,” “responsible,” and “conscious” consumer practices.

Although the treadmill model’s emphasis remains on production, it could also be said that it addresses the way that producers and other stakeholders literally *consume* the ecosystem and *become* consumed by the (il)logic and seductions of the treadmill. As such, it could be said that we have redefined or broadened our notions of what consumption is (industrial and collective vs. personal/individual). The study of the social, economic, and environmental impacts of personal consumption is gaining greater visibility (see Clapp, 2001; Park, 2003; Schor & Holt, 2000) and we welcome this development. However, scholars emphasizing this phase of the product lifecycle would do well to remember that it is just that—a *cycle* that begins with production.

Was the Treadmill a Dialectical or a Linear Change Theory?

One of the critiques of the treadmill is that it appears to be a theory of linear change. There are two quite distinct aspects of our research on the treadmill. First, we note that the initial *theory* of the treadmill was a historical model of changes that seemed to have appeared in the United States and other industrial societies. Alongside this historical pattern, Schnaiberg (1980) initially proposed that there were many political-economic alternatives to the social and ecological impacts of an accelerating treadmill. As workers confronted new social and economic restrictions, they would act politically to favor policies offsetting the treadmill tendencies. Likewise, as environmental degradation began to have more pronounced effects on communities and families, citizen-workers would act to reduce relatively unrestricted economic control over ecosystems. In both cases, Schnaiberg predicted that social and political actions would serve to reduce the growing influence of treadmill institutions and ideologies. Among other strategies, he listed the following possibilities:

- small-scale entrepreneurialism in lieu of large corporate employment;
- direct state provision of essential public services (e.g., transportation, education);
- profit seeking could decrease, in favor of other goals of corporate entities;
- rising labor costs could reduce capital available for technological innovation;
- state subsidies for provision of employment by the private sector;
- expansion of state agencies to absorb displaced workers;
- unsold production may raise inventories and reduce capital accumulation and investment;
- firms could absorb more profits rather than investing them (e.g., in salaries or bonuses);
- support for increased public sector consumption, to offset reduced consumer demand; and
- increased taxation to reduce capital investment and enhance social services (pp. 228-229).

As part of his initial work, Schnaiberg (1980) described the *dialectical* dimensions of economic growth and environmental impacts. He outlined three syntheses—an economic, a managed (planned) scarcity, and an ecological synthesis. Each of these would leave treadmill forces in a different level of dominance of the political-economic system. The treadmill was quintessentially an economic synthesis. By 1975 to 1980, however, there were significant policies of environmental protection, which Schnaiberg labeled as planned scarcity. Here the state would limit the degree to which treadmill institutions had access to ecosystems. At the other extreme, the ecological synthesis would entail the state's substantial control over ecosystems, without regard to issues of profitability and of wages/employment. Treadmill institutions would, *theoretically*, have to restructure their activities to deliver employment and wages and to protect crucial aspects of ecosystem functioning. Interestingly, the ecological synthesis bears surprising similarity to the concept of sustainable development, the successor to Schumacher's (1973) intermediate technology development trajectory. Equally important, however, is the fact that in the past 25 years, there appears to be very limited movement towards sustainable development nationally or globally. Even the proposals of the Kyoto conference, which quite modestly proposed to limit production of greenhouse gases to reduce global warming, failed to find support in the United States (and a complex mixture of support and opposition elsewhere).

So the theory of the treadmill inherently entailed a dialectical system, in which social forces benefiting from its expansion would engage in political contests with those diminished by such expansion. And in the past 25 years, there have indeed been local, national, and multinational contests challenging the treadmill. Yet it is our assessment that the *empirical history* of the period from 1976 to 2004 is one in which the treadmill has only occasionally been slowed. It is more accurate to suggest that its rate of growth has sometimes been slowed by political opposition. One of Schnaiberg's (1980) naive expectations was that the publication of the treadmill model would lead to substantial mobilization of *opposition* to the treadmill.

Yet history has given the lie to his expectations. It is hard to argue empirically that despite the plethora of state regulations, the empowering of global conferences, and the emergent networks of progressive social movements (non-governmental organizations), the treadmill has been shrunk. There *have* been a few modest victories, such as the increased energy efficiency of many productive enterprises and the reduction of air, water, and land pollution in a variety of locales, especially in the United States and some other industrial societies. There *has* been a rise of education in business schools about "environmental management" and new social theories about ecological modernization as a form of reflective modernity (Beck, 1992; Mol, 1995). And yes, there has been an enormous increase in postconsumer recycling in industrial societies (Weinberg et al., 2000).

Yet treadmill structures have adapted quite well to these new challenges. We could state boldly that *increasing the return on investment has displaced every other social and environmental goal* in this period. Moreover, this principle has become dominant in more societies through the forms of globalization that have been dominated by investors from the previously industrial societies. Indeed, this principle is increasingly dominating all forms of globalization, despite the resistance by socially and environmentally progressive forces in northern and western Europe, as well as indigenous peoples everywhere (Collinson, 1996; Goldman, 1998). We could go even further than this: It seems apparent that *more of human activities all throughout the world fall under the influence of the treadmill institu-*

tions and logic than was true in 1980. In one sense, this growing monoculture of the production system is expressly antithetical to the goal of sustainable development or to the even more modest goal of a seriously managed scarcity model (Stretton, 1976). From the perspective of the treadmill, the media representation of economic change is profoundly misleading. When “productivity” increases, especially through increased technology per worker, this is actually an acceleration of the treadmill—producing higher production and profits with fewer workers. In effect, this increases the demands for more treadmill investment by increased levels of displaced workers. As we write this, more reporters are noting that job woes persist even as the economy begins recovery in what is now becoming infamously known as a “jobless recovery” (Krugman, 2003, pp. 73-75). This is a concept that raises troubling questions about what exactly a “recovery” is if it excludes employment security for workers. Paradoxically, consumer debt is at an all-time high, a scenario we envisioned earlier (Schnaiberg & Gould, 1994, chap. 6).

So, we can argue that the treadmill theory was dialectical but that the empirical history of the United States and global political economy since 1980 has been only weakly so. Indeed, rather than the treadmill expanding linearly over this period, it has expanded exponentially. As we will note below, this causes serious reevaluation of various proposals for environmental protection, including the recent arguments of ecological modernization theorists (Mol, 1995).

II. EVOLUTION AND APPLICATION OF THE THEORY

How Has the Treadmill Theory Changed Under Growing Globalization of Production Since 1980?

Other than our own work, there has been little systematic application of the treadmill logic to analyses of globalization. However, there were some preliminary treatments of global change even in Schnaiberg's (1980) initial work. In many ways, even his earliest primitive analysis presaged the effects of NAFTA and the World Trade Organization changes: a rise in investment in less-developed countries would eventually lead to reduced consumer spending and hence, to a reduction of U.S.-based production for the U.S. market. This in turn should have reduced the environmental impact of U.S. production and hence, afforded more potential for ecosystems to recover from past disruption (if the state intervened to pressure the treadmill institutions to do this).

To trace the role of the treadmill under conditions of globalization, however, requires some careful distinctions. One of our recent puzzles was the fact that the rising U.S. imbalance of trade payments has left the United States as the world's largest debtor nation! Yet there has been little political attention to this situation, which could, according to macroeconomic theories of trade, lead to a total collapse of the U.S. treadmill structure. Why has this aberration caused such little political ripple?

A partial answer seems to require us to distinguish between states and global interest groups. When the United States experiences a vast array of imports for a much lower array of exports, what does this mean actually? To *whom* is “the United States in debt?” Ultimately, the answer seems to be, in part, to U.S.-based investors and managers who have shifted production abroad and imported the results of this “foreign production” (foreign investors have taken on an increasing level of debt in U.S. investments in recent years as well). Because the treadmill's major goal is

increasing return on investment, after all, U.S. investors and managers desire to reduce U.S. investment in favor of greater investment abroad, precisely because of the attraction of lower overseas wages (and often lower environmental protection, as in the NAFTA debates). In addition to offering this direct benefit to U.S. investors and managers, this system pacifies more U.S. environmentalists (through reductions of local production and pollution). And finally, in an era of downsizing and wage reductions, the importation of more-cheaply-produced “foreign” goods has permitted less affluent U.S. workers to buffer themselves somewhat against their wage losses or wage stagnation. Interestingly, still a third benefit of this for U.S.-based investors and managers is that it strengthens their claims that they need labor and environmental protection concessions from workers and the state to remain “competitive” (often with their own overseas production organizations!).

In general, capital seems to have shifted more towards environmental degradation through production abroad than it has to environmental protection within the United States or in U.S. investment-countries overseas. Moreover, there appears to be a shadow “pricing” of environmental disruption by globalizing treadmill interests. They are grudgingly willing to reduce or ameliorate pollution from their production facilities. But in return, they absolutely refuse to accept any limits to production (actually, profit limits). Thus, we in the United States have cleaner streams and rivers and some reductions of air pollution. But in return, ecological damage due to logging, mining, and agriculture has increased dramatically since 1980, both in the United States and in U.S.-investor locales overseas (at least as measured by ecological indicators of habitat destruction and species extinction). The export of hazardous chemical wastes and the transfer of toxic technologies has followed the same pattern, producing extreme occupational health problems and ecological disruptions in the global South as the U.S. Environmental Protection Agency celebrates improvements within certain environmental indicators as if they were primarily the result of developing cleaner production domestically (Clapp, 2001; Daykin & Doyal, 1999).

Indeed, in an age where there have been increasing calls for sustainable development and sustainable biodiversity, the loss of habitat and associated species in countries of the global South has rapidly accelerated since the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. Although some of this may be due to increases in population (Rudel, 1993), the majority of habitat loss appears to have come through increased investment in extractive activities (agriculture, mining, and especially forestry; Rudel, 1993; Sonnenfeld, 2000). This is the major cause of habitat destruction, despite recent and visible declarations and policy mobilization by organizations whose main mission is environmental sustainability through population reduction and control (see, for example, the Population Institute, Federation for American Immigration Reform, Sierra Club). Loss of species diversity is further accelerated by the pollution associated with the increased processing and manufacturing activity (e.g., refineries and petroleum distribution, etc.). Many of the rates of natural resource extraction (e.g., oil mining) and pollution (e.g., power plant emissions) have been decreased in the United States and other industrial societies. But the globalizing capital flowing from investors from industrial countries (now increasingly capital “service countries”) has been guided by “cheap natural resources” and weak environmental regulation in the global South, along with cheap labor.

Once again, this suggests we be extremely cautious in accepting arguments about “hypermateralism” (superefficient technologies) as predicted by ecological

modernization theorists. It is true, for example, that there has been some decoupling between energy consumption and GNP increases *within the United States* in the past two decades. Yet it is not true that all of this “U.S. GNP” arises from U.S. production. Much of the service revenues of U.S. *corporations* arise from coordinating investment and production *abroad*. When we examine the ecological impact of such non-U.S. production, we find increased materialism with few limitations imposed by states or corporate entities on natural resource consumption (Goldman, 1998; Sonnenfeld, 2000). Returns on investment abroad add to the U.S. GNP, but ecological losses and natural resource consumption are not factored into the U.S. production record (York & Rosa, 2003).

In its initial presentation (Schnaiberg, 1980), the treadmill was largely conceptualized as an analysis of the relationship of the U.S. political economy to the natural environment. Implications for other northern industrial economies were implicit, and the relationship of those economies to those of the global South was also alluded to. Nevertheless, it is clear that the treadmill itself already operated on a global scale and had significant global implications. Schnaiberg’s *The Environment* was published just as

- the nonaligned movement of Southern nations was collapsing;
- the Washington Consensus on neoliberal global integration was gaining steam;
- transnational electronic networks were still under construction;
- the Southern debt crises were appearing on the horizon; and
- transnational trade liberalization agreements were yet to be fully negotiated.

As those changes to the global political economy emerged, the need for a more consciously transnational articulation of the treadmill model became clear.

The South Commission and the United Nations Conference on Environment and Development (the Earth Summit of 1992, in Rio de Janeiro) both served to focus greater social attention on the global dimensions of environmental problems and the specific ways environmental problems were manifested in the global South. The relationship between transnational economic production and growing global inequality and accelerating ecological degradation were highlighted. As a result, in Schnaiberg and Gould’s (1994) *Environment and Society*, the treadmill was more deeply contextualized in global history and the transnational economy. The South was seen as moving from scarcity to even *greater* scarcity. Historic and increasing reliance of the Northern industrial treadmill on access to Southern natural resource pools, labor pools, markets, and waste sinks were given greater primacy in this later iteration of treadmill theory. So were the implications of those transnational connections for domestic and international environmental *politics*. Here, the emphasis was placed on the transnational distribution of economic benefits and ecological costs and the acceleration of withdrawals and additions. Resulting diminution of social returns to increased productive capacity and the structural dependency of labor were also more clearly articulated. The focus was on economic actors with growing ease of transnational operation.³ The transnationalization of the treadmill model was well timed to meet the era of “globalization.”

The local scale at which most humans experience global dynamics were seen as increasingly shaped by changes imposed by globalization on national political economies. Problematizing the then-popular slogan of “Think globally, act locally,” Schnaiberg and Gould (1994) argued that due to the greater capacity of

private capital actors to operate on a global scale, each locality was forced to compete with others because all were in an increasingly vulnerable competitive position. As a result, the effectiveness of local political action to protect the environment would be diminished and environmental protection conflicts would need to match the scale of operation of capital.⁴

The growing hegemony of treadmill values and political economic forms manifest in corporate-led neoliberal globalization was further addressed in the new foreword to *Environment and Society* (Schnaiberg & Gould, 2000). This brief introduction to the earlier work identified the treadmill model as a set of *global* processes, relations, and forces decreasingly tied to the U.S. state. We noted that the treadmill had become more entrenched and less available to deceleration or dismantlement. Marking the 20th anniversary of the publication of Schnaiberg's (1980) *The Environment*, this forward articulated the extent to which the earliest national-level model had transnationalized and largely defeated competing alternative models for renegotiating socioenvironmental dynamics.

However, it also notes the emergence of new and/or renewed national and transnational political coalitions in opposition to a transnationalized treadmill. Most notably, by undermining the security of labor, treadmill transnationalization to some extent broke the alliance among workers, private capital, and the state that had been the primary engine of treadmill support (Rubin, 1995, and others have called this the breaking of the "social contract" in U.S. labor relations). By simultaneously disempowering labor and accelerating ecological disruption, the transnational treadmill made it possible (or even necessary) for labor to lend support to the opponents of treadmill expansion at the *transnational* level. Labor-environmental coalitions urged in earlier iterations of treadmill theory emerged more at the turn of the century than they had in the 1980s (Gould, Roberts, & Lewis, 2004). Transnationally organized "extralocal action" to confront the treadmill called for in *Local Environmental Struggles* (Gould et al., 1996) emerged, especially in the anticorporate globalization movement (Buttel & Gould, 2004).

In short, as the scale of treadmill actors' operation increased through processes now termed *globalization*, the treadmill model scaled up to address the move from primarily national to primarily transnational political economic arrangements.

Has the Treadmill Been Evaluated Empirically?

When the initial treadmill theory was presented by Schnaiberg (1980), it had no formal empirical evaluation. Indeed, the theory itself had been grounded in analytic induction (Glaser & Strauss, 1967). In formal terms, this means that the theory "fit" the data from which it was actually abstracted. So the 1980 volume represented a grounded but untested theory. What has happened in the period from 1980 to 2004? Most directly, we have individually and collectively tested how well the treadmill fits social production trends in the intervening decades. This includes work on Great Lakes water pollution (Gould, 1991, 1992, 1994), on local mobilization for toxic waste control (Weinberg, 1997), on local wetland protection efforts (Gould et al., 1996), on global environmental treaties (Gould et al., 1996), on the rise of postconsumer recycling in the United States (Weinberg et al., 2000), on ecotourism (Gould, 1999), on local alternative technology initiatives in the global South (Schnaiberg & Gould, 2000), and on environmental injustice in the waste treatment and electronics industries (Pellow, 2002; Pellow & Park, 2002).

Each of these studies had a different set of specific questions, but all are subsumed under a general quest to see whether recent social reforms have led to more

socially progressive and ecologically sustainable production. Although the details of each study differ, they all fail to find a substantial weakening or deceleration of the treadmill structures and processes. Indeed, as noted earlier, these studies were a painful lesson for us on how resilient the treadmill has become.

It appears that there is more empirical (or political) support for the major contending theory—ecological modernization—that has emerged in the past decade or so (Beck, 1992; Mol, 1995). Central to ecological modernization theory is an assumption that the design, performance, and evaluation of production processes have been increasingly based on ecological as well as economic criteria (Mol, 1995, 1996; Mol & Spaargaren, 2000; Spaargaren, 1997; Spaargaren & Mol, 1992). As a theory of industrial change, ecological modernization suggests that we have entered a new industrial revolution, one of restructuring of production processes along ecological lines (Mol, 1995). Yet recent summary and empirical critiques of ecological modernization theory (Schnaiberg, Pellow, & Weinberg, 2002; York & Rosa, 2003) indicate the methodological and theoretical limitations of such supporting studies.

In their evaluation of ecological modernization theory, York and Rosa (2003) compared the strength of ecological modernization theory with political economic approaches to global environmental problems, including the treadmill of production model. Drawing on a range of examples (the Thai pulp industry, global environmental treaty ratification, the coal industry, the Dutch chemical industry, etc.) York and Rosa concluded that there is stronger evidence supporting the treadmill model than there is for the ecological modernization theory. This is largely because the treadmill model actually evaluates more than the simple adoption of environmentally responsible policies. They examined whether this produces positive or negative ecological impacts locally and extralocally. Ecological modernization scholars have, on the whole, not pursued this line of analysis.

It is certainly true that the treadmill theory is insufficient to explain *all* patterns of economic and environmental change since 1980, but we believe the evidence indicates stronger support for the treadmill model in comparison to the ecological modernization framework.

What Forces Have Limited the Diffusion of the Treadmill in Environmental Sociology?

Just a few months after the publication of Schnaiberg's (1980) *The Environment: From Surplus to Scarcity*, Ronald Reagan was elected president of the United States. He ushered in a neoconservative agenda, emphasizing state deregulation and transnational neoliberalism. This new political zeitgeist of the 1980s was clearly antithetical to the treadmill theory's articulation of the need for "politics over markets" (Lindblom, 1977). Its antienvironmental, treadmill-accelerating agenda simultaneously validated the treadmill model while making resistance to the treadmill more difficult. By increasing the power and liberty of transnational corporations and treadmill elites, rolling back the initial gains of environmentalists, and launching an attack on the countervailing forces that sought to constrain corporate power (Derber, 1998), the Reagan administration dimmed the prospects for slowing or dismantling the treadmill just as the theoretical framework was making its intellectual debut.

The declining power of organized labor, which had been a powerful force promoting both progressive distribution and environmental health, had some impact as well. Civil society resistance of the 1960s and 1970s (e.g., Shuman, 1998), offer-

ing countervailing forces to the treadmill of production, also waned. Environmental and other social movements, which were often insurgent prior to the publication of Schnaiberg's (1980) *The Environment*, became more conservative. They became more cooperative with private capital and the state. Adoption of "Third Wave" environmentalism strategies supplanted earlier insurgence (Dowie, 1995). An increasingly professionalized mainstream environmental movement now emphasized cooperative approaches, voluntary action on the part of treadmill actors, and "flexible," market-based approaches to source reduction and ecosystem protection. This stance resonated well with the Reagan administration's neoliberal political-economic agenda (and continued into the Clinton era) but withdrew from any serious challenges to the treadmill.

Transnationally, the Southern debt crises of the 1980s disabled many alternative development strategies adopted by developing nations. This crushed most treadmill-alternative pilot projects. The weight of international debt payments and the international financial institutions' structural adjustment policies suppressed efforts to build alternative structures for production and distribution. Ideological support for such efforts from "mixed economies" and social welfare states of Europe was diminished as well. The combined influence of Reagan in the United States and Thatcher in the United Kingdom shifted the global political climate and also led to an upsurge in U.S. military interventions and muscle flexing around the globe (Blum, 1995). Transnational insurgence against the Washington Consensus model of global economic integration was displaced by new corporate libertarian deregulatory regimes (Derber, 1998; Korten, 2001). Dismantlement of Eastern Bloc state socialist economies at the start of the 1990s, and their replacement with "shock therapy" policies of Western "free markets" removed the last global social support for opposition to the treadmill. The treadmill emerged as the only path for social and economic change, regardless of its ecological consequences.⁵

All of these changes to domestic and transnational political economies, and the resultant acceleration of ecological disorganization, poverty, and inequality, served to empirically validate the predictions of the treadmill model. Yet even as treadmill theory proved correct in assessing the causes, consequences, and necessary alternatives to ecological degradation, it became less politically viable.

Those seeking to further their careers in the study of socioenvironmental dynamics were thus deterred from adopting a theoretical framework that lay in direct opposition to state, private capital, and international financial institution-policy regimes. A better option was to search for models that might be more amenable to the political and economic zeitgeist. Mainstream environmental *movements* had chosen to move toward Third Wave environmentalism, and the influence of the mainstream environmental movement on the *field* of environmental sociology should not be underestimated. With radical structural proenvironmental change off of the political agenda, some environmental scholars retreated into intellectual abstraction.

They sought insights and careers in constructionist models. These posed no threat or challenge to power holders who controlled the gates for grant funding and for policy-maker access. Others chose to focus on areas of apparent environmentalist success in an era of major environmentalist failure. They chose to reify grassroots struggles as national and transnational struggles waned. Others chose to adapt Third Wave environmentalism into sociological theory. In this view, the treadmill would simply self-correct for environmental limits through market mechanisms. This supported rather than opposed the emerging neoliberal agenda.⁶

In addition, some of the resistance to the treadmill model stems from its power to nullify commonly proposed and often popular nonstructural solutions to environmental problems (i.e., efficiency, recycling, appropriate technology, ecological modernization, ecotourism, population control, attitude adjustment, voluntary simplicity, etc.). Many of these solutions had become sacred cows of the environmental movement at the time that Schnaiberg's (1980) *The Environment* was published, thus providing a political opening for treadmill theory to be simultaneously cast as anticapitalist and antienvironmentalist. By presenting structurally based critiques of the solutions offered by both treadmill elites and their environmentalist opponents, the theoretical framework was left with few potential political and intellectual allies. Even within the academy, the treadmill model is more often critiqued as "depressing" than inaccurate, reflecting the model's utility in debunking the environmental myths surrounding nonstructural paths to socioecologically sustainable development trajectories. *Environment and Society: The Enduring Conflict* (Schnaiberg & Gould, 1994) included critical analyses of recycling and "appropriate technology" and more overtly called for political conflict as a means to achieve sustainability. This position served to deepen the alienation of both treadmill elites and mainstream environmentalists from treadmill theory.

III. THE FUTURE ROLE OF THE TREADMILL THEORY

Is the Treadmill More/Still Useful Today for Ecological Analyses? For Social Analyses?

An increasing number of younger scholars are drawing on the treadmill, perhaps because national and global environmental politics support and reflect the treadmill model more than they do other theoretical frameworks. Battles over environmental protection have recently become more contentious, more transnational, and more multifaceted. The "Battle in Seattle" at the World Trade Organization's millennium round of talks, and the recent shutdown of talks at the World Trade Organization meeting in Cancun, Mexico, attest to this. Environmental protection is no longer restricted to the domain of policy "experts," academics, and scientists. People are starving while land and watersheds, forests, and ways of life are being destroyed (Gedicks, 2001; Goldman, 1998).

Scholars need frameworks and models that reflect reality. The treadmill has always offered this, particularly for academics who are willing to accept the possibility that the trajectory of national and global environmental protection has been limited at best. Abstract, detached modeling techniques and opaque theoretical constructions are not as accessible, useful, or appealing to scholars, students, and publics who seek to understand the contentious and ecologically disorganized world. After more than three decades of institutionalized environmental protection at the U.S. federal level, why is the United States more ecologically compromised than ever before?⁷

Moreover, the treadmill offers a much more credible and useful theoretical link between environmental sociology and other subfields within the sociological discipline. Although environmental sociology claims to be *interdisciplinary* (Dunlap & Michelson, 2002), its weaknesses include its failure to build lasting bridges to *sociology* itself. The treadmill of production bridges environmental sociology with the sociology of work, Marxist sociology, political sociology, urban sociology, the sociology of the world system, and the sociology of race, gender, and class.

Equally important is the capacity of the treadmill to speak to all sociologists. This affords them a broader scope to incorporate environmental factors into their epistemological, methodological, and theoretical work. Nonenvironmental sociologists might deepen and broaden their approaches to sociological phenomena by adopting what Humphrey and Buttel (1982) termed the “double determination”—that approach to the study of society incorporates both *social* theory and a focus on the *natural* world. Treadmill scholars have always understood that environmental politics are driven by both social/human and ecological/natural factors and limitations. Environmental sociology’s founders intended to challenge the dominant Durkheimian paradigm, which restricted sociologists to explaining social phenomena only through other social phenomena. A broadening of this approach is intrinsic in treadmill analyses.

NOTES

1. Another key theoretical contribution is the link between the treadmill model and more recent developments in environmental sociology. For example, the treadmill of production predated the now well-established field of environmental justice studies and advanced the argument that environmental problems and solutions are not shared equally across or within populations. It laid a foundation for more recent research that focuses on how other forms of inequality (such as race and gender) intersect with environmental policy. Schnaiberg’s 1980 work is cited in many environmental justice studies and texts, including Robert Bullard’s (1990) landmark book *Dumping in Dixie* (see also Hurley, 1995; Pellow, 2002; Pellow & Park, 2002; Walsh, Warland, & Smith, 1997).

2. As environmentalists and treadmill scholars now know, a combination of production and consumption of automobiles and trucks has maintained high levels of air pollution in our urban areas. Specifically, although motor vehicles built today emit fewer pollutants (60% to 80% less, depending on the pollutant) than those built in the 1960s, cars and trucks still account for almost half the emissions of the ozone precursors (volatile organic compounds and nitrogen oxides) and up to 90% of the carbon monoxide emissions in urban areas.

3. Special attention was given to the effects of treadmill penetration on more socially and ecologically sustainable development paths and initiatives throughout the global South and the mechanisms by which the treadmill would force out alternative development strategies at local and regional levels were described.

4. The call for transnational, extralocal, political conflict with treadmill elites appeared just before the embryonic anticorporate globalization movement would gain substantial social visibility (most notably 3 years later in November of 1999 in Seattle, Washington).

5. The political climate for adoption and diffusion of the treadmill model became quite hostile and difficult. Treadmill theory implies that deep structural changes in the direction of progressive distribution and growth deceleration are central to any viable solution to environmental problems. But the structural changes that were being implemented by transnational corporations, states, and international financial institutions were in a diametrically opposed direction. This made the possibility of implementing treadmill prescriptions appear less viable than ever.

6. Each of these theoretical and intellectual tacks was less threatening to careers and promised better intellectual markets. Structural analysis and neo-Marxism became decreasingly fashionable in response to the external political realities. This was increasingly manifest in internal professional organizational pressures. In short, treadmill theory became politically and professionally inexpedient.

7. Studying levels of environmental concern or the public declarations by state and industry elites about their devotion to sustainability can be useful for analyzing how individuals and organizations produce discourses on and interpret environmental problems. But these approaches do not allow one to examine the root causes of the environmental crisis or

even the actual outcomes of state and corporate environmental policies. If scholars wish to follow this line of analysis, the treadmill is a far more useful framework.

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Allan Schnaiberg's work has concentrated on issues of "saving the environment, from whom and for whom?" since 1973. His book The Environment: From Surplus to Scarcity (Oxford, 1980) developed the initial theory of the treadmill of production. His later collaborations elaborated this theoretically and empirically in Environment and Society: The Enduring Conflict (St. Martin's Press, 1994; Blackburn Press, 2000), Local Environmental Struggles (Cambridge University Press, 1996), and Urban Recycling and the Search for Sustainable Community Development (Princeton University Press, 2000).