
Readings

of particular interest

Hospital Duplication and Cost Control

“Duplicated Hospital Facilities: How Much Can We Save by Consolidating Them?” by William B. Schwartz and Paul L. Joskow in *The New England Journal of Medicine*, vol. 303 (December 18, 1980), pp. 1449-1457.

A major goal of health planners has been to prevent unnecessary duplication of health facilities. In 1978, the Health Resources Administration (HRA) of the Department of Health and Human Services established guidelines for regulators to use in avoiding such duplication. To date, however, there has been no systematic analysis of the savings that would accrue if the guidelines were fully implemented.

In this study, William Schwartz, professor of medicine at Tufts, and Paul Joskow, professor of economics at the Massachusetts Institute of Technology, evaluate the potential cost savings from the consolidation of the four kinds of facilities most often viewed as costly and redundant: computerized axial-tomographic (CAT) head and body scanners, open heart surgery and cardiac catheterization facilities, megavoltage radiation therapy units, and general hospital beds. They conclude that “the expected saving falls far short of HHS goals,” and that the costs of consolidation—in regulatory expense and inconvenience to patients—“would reduce or possibly eradicate this gain.”

The authors first determine the number, intensity of use, and annual operating costs of the facilities in each category. Taking total patient demand as fixed, they then compare the actual rates of usage with the HRA guidelines and calculate the number of facilities required to serve prevailing patient demands at the utilization rates defined by the guidelines. The difference between the actual number of facilities and the “required” number indicates the extent of duplication. Finally, they multiply the num-

ber of patients served in duplicative facilities by the average current cost per patient, and subtract the marginal cost of treating these patients in remaining facilities. The result is the net savings from consolidation.

For CAT scanners, Schwartz and Joskow found that more than 70 percent of head scanners met HRA’s optimal utilization criterion of fifty procedures a week. The other 30 percent served an average of thirty-seven patients a week. Body scanners, which constitute two-thirds of all CAT scanners, had a lower rate of usage, almost 80 percent failing to meet the guidelines. The authors conclude that \$85 million would be saved by meeting the guidelines, mostly from the consolidation of body scanners.

To estimate the savings from consolidating open heart surgery facilities, the authors first develop estimates of the fixed costs of an open heart surgery operating at low volumes in a well-equipped community hospital. Extrapolating from California data on actual utilization levels, Schwartz and Joskow estimate that about \$15 million a year would be saved nationwide from consolidation, less than 2 percent of the total cost of hospitalization for open heart surgery. The saving could, however, be as low as \$10 million or as high as \$30 million a year. Using similar procedures, the authors estimate a theoretical saving of \$15 million a year for cardiac catheterization.

For therapeutic radiology, the authors estimate that in 1977, 70 percent of patients were treated in facilities meeting the HRA guidelines of at least 300 procedures a year. Lacking good information on how unit costs decline as the number of cases increases, the authors assumed that radiation units had scale economies similar to those of CAT scanners. This and other assumptions, together with estimates of the distribution of utilization and the average cost per procedure, resulted in an estimate of \$115 million in annual savings.

Among the most visible targets of consolidation have been hospital beds. According to some estimates, 5 to 10 percent of the beds in short-term general hospitals (60,000 to 100,000 beds) are unnecessary. Yet definitions of and data on excess hospital beds have been imprecise. For example, the HRA guidelines, in defining "excess," do not distinguish among beds that are never used, misused beds (those occupied by patients who could be cared for as outpatients), and underused beds (those uneconomically reserved for peak demand periods). Moreover, studies of bed use have presented average rates of use for entire hospitals rather than for separate departments such as surgical and medical. In addition, studies tend to neglect the fluctuation of patient demand. But even with precise definitions and more informative data, the authors point out, the judgment on appropriate bed capacity will vary from physician to physician. There is inevitably legitimate disagreement concerning how long a hospital stay should last and when outpatient should be preferred to inpatient care.

Schwartz and Joskow estimate that 75,000 beds, or 7 percent of all hospital beds, could be eliminated without significant increases in admission delays. At an average cost of \$52,000 per year per bed at a community hospital and assuming the marginal cost of care to be 80 percent of the average cost, that would reduce total hospital expenditures by \$800 million a year, or about 1.4 percent.

All in all, the authors conclude that less than 2 percent of total hospital expenditures, or \$1 billion, could theoretically be saved if HRA's guidelines were observed in the four areas. Under different assumptions, the figure could range from \$650 million to \$2 billion.

Schwartz and Joskow then discuss the offsetting costs of consolidation, including the administrative costs of the regulatory process and the costs to patients and families of less convenient locations. In 1978 the federal government gave \$160 million to local, regional, and state agencies for health planning. The authors estimate that state expenditures are at least half those of the federal government, bringing the total cost of administration to \$250 million. Since under the planning process providers must file applications to construct or expand facilities and must collect data to

support their applications, they wind up spending "at least as much as the agencies do . . . and probably more."

For patients and families, increased travel time imposes additional costs, as well as physical risks to patients requiring immediate attention. Moreover, delays in treatment may themselves make treatment more expensive. These costs are not estimated since they vary according to patient preferences and the specific ways the regulations are put into effect.

Schwartz and Joskow conclude that after offsetting costs are considered, even the most promising consolidations yield "disappointingly small" results. Significant cost containment is more likely to come from systemic changes in the delivery of medical care: more outpatient care, shorter stays, more intensive use of hospital facilities during off-peak periods, and other improvements in hospital management. Only by changing "the quantity, quality, or patterns of care . . . and by providing general incentives for hospitals to eliminate organizational slack" can cost containment be an ongoing rather than a one-shot attack on escalating medical costs.

Natural Gas Deregulation: The Costs of Gradualism

"The Regulation and Deregulation of Natural Gas in the U.S., 1938-1985" by Peter R. Merrill, in the Harvard Energy and Environmental Policy Center Discussion Paper Series (January 1981), 94 pp.

In September 1978, eighteen months after the Carter administration announced its National Energy Plan, Congress passed the Natural Gas Policy Act. As in the case of the airlines, this deregulatory legislation provided neither complete nor immediate decontrol. And according to Peter R. Merrill, a researcher at Harvard's Energy and Environmental Policy Center, it constitutes a Pyrrhic victory for supporters of natural gas deregulation because it mandates a "deregulatory lag" whose consequences will be worse than those of the controls the law supplanted.

Federal Energy Regulatory Commission controls will actually tighten in several areas during the seven-year transitional period from

1978 to 1985, according to Merrill. The act extends federal rate regulation to the intrastate market and, for the first time, authorizes FERC to set gas rates for some industrial customers. Moreover, Merrill says, what price relief the act does grant to producers is likely to prove inadequate. During the transitional period, for example, the act limits the increase in the ceiling price of natural gas to 4 percent above the inflation rate. Soon after the act was passed, however, the import price of natural gas increased 48 percent in one year as a result of the Iranian revolution. The act allowed the ceiling price to rise by only 11.6 percent in the same year. Before "deregulation," FERC had adjusted the interstate price every two years to reflect the price of gas imports.

Merrill concludes that the gap between domestic and world prices would have been closed more quickly under previous FERC policies than it will be under the act. Now, pipelines will pay far more for foreign sources of natural gas than domestic producers are permitted to charge, encouraging imports at the expense of domestic production. Moreover, the act may backfire completely if the price gap becomes so large that decontrol becomes politically infeasible in 1985.

Deregulation was sidetracked, Merrill says, by the politics of regional economic interest. Before President Carter submitted his National Energy Plan, the Senate had voted three times for field price decontrol, while the House, where consumer states have greater representation than producer states, had consistently opposed it. The complex deregulation measure, which emerged in conference from radically different House and Senate bills, attempted to reconcile two conflicting goals: lifting field price controls and sparing residential and small commercial customers from sharp price increases. It sought to stem the flight of natural gas from interstate to intrastate markets, not by quickly lifting the interstate price controls that caused the shortage, but by extending them to the intrastate market. The incremental pricing provisions of the act also require pipelines to recover their higher acquisition cost of natural gas first from large industrial customers, up to the price of alternative fuel, and only then from residential and commercial customers.

The unregulated market is an ideal allocator of natural gas, the author writes, supply-

ing gas to those end-users who value it most highly. But while protracted phase-in periods and interim extensions of regulatory jurisdiction may be a political requisite of decontrol legislation, the "curtailment" provisions of the act are both economically unwise and politically unnecessary. Here, Merrill says, a "second-best" policy would have achieved a more efficient allocation of natural gas without harming residential and commercial customers. When utilities curtail supplies under the act, they must allocate gas according to purchases made in 1972, without regard to changing demand conditions or regional variations in the permissibility of burning high-sulfur fuels. At least among industrial customers, a price system could replace arbitrary curtailments. The "Vickrey" auction, a sealed-bid auction used for new equity issues on the French stock exchange and certain Treasury bill sales here, is one such simple and efficient procedure. Merrill estimates that \$1 billion was lost to the U.S. economy in 1977-78 because of inefficient curtailment practices. Half of this loss, he concludes, could have been eliminated by competitive auctions.

Stalking the "Unfair" Price Cut

"Predatory Pricing Revisited" by John S. McGee, in *Journal of Law and Economics*, vol. 23 (October 1980), pp. 289-330.

Can a firm that is dominant in an industry cut its prices enough to drive its competitors out of the field, and then raise prices to monopoly levels? This question has long engaged the attention of economists and antitrust theorists. In this article, John S. McGee of the University of Washington critically reviews the recent literature on "strategic" or "predatory" pricing. His own view is that because "predatory price cutting imposes greater costs upon predator than prey," it is unlikely to pose much of a threat to competitive balance.

A "strategic" price cut is one that would not have been undertaken except as an investment in greater future monopoly. But since price cutting is normal competitive behavior in a great many situations, especially where one firm is more efficient than another, strategic

price cuts are frequently hard to distinguish from "nonstrategic" or ordinary cuts.

A dominant firm will succeed in its predatory campaign only if the competitor it is attacking permanently retires its assets from production—converting them irrevocably to other uses, selling them to the predator, or simply not replacing them as they wear out. A predatory strategy of "grinding down" a victim's plant, so that it wears out faster than it is replaced, may pose more risks for the would-be monopolist than for the victim. Since the predator is likely to increase its market share and thus its share of production, McGee notes, it will be grinding down its own plant faster than its competitor's. (If the predator is pricing below its variable costs, it will also be losing more money than its victim both absolutely and proportionately.) And "because it will take a long time to grind down long-lived and specialized capital assets," McGee says, "these kinds of assets hold the predator hostage at least as effectively as they do the prey."

Moreover, a victim's decision to withdraw its assets permanently from the field depends not on the current but on the expected future profitability of the assets. Even if the victim is now losing money, the prospect of earning high profits when the price war is over will encourage it to replace its assets as they wear out and to demand a high (rather than distress) price if the predator offers to purchase. The predator could, to be sure, wipe out the victim's expectation of future profits if it could effectively threaten to hold prices down indefinitely. McGee contends, however, that such a threat is unlikely to be believed, since it would be suicidal to carry it out unless the predator were genuinely more efficient than the prey. Some theorists have speculated that a predator with a "long purse" could outlast a victim in a price war. McGee counters that no one has ever shown why predators could acquire the reserves they need, but victims could not. Attempts at predation may also be foiled if customers can store commodities during periods of low prices or enter into contracts with the predator's intended victim. Nor will actual or threatened predation be any more successful, he says, as a way of discouraging prospective or potential competitors.

McGee discusses a variety of standards proposed by lawyers and economists to guide

courts in weighing allegations of predatory pricing. Some legal rules would require price reductions to be "quasi-permanent," restrict promotional pricing, or forbid dominant firms from increasing output in the face of new competition. Too many of these proposals, he says, would encourage charges of predation by less efficient firms that have (quite properly) been forced to the wall as a result of ordinary competitive price-cutting.

Merit, Bias, and Professional Work

Reasoning about Discrimination: The Analysis of Professional and Executive Work in Federal Anti-bias Programs by Richard A. Lester (Princeton, N.J.: Princeton University Press, 1980), 384 pp.

Federal affirmative action efforts typically follow a two-stage pattern. In the first stage, the government tries to prove past discrimination by comparing the racial or sexual composition of an employer's work force with that of some relevant pool of job applicants or the labor force in general. If the government claims to find such past discrimination, it proceeds to the second stage: negotiating an affirmative action plan by which the employer agrees to adopt numerical hiring and promotion goals for members of the protected groups.

In this book Richard Lester, formerly dean of faculty at Princeton and vice-chairman of the President's Commission on the Status of Women, critically examines the federal contract compliance program, the Equal Pay Act, and the Age Discrimination in Employment Act as they have been applied to professional, academic, executive, and civil service employment during the past decade. He argues that the methods used both for assessing discrimination and for remedying it where found are ill-suited to many types of professional and managerial work and tend to undermine the integrity of promotion and pay systems based on individual merit. The primary reason for this, he says, is that the performance of "highly individualistic" scholarly or managerial work cannot be easily standardized and quantified for purposes of comparison across broad categories. Most analyses of discrimination fail because they must ignore individual performance

and concentrate instead on a few easily measured aggregates.

In university faculty hiring, according to Lester, the government attempts to prove sex bias by referring to the overall male/female ratio in the Ph.D. population, omitting from consideration the individual performance factors—for example, quality of research—that actually lead a department to choose one Ph.D. over another. An added problem is “that it makes no allowance for the effects of women’s career choices,” such as temporary withdrawal from the labor force or voluntarily adopted geographical restrictions. In managerial employment, similarly, the government does not allow for the effect of “protective” state laws which until the late 1960s kept many women from gaining experience in professions requiring long hours and night work.

Since the proportion of women among new Ph.D.s increased from 10 to 12 percent in the 1950s and 1960s to 25 to 27 percent in the late 1970s, he says, sex ratios for faculty hired and promoted in the earlier period naturally lag behind the current ratio for all Ph.D.s.

A university that in 1970 was judged to have no underutilization of women in its academic departments (and, therefore, was then not required to have any numerical hiring and promotion goals for its faculty) would be apt by 1977 to be charged with significant underutilization of women in many departments, even if it had exactly the same faculty in 1977 as in 1970 with no losses or new hirings during those seven years.

When the government came up with guidelines for the analysis of university salaries, it provided that “only the salaries of women and minorities were to be tested for salary equity, and only those below the calculated norm were to be considered for corrective, special salary increases.” Correction, Lester notes, “is not for all inequity but only for persons in the designated categories and in one direction.” Labor Department lawyers, Lester adds, have sought to prove invidious pay disparities by pairing “a single female and a single male faculty member across disciplinary lines in the arts and sciences (for example, a professor in English and one in chemistry),” because both are in the same occupational category in the same “establishment.” They do this even though the college

may be competing with lucrative outside pay offers in the latter but not the former case.

Lester is also critical of the Age Discrimination Act Amendments of 1978, which when fully implemented will forbid the involuntary retirement of tenured professors below age 70, and of similar laws in California and Connecticut forbidding involuntary retirement at any age. These laws, Lester says, are helping to perpetuate the disparities of which the government complains.

Inspecting Great Britain

Inspectorates in British Government by Gerald Rhodes (Winchester, Mass.: Allen & Unwin, 1981), 281 pp.

“The Statute Book from the time of Henry the Third,” a British Parliamentary committee once noted, “abounds with Acts of Parliament enacting and declaring that there should be one uniform Weight and Measure throughout the Realm; and every Act complains that the preceding Statutes had been ineffectual, and that the Laws were disobeyed.” In 1835, accordingly, Parliament set up a corps of local inspectors empowered to enter shops to enforce the Crown’s edict.

The weights and measures inspectors were among the first of what have come to be tens of thousands of central government officials authorized to enter private premises across the land to check on everything from the marketing of British eggs to the working conditions of British skin divers. In this volume, Gerald Rhodes of the Royal Institute of Public Administration discusses the proliferation of the “inspectorates,” as they are called, and their current role in enforcing regulations.

The first British inspector was Her Majesty’s Inspector of Anatomy, appointed in 1832 to scrutinize the conditions under which cadavers were used to teach anatomy to medical students. By the end of the 1870s, there were more than a dozen different health and safety inspectorates, some with wide-ranging powers. Environmental inspectors could declare a furnace a nuisance unless it reduced its smoke emissions “as far as practicable,” and could require water polluters to use the “best prac-

ticable and reasonably available means" of rendering their effluents harmless.

Although the task of most inspectorates is to enforce laws and regulations, a few supervise the activities of local schools, police, and fire departments. These so-called efficiency inspectorates work through administrative (rather than judicial) processes, and their inspection powers are generally less explicit than those of the enforcement inspectorates. Their most powerful weapon in holding local authorities to defined standards of performance is frequently their power to recommend that the central government withhold grants.

The efficiency inspectorates are nearly as old as their enforcement counterparts. Their power to inspect local schools, for example, dates back to 1839, when Parliament made inspection a condition for central government financial grants to local schools. But in recent decades, efficiency inspectorates have languished. Some, such as Poor Law inspectors, have disappeared, while others, such as prison inspectors, have been internalized by the regulated body. The education inspectorate, by far the largest efficiency inspectorate remaining, has been criticized by both teacher and administrator groups, both of which would like it reduced to a purely advisory function.

Enforcement inspectorates, by contrast, have grown steadily both in number and in breadth of responsibility. The weights and measures inspectors now enforce a broad range of "consumer protection" laws—processing complaints, interpreting the law to merchants, and running consumer advice centers. Although they have doubled in number since 1950, they have cut back severely on inspections because of these new responsibilities. Similarly, in the case of the electrical safety inspectors, Rhodes says that "perhaps their major function is the conduct of public inquiries and hearings, following objections to proposals by electricity boards for new power stations or overhead lines."

According to Rhodes, the inspectorates' usual "reliance on cooperation and persuasion rather than strict enforcement" accords with "British empirical tradition." However, since it is the inspector who effectively decides whether to prosecute, the inspector's suggestions can easily be received as if they had the force of law. For, as one study of factory inspection put

it in 1970, "it is extremely rare for a general inspection *not* to result in a 'discovery' and formal notification of a number of breaches of the law for which criminal proceedings could be instituted."

Washington and the Schoolhouse

"The Government in the Classroom" by J. Myron Atkin, in *Daedalus*, vol. 109 (Summer 1980), pp. 85-97.

Public schools have "become an arena for some of the country's major struggles for political power," writes J. Myron Atkin, dean of Stanford's School of Education. Atkin surveys the growth of federal regulation of local schools and suggests that the quality of education may be suffering "as power shifts from teacher to politician and civil servant."

Washington's role in elementary and secondary education dates back to the late fifties, when concern over the Soviet Sputnik launch and memories of the Manhattan Project in World War II spurred a major push for improved science education. When Congress passed the National Defense Education Act in 1958, few observers feared any eventual loss of local autonomy. The importance attached to national defense and the nearly unanimous public support for science as a good easily overcame what few objections there were.

Questions of race and poverty provided the basis for the next great leap in federal involvement, the Elementary and Secondary Education Act of 1965. Title I of that act established a "compensatory education" effort, including curriculum development, to improve schooling in the poorest urban areas.

The 1958 and 1965 acts, by plunging the government into the details of school curriculum, helped open the way for much more extensive federal intrusion in the next decade. "[T]he curriculum activities — because they were uncontroversial in the early years and seemed so reasonable—helped to create a climate in which government intrusiveness seemed natural."

It was in the 1970s that special-interest groups began working their will systematically on local education, Atkin says, with help from

both legislatures and courts. Schools were increasingly under obligation to provide for bilingual education, ethnic history, vocational education, and drug abuse counseling, among many other programs. The passage of such landmark legislation as the Education of All Handicapped Children Act of 1975, which required educators to come up with an individual learning plan for each child, was testimony to the political clout of the interest groups.

The first major reaction to federal involvement arose in the mid-seventies, with the controversy that surrounded "Man—A Course of Study" (MACOS), a curriculum project supported by the National Science Foundation. While parent activists could block some individual projects of this sort, they soon discovered that local schools had come to rely on federal financial help. "The 8 or 9 percent of the local education budget provided by the federal government," notes Atkin, "turned out to be not marginal but essential."

State governments too were extending unprecedented controls over local educational autonomy during the seventies. Here the reasons were different: a desire to cut costs during a period of falling enrollments and a pervasive concern about the decline in educational quality indicated by the continuing drop in test scores. State governments also were susceptible to special-interest lobbying. One ballot initiative now pending in California would require 200 minutes per week of instruction in the arts.

Some interventions crop up in different forms at the state and federal levels. One is the continuing policy of "mainstreaming" children who once were placed in special classes or institutions, such as the handicapped or delinquent, who are the subject of federal and state guidelines respectively. Because such children command disproportionate attention from the teacher, they can disrupt regular educational activities.

Caught between state and federal, legislative and judicial, presences in the classroom, teachers are increasingly finding that their "range for professional action is being narrowed, with individuals farther and farther from the classroom making basic decisions about curriculum," Atkin says. And while the government intrusions may have helped some of the most disadvantaged students, Atkin believes, the overall effect has been more a level-

ing down of achievement. He predicts that parents with the means to do so may provide their children with private educations in coming years, adding: "We may be entering a period in which government services reduced to the bone will increasingly serve only the handicapped, the juvenile offender, and the poor."

Deregulating Concentrated Markets

"Deregulation and Oligopolistic Price-Quality Rivalry," by James H. Vander Weide and Julie H. Zalkind, in *American Economic Review*, vol. 71, no. 1 (March 1981).

Many discussions of the likely economic effects of deregulation are implicitly based on the classical model of perfect competition. According to James H. Vander Weide of the Duke University Graduate School of Business Administration and Julie H. Zalkind of the Energy Information Administration, however, such industries as airlines, banking, and trucking—all favorite targets of deregulators—do not obey the standard laws of perfect competition. Instead, they are more usefully thought of as oligopolies in which each competitor is large enough to have a significant effect on the decisions of others.

In this article, Vander Weide and Zalkind examine the economic consequences of deregulation using a model of regulated oligopolistic rivalry. The oligopolistic firm in their model produces a product having both quantity and quality dimensions. Although the firm's revenue is explicitly based only on the quantity it sells, the demand for its product depends on the product's price and quality, as well as those of its competitors.

Vander Weide and Zalkind study two possible types of cost function, representing contrasting ways in which quality can affect the costs of production. One applies to those dimensions of quality, such as automobile safety, whose cost varies directly with sales volume. The other applies to quality dimensions, such as numbers of bank branches or airline flights, whose cost is independent of sales volume (adding a new flight may cost about the same amount whether it attracts one or fifty new customers). Both of the authors' cost functions

allow for the presence of economies or diseconomies of scale.

For each cost function, Vander Weide and Zalkind examine the economic effects of deregulation in two kinds of industries—those where price and entry are regulated and firms compete on the basis of product quality, such as airlines and trucking, and those where quality and entry are regulated but firms compete on the basis of price, such as banking in states that limit branching. Their results suggest that the economic consequences of deregulation depend on a variety of factors, including which variables had previously been regulated and which are to be deregulated, whether the regulated variables had been fixed at levels higher or lower than those which would obtain in an unregulated oligopoly, and the nature of individual firm cost and demand functions. If entry into airline markets is deregulated but price remains fixed, for instance, then the number of flights per carrier, the number of passengers per carrier, and the load factor will decrease, but total flights serving the market and total passengers in the market will increase. If both price and entry are deregulated, however, the increase in flights in a market resulting from entry deregulation may be more than offset by a decrease in flights resulting from price deregulation. This effect could occur where the pre-existing regulated price level was below that which the unregulated oligopoly produces.

ing into salable sulfuric acid. A \$2.7 million initial investment enables Dow Corning to recover chlorine and hydrogen formerly lost to the atmosphere in making silicon, at a \$900,000 annual savings in operating costs. Georgia-Pacific's paper mill at Bellingham, Washington, is producing as a byproduct alcohol so potent (190 proof) that "the Treasury Department has stationed men in the plant full-time to make sure that none of it is converted to drinking liquor before its sale to industrial users."

Energy and animal feed are two frequent products of waste recovery efforts. Steam and hot gases from coke ovens, methane from organic wastes, and bark and sawdust from for-

The Profits in Recycling

"Making Pollution Prevention Pay" by Michael G. Royston, in *Harvard Business Review*, vol. 58 (November/December 1980), pp. 6-22.

Alert firms can often make pollution control profitable by recovering valuable resources formerly lost in the form of effluents. Michael Royston, professor of technology and environment at the Center for Education in International Management in Geneva, Switzerland, collects in this article information on scores of profitable ventures in resource recovery around the world.

A metallurgical process developed in Finland, for example, turns 98 percent of the damaging sulfur dioxide fumes from copper smelt-



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est industry waste are potential heat sources; livestock thrive on wastes from distillery, cheese, and citrus processing operations, and even on wastepaper. Cement, fertilizer, and building materials are other common recovery products. One British firm uses its china clay wastes to make prefabricated houses.

Often waste recovery is institutionalized by operating the waste-producing and waste-consuming processes at the same site. This "systems approach" is particularly suited to thermal effluents, which are used for everything from local space heating to the cultivation of eels (\$6 million worth at one Scottish distillery). Royston lists twenty-five examples of such integrated systems.

Royston cites Minnesota Mining and Manufacturing (3M), the diversified American company, to demonstrate how one firm can profit by "viewing pollution as an indicator of waste and an opportunity for profit rather than as a costly threat." In a four-year span in which 3M's production increased significantly, the company cut its liquid effluents from 47 tons to 2.6 tons, gaseous effluents from 3,000 tons to 2,400 tons, and solid waste from 6,000 tons to 1,800 tons. The result: a saving of \$2.4 million a year. Perhaps most significant is that 3M achieved its gains not by installing new pollution control equipment but by rethinking the production process itself: "reformulating products, redesigning equipment, modifying processes, or recovering materials for reuse." Royston sums up this approach as "good housekeeping." "The key to 3M's success," he adds, "has been giving corporate-wide recognition to the importance of technological innovation in making the company efficient and profitable, delegating responsibility and initiative to the shop floor, and rewarding all company personnel who get involved" in the program.

But even 3M would be hard put to match DSM, the Dutch state coal and chemical enterprise. DSM stages internal simulations of public environmental-impact hearings, with company employees playing the roles of ecology activists. Such precautions can help avert court challenges to planned projects, Royston says, adding: "The ultimate objective of the corporation is survival, and reaching that depends very much on the adaptation of the corporation to its environment."

Making Cable TV Pay? (Continued from page 39)

approach would eliminate the cumbersome and impractical CRT process, leaving the pricing of copyrighted programs to the marketplace.

Admittedly, this solution is imperfect. However, in light of the entrenched position of the traditional cable system and the claims of their viewers, some compromise with free market principles is probably unavoidable. The compromise outlined here is the fairest possible, for both cable and for the copyright owners. The latter would have full copyright protection in those markets (the 100 largest) from which they draw 90 percent of their revenues. And the great majority of the 4,200-odd cable systems would be better off because, as systems in the smaller markets, they would have no copyright payments. The larger cable systems in the top 100 markets can well afford to pay for the programming they use and, in any event, will depend for their success on pay-TV and the new services. For them to seek to retain the relatively small advantage of a compulsory copyright for distant signal carriage is piggishness—an assault on the rules of fair play.

IT IS DIFFICULT to sympathize with the broadcast industry. Indeed, there is something almost deliciously ironic in the problems it now confronts because of cable. For it was VHF broadcaster pressures that led to the present inadequate spectrum allocations system that, in turn, fostered the growth of cable (see Stanley M. Besen and Thomas G. Krattenmaker, page 27). And it was the broadcasters that held back the development of over-the-air pay-TV for decades, so that when enterprising cable systems turned to satellite-distributed pay-TV as a device for penetrating the major markets, the move was not precluded by a long-established subscription TV service. Like Rubashov in *Darkness at Noon*, they are being devoured by a force of their own making (although it should be noted that about one-third of the cable systems are owned by VHF broadcasters).

The copyright owners, however, have done nothing to deserve the inequities of compulsory license. Enough violence has been done to the marketplace in the last two decades. It is time—indeed, long past time—to bring true deregulation to the cable copyright field. ■