short-run incentives to reduce unit costs. It should be noted, however, that, despite weaknesses in the framework of control for the nationalized industries, it is by no means clear that the operational efficiency of the ESI—the dimension of performance most likely to be improved by regulation of the RPI – X type—can be classed as poor. In its 1981 investigation of the CEGB, for example, the MMC (Monopolies and Mergers Commission, 1981a) concluded that "we are satisfied that the Board has an effective operational planning system and that the out-turns are adequately monitored," while Pryke (1987) points out that "the thermal efficiency of its [the CEGB's] fossil-fuel stations compares favourably with that of other countries, and the availability of its big generating units, which used to be so poor, is now relatively high by international standards." (See Henney (1987) for a dissenting note, however.)

The dimension of internal efficiency in which the performance of the ESI has more clearly been deficient is investment costs. Thus both time and cost overruns in the construction of new power stations in general, and of nuclear plants in particular, have frequently been substantial, and the MMC report noted that "the weaknesses and failings on power station construction sites discussed in earlier reports still exist." Because of the long periods associated with the planning and construction of new capacity, it is too early to assess whether or not the changes brought about by tighter financial constraints have yet had, or are likely to have, a material effect on investment costs. What can be said, however, is that, with respect to new investment, moving to a system of price regulation of the type now used in the telecommunications and gas industries might easily create at least as many problems as it would solve (see sections 4.2 and 9.3.4).

9.3.3 Competition

Between 1947 and the early 1980s successive Governments showed little or no interest in policies designed to increase competition in the ESI. In part, this can be explained by the natural monopoly characteristics of electricity transmission and distribution and by the difficulties of promoting competition among independent generating companies that are connected to a single supply network. Since public policy has more recently shifted to a (nominally) pro-competitive stance in its approach to electricity generation, it will be useful to say a few words about the latter difficulties before going on to evaluate the impact of liberalization on the industry.

There is little doubt that the establishment of a regional or national

power network can potentially be of great benefit to consumers of electricity. To be included among the gains are the following effects (see Joskow and Schmalensee, 1983):

(i) the realization of plant-level scale economies through the consolidation of geographically dispersed loads;

(ii) increased reliability of supply via the consolidation of uncertain loads and uncertain plant performance characteristics;

(iii) efficient production, achieved by coordinating the operations of plants with differing marginal costs of supply;

(iv) lower total capacity requirements resulting from the aggregation of demands with differing load characteristics;

(v) economies from the coordination of maintenance schedules;

(vi) economies in responding to emergencies such as plant and transmission failures.

However, the existence of an integrated power system poses certain problems for the development of competition in electricity generation. To prevent system failures, electrical equilibrium must be maintained at all points in the network: the power "demanded" at each point must be equal to the power "supplied." It follows from this that, unlike most markets, a company generating electricity at a particular point in the network *cannot* direct its output to a designated point of demand. Hence, the performances of the various generating sets attached to the system are, in a very direct and obvious way, interdependent.

In practice, it has proved difficult to handle these network interdependences in an efficient manner through the use of a fully decentralized set of contractual relationships. Large networks, whether they be comprised of publicly owned or privately owned firms, therefore typically make use of some centralized "planning" authority that makes allocative decisions (e.g. which power stations are to generate electricity at a particular moment) on a command or fiat basis. However, the establishment of central coordination (to overcome the externalities associated with full decentralization) is in conflict with the goal of promoting greater competition through the encouragement of more individualistic decision making. In other words, the technology of electricity supply creates a policy dilemma—the benefits of coordination among firms have to be balanced against the benefits of competition—and the question of how this trade-off should be resolved is one of the most important issues in electricity economics.

To date the role of competition in the British ESI has been extremely limited. Until 1983 the CEGB was protected from competition by statutory barriers to entry, but the most significant of these were removed by the Energy Act which sought to introduce competitive pressures into the industry whilst preserving the CEGB's centralized control of the network through its ownership of the national transmission grid. With respect to purchases of power from private producers by the industry's Area boards the relevant clause of the Energy Act states that

"The principles on which tariffs are fixed and prices proposed by an Electricity Board ... shall include the principle that a purchase by the Board ... should be on terms which
a) will not increase the prices payable by customers of the Board for electricity supplied to them by the Board, and
b) will reflect the costs that would have been incurred by the Board but for the purchase."

With respect to the use of publicly owned transmission and distribution facilities by private suppliers, the relevant clause states that

"The principles on which tariffs are fixed and prices proposed by an Electricity Board ... shall include the principle that charges should be no more than sufficient to provide a return on the relevant assets comparable to any return that the Board expects to receive on comparable assets."

The first of these two clauses relates only to purchases of electricity by Area Boards. Thus, in effect, the Act stipulates that the PPTs (setting out the terms on which Area Boards are willing to purchase electricity from private producers) should reflect the avoidable costs of the *Area Boards*, and not the avoidable costs of the CEGB. Since the purchase costs of the Area Boards are largely governed by the rates of the BST, we should therefore expect to see prices offered to private producers that are closely in line with BST rates.

The CEGB's response to the Energy Act was to restructure the BST in a way that compelled the Area Boards to offer less favorable terms to private producers than to the CEGB. In 1984–1985, the first tariff year after the introduction of the Act, a new system service charge was introduced into the BST which incorporated cost elements that had previously been treated as capacity related and hence had been considered to be components of long-run marginal cost. The charge was allocated among Area Boards on the basis of each Board's maximum demand in the tariff year 1982–1983. Since this procedure was retained in subsequent tariff years, it implied that any changes in maximum demands in the years subsequent to 1982–1983

had no effect on the allocation of the system service charge. Hence, as far as an individual Area Board was concerned, the system service charge became an unavoidable cost from 1984–1985 onward and, as such, was to be excluded when constructing its PPT. The result is that, unless an Area Board completely disconnects itself from the CEGB, the per unit charge paid to the CEGB is significantly in excess of that paid to a private producer, for supplies with similar load characteristics.

Under the most favorable of the PPTs that are available to a private producer, an approximate estimate of the disparity between average PPT prices and average BST prices is given by the percentage of the CEGB's revenues from Area Boards which is accounted for by the system service charge. The resulting estimates are shown in table 9.6. The figure for 1983–1984 shows the corresponding figure for the old service charge component of the BST in the last tariff year *not* covered by the Energy Act, and the table reveals the sharp upward movement in the relative importance of fixed (i.e. unavoidable) charges in 1984–1985, followed by further upward shifts in the subsequent years. Thus, by 1986–1987 private producers were being offered terms that, at best, were nearly 10 percent less favorable than those demanded by the CEGB.

In 1987–1988 the CEGB took an additional substantial step in the same direction by introducing a "nonmarginal" energy charge, nominally aimed at recovering that fraction of its coal costs that could be attributed to the protection of the domestic coal industry. This substantially raised the fixed cost component of Area Board payments to the CEGB and, although the Government prevented Area Boards from reducing their PPT rates by a corresponding amount, the prices available to the CEGB's potential rivals fell by approximately 5 percent and the gap between average BST and average PPT rates increased further.

In defense of its tariff manipulations, the CEGB can claim that the Energy Act was incorrectly formulated, in that economic efficiency requires that private producers be offered terms based on its *own* short-run marginal costs since, for example, to offer more when the industry already has excess capacity would simply stimulate the construction of additional

Table 9.6 The CEGB's system service charge revenues as a percentage of all revenues from Area Boards

Year	1983–1984	1984–1985	1985–1986	1986–1987
Percentage	1.0	7.8	8.7	9.5

Source: *CEGB Annual Report and Accounts* (1984, 1985, 1986, 1987).

surplus plant. This reasoning has some merit, although the supply/demand balance in the South of England indicates that incremental generating capacity or transmission capacity (to transport electricity from the surplus areas of the North and Midlands) will be required in the near future. Nevertheless, the ease with which the CEGB has been able to achieve its purpose (i.e. deterrence of new entrants) vividly illustrates the market power of a lightly regulated dominant firm.

Substantial difficulties also confront a potential entrant who wishes to make use of the publicly owned electricity grids to supply consumers directly. As in the gas industry, the charges for the "transportation" of electricity and for connection to the grid are set by the corporations themselves (rather than by regulators), the incumbent firms have sufficient flexibility in pricing policy to respond to entry threats by selective price discounting, and entrants are at a comparative disadvantage with respect to the security of supply they can offer to any given customer.

Thus, faced with a situation in which the incumbent firm can effectively determine the terms available from the major distributors of electricity and/or can offer selective discounts without triggering regulatory interventions, our conclusion is that, notwithstanding the intentions of the Energy Act, private producers of electricity continue to face substantial barriers to entry into the industry. Significant levels of new entry, based upon either the generation of electricity as a main business or the development of combined heat and power schemes, have not yet been observed in Britain. Nor can they be expected in the future in the absence of additional pro-competitive policy measures to ensure that new entrants can gain access to the the markets for their outputs on fair terms. Thus far, policies to liberalize the market have been limited in scope and have had little practical effect.

9.3.4 Prospects for Privatization

In its post-election evaluations of policy options for the ESI, the most important initial questions to be settled by the Government concern the organizational structures to be adopted for the privately owned companies. British Telecom (BT) and British Gas were sold as single units, but there is little prospect that the same model will be followed for electricity supply, if only because there is already some vertical separation between generation and distribution in England and Wales (but not in Scotland). Hence, in electricity, the pressures towards "structural conservatism" point in the same direction as the economic arguments concerning competition and regulation: away from a solution based upon the creation of a single fully vertically integrated electric utility company.

Given this point, we will proceed by assuming initially that, in the course of privatization, the current division between the distribution and generation of electricity in England and Wales is retained. This leads to separate discussions of policies towards the Area Boards and the CEGB. In both cases, however, options involving some *horizontal* restructuring of the existing public corporations will be examined. Next, we will consider the potential merits of vertical integration at either the national or regional level and, since it plays such an important role in the economics of the industry, we will pay particular attention to the future of the national transmission system. Finally, we will examine the rather different position of the industry in Scotland, before setting out a brief assessment of the main policy options.

Privatization of the Area Boards Since cost conditions in electricity distribution effectively rule out the possibility that incumbent firms can stringently be constrained by the development of actual or potential competition, privatization will entail the replacement of existing public monopolies with regulated private monopolies. In these circumstances the principal potential benefits of privatization are twofold:

(i) it might help to promote increased competition in electricity *generation* by introducing profit incentives for the distribution companies to shop around for low cost supplies;

(ii) it might introduce greater incentives for the reduction of distribution costs.

With respect to (i), as we pointed out earlier, institutional arrangements in the publicly owned ESI have created close relationships between Area Boards and the CEGB in which the former have played a relatively subservient role. For example, Area Boards have not challenged the manipulations of the BST that have been designed to deter new entry into generation. In contrast, there would have been fewer incentives for privately owned profit-seeking distribution companies to have been quite so cooperative with the CEGB on this matter, since the effect of entry deterrence is likely to be higher wholesale electricity prices in the longer run. Thus privatization of the Area Boards can be expected to lead to reduced barriers to entry into electricity generation.

It should be noted, however, that the underlying problem—an excessive degree of vertical integration, leading to reduced competition in generation—has little to do with ownership *per se*. Abolition of the Electricity Council and its replacement with a regulatory body independent of the public corporations (along the lines of the Herbert Committee recommendations) would have been one alternative way forward. Moreover, a dominant electricity generating company would, if unregulated or only lightly regulated, continue to possess substantial market power in its dealings with both distribution companies and actual or potential competitors. Hence, although it may be a step in the right direction, privatization of the Area Boards is neither a necessary nor a sufficient condition for *significantly* enhanced competition in electricity generation.

Similar remarks apply with regard to the introduction of incentives for reductions in distribution costs. In section 2.4 it was shown that an unregulated private monopoly will not necessarily be more cost efficient than a public corporation, and in chapter 4 we noted how regulation itself may introduce distortions in a private firm's choice of inputs, leading to costs that are higher than minimum feasible levels. The lesson to be drawn from the earlier analysis is therefore that the conduct of regulatory policy will have a crucial bearing upon the cost performance of the industry, a message that is reinforced by evidence from the U.S. experience. How then will privatized distribution companies be regulated?

The evolution of U.K. policy to date indicates the establishment of a regulatory authority to monitor an initial pricing formula (for domestic sales at least) of the RPI $- X + Y$ form. Here X would be a number based upon an estimate of the opportunities available to the companies for reductions in real controllable costs and Y would be linked to some index of the unit cost of bought-in supplies of wholesale electricity. The Y factor introduces an immediate conflict between the desire to allow changes in wholesale electricity prices to be passed on to final customers and the desire to establish strong incentives for distribution companies to seek out and promote cheaper supplies of wholesale electricity. *Partial* indexation of retail to wholesale prices is one possible way of coping with the problem, or, if privatization is accompanied by price controls on wholesale prices, Y might be set equal to changes in the maximum allowable average price (rather than the *actual* prices paid by Area Boards, which could be lower). However, the introduction of yardstick regulation (see below) is potentially the most effective way of improving this and other, more important, trade-offs.

As we showed in section 4.4, the use of a single pricing constraint can be reconciled with satisfactory incentives toward the adoption by firms of efficient tariff structures provided that the weights used in the construction of the regulated price index are set appropriately. Although extensive and detailed demand and cost information would be required to compute the optimal weighting pattern for the index, it should be possible to arrive at some approximation to this pattern on the basis of existing Area Board data.

With respect to price regulation, in our view the most important single issue to be settled concerns the nature of the process that will be used to review and amend the pricing formulas set for the privatized electricity distribution companies. If, as we anticipate, the telecommunications and gas precedents are followed, it will be the MMC that periodically conducts the regulatory reviews. However, the MMC's rather general public interest guidelines, together with the absence of credible long-term guarantees to investors, are potential sources of uncertainty and may lead to a bias towards underinvestment in privately owned utilities. Hence, we favor a more explicit approach to the framing of longer-term policy that, in relation to adjustments of the price control formula, would attach significant weight to the criterion of a "fair" rate of return on capital. In electricity distribution the existence of a number of similar utilities implies that rate-of-return regulation can be combined with the provision of reasonably strong incentives for cost reduction, and that it need not lead to a substantial bias towards overcapitalization. This is possible because of the absence of an "information monopoly" that would block the application of regulatory yardsticks.

To illustrate, consider an explicit regulatory bargain in which the totality of investors in privatized distribution companies is guaranteed a fair rate of return on capital, but in which the prospective allocation of returns among the different firms is made dependent upon their relative performance. In the initial indexation period each company is set a pricing constraint that, on best available information, will allow it to earn the fair rate of return. Because of differences in internal efficiency and of unanticipated demand and cost movements, however, it is to be expected that at the end of the period some companies will have performed better than others. If, by the time of the first regulatory review, a given company had achieved a higher rate of return than the average for the industry as a whole (by, for example, obtaining lower wholesale prices or reducing distribution costs), it would be allowed to set prices in the subsequent period at a level calculated to permit it to retain some, but not all, of its relative financial advantage. At the same time the set of allowable prices for the 12 companies as a whole would be fixed so as to yield no more than a fair rate of return on the total capital employed in electricity generation. Put simply, the *relative* prices of the distribution companies would be determined by past relative performance, while the *average* level of retail electricity prices across the country would be determined by the criterion of a fair rate of return (see section 11.3.5 for a fuller account of this procedure).

This system of regulation for retail electricity prices has the following advantages.

(i) The incentives for strategic overinvestment are relatively slight since each company is able to capture only a fraction of the profit gains that such behavior would produce for the industry as a whole.

(ii) Since the benefits of better than average performance with respect to cost reduction would persist over several review periods it is possible, depending upon the (policy-determined) speed at which rates of return are equalized, to induce quite strong incentives for improvements in internal efficiency.

(iii) By opting for relatively short indexation periods, it is possible to ensure that average prices across the country closely track average costs whilst preserving the aforementioned cost-reduction incentives.

(iv) *Either* retail electricity prices can be indexed to movements in *average* wholesale prices across the country, rather than to the input prices of a single distribution company, thus preserving shorter-term incentives to acquire cheaper supplies, *or*, if the period between price reviews is reasonably short, such indexation can be abandoned entirely without significant loss.

The incentives provided by yardstick regulation can, of course, be eroded by collusion amongst distribution companies with respect to cost-reduction and investment programs. Similarly, the benefits would be lost if, prior to privatization, the Area Boards were amalgamated into a single national distribution company. Here we face a classic trade-off between the number of firms in the industry and the realization of potential scale economies (see section 3.2.1). Larger numbers tend to impede collusion and, in this case, facilitate the development of competition in cost-reduction activities by enabling regulators to devise more effective incentive structures (because the supply of information is less monopolized). Although, in the course of the privatization debate, it has been suggested that there might be scale economy benefits from the creation either of a single distribution company or of a smaller number of Area Boards than currently exists, little or no evidence has been put forward in support of this position. In view of the clear detriments of horizontal integration, therefore, and assuming that privatization of electricity distribution is to proceed, we would favor the preservation of current organizational structures.

Moreover, again assuming that a substantial transfer of ownership is to take place, we believe that there is a case to be made for the retention (at least initially) of some of the Area Boards in the public sector. The major benefits of the yardstick approach derive from innovations in regulatory policy and are not an automatic consequence of the transfer of ownership. Coupled with the introduction of performance-related pay for managers, the approach could equally well be applied to publicly owned corporations. Indeed, a mixture of publicly and privately owned distribution companies would create a greater diversity of interests and incentive structures in the industry that might serve to hinder the development of collusive arrangements (cf. arguments surrounding the role of the British National Oil Corporation developed in section 9.4.4 below).

In addition to the scale economies point, a second argument that has been put forward in favor of greater horizontal concentration in electricity distribution is that larger companies are required to offset the market power of the CEGB (the countervailing-power argument). Again we have little sympathy with this view. Given the opportunities afforded by privatization to reform the regulatory and competitive structures of the ESI, the better way of proceeding is to tackle the problem of monopoly power in generation through measures to increase competition in the upstream part of the industry and/or enhance the effectiveness of regulatory policy, and it is to these issues that we now turn.

Privatization of Electricity Generation At the moment, the CEGB is responsible for both the generation *and* transmission of bulk electricity in England and Wales. Thus, in addition to its generating assets, the CEGB owns and operates the national high voltage transmission system known as the national grid, and it is this latter aspect of its business that can safely be classified as a natural monopoly activity. However, it is extremely unlikely that, considered as a *separate* operation, electricity generation also constitutes a natural monopoly; in many countries the production of electricity is undertaken by a relatively large number of different companies, and international evidence does not indicate the existence of any clear cost-efficiency benefits associated with single-firm production. Hence restructuring of this side of the U.K. industry prior to, or in the course of, privatization is an option that merits serious consideration, and we will examine ownership transfer based on three alternative forms of organization: A, continuation of the CEGB in its present form (i.e. sale of the CEGB's power stations in a single block); B, the creation of regional generating companies; C, the creation of two or more nonregional generating companies from the CEGB's existing assets.

For each alternative, there is also the question of what to do with the national grid. Since the respective merits of the options are contingent upon decisions about the future of the transmission system, we will offer some preliminary remarks on this issue in the evaluation of each alternative.

Option A A single sale of the CEGB's full portfolio of assets (generating sets plus transmission links) would not require restructuring of the upstream parts of the industry, and is the option that would permit the most rapid transfer of assets to the private sector. Unsurprisingly, the management of the public corporation has expressed a strong preference for this approach, suggesting that the arguments against restructuring that were successfully deployed in the case of gas privatization are also directly relevant to electricity. The economic case is largely based upon claims that internal efficiency would be damaged if smaller-scale generating companies were established. Thus, for example, it might be argued that there are economies of scale in day-to-day operations arising from the the centralized despatch of power stations according to their respective marginal operating costs and in longer-term investment planning arising from the coordination of plant construction programs.

However, while arguments for the existence of significant economies of coordination are generally sound, the attainment of such benefits does not *necessarily* require the creation or retention of a single company responsible for *all* electricity generation and transmission activities. As experience in the U.S. and elsewhere shows, coordination can be achieved by cooperation amongst a number of separate companies (e.g. centralized despatch of generating stations via power-pooling arrangements). Although, as argued earlier, such cooperation might tend to impede the development of effective competition, the trade-off with competition could be improved by entrusting coordination functions to a separate transmission company, since it is in the organization of energy flows through the grid network that many of the benefits of scale reside.

In defense of the proposition that single-firm production is, nevertheless, the superior option, France is often quoted as an example of a country where substantial scale economies have been reaped as a consequence of this form of industrial organization. Electricité de France has focused heavily upon nuclear plant, basing capacity expansion around pressurized water reactors (PWRs). By relying upon a single type of reactor, the

publicly owned industry has been able to obtain low unit costs from "learning" effects in plant design, construction, and operation (economies of replication), and from the construction and operation of several large reactors on a single site (economies of colocation). Moreover, it can be argued that such benefits would have been substantially reduced if the structure of the French industry had been less concentrated because, for example, many of the "learning" advantages are internal to the firm concerned and cannot easily be transferred to other organizations.

For a number of reasons, however, these scale economy arguments in favor of single-firm production are not entirely convincing. First, it is one thing to demonstrate the existence of *potential* benefits of large size but quite another to show that a highly concentrated industrial structure will necessarily provide sufficient incentives for their *realization*. Thus, for example, the CEGB's own performance record counts against the point that lower construction costs follow fairly automatically from larger scale (see section 9.3.2).

Second, even accepting the existence of economies of replication and colocation, there is little evidence to suggest that the minimum efficient scale for an electricity generation company is of the order of 50 GW or more (the net capability of the CEGB was 52.4 GW in early 1987). The smaller Belgian industry has pursued a strategy similar to that of the French, with not dissimilar results, and American studies have tended to place minimum efficient scale (whether at the firm or system level) at a much lower level of capacity than 50 GW (see Joskow and Schmalensee, 1983). The continued existence of successful smaller companies in countries with more fragmented wholesale electricity markets also provides corroborative evidence for this view.

Finally, economies from learning or experience are much more significant for nuclear technologies than for other methods of generating electricity: older well-established fossil fuel technologies do not exhibit these effects to anything like the same extent. It is therefore impossible to divorce evaluation of the likely effects of privatization from views about the prospects for nuclear generation in Britain. Currently, the CEGB hopes to obtain permission to build a series of PWRs, but its investment appraisals are based upon the 5 percent required rate-of-return criterion laid down in the 1978 White Paper. One effect of privatization would be to increase significantly the discount rate applied to investment projects, perhaps to something of the order of 10 percent real or more. At these higher rates of discount the economic case for nuclear power is far from clear (see Yarrow, 1988), and should future plant construction be based upon fossil fuel technologies the learning-effects argument would lose most of its force.

Much depends, therefore, upon whether a large-scale nuclear program in Britain is considered desirable. The Government is firmly committed to an expansion of nuclear capacity and, if this position is taken as given, it strengthens the case against a comprehensive break-up of the CEGB. Nevertheless, a pro-nuclear policy stance does not in itself establish a decisive case for the retention of a single generating company. Rather, it points only towards the development of organizations that would be larger than those appropriate to fossil fuel technologies, and there is always the option of creating a company or public corporation responsible exclusively for nuclear generation in England and Wales (which accounted for around 20 percent of total supply in the mid-1980s), leaving smaller competitors to operate with the alternative technologies. Moreover, since a single privately owned generating company would have considerable market power, it would be necessary to regulate the monopolist's wholesale electricity prices, leading to potential suboptimalities in investment expenditures of the type analyzed in section 4.2.3. The investment problem is likely to be serious for electricity generation in general, and for nuclear generation in particular, because of the high capital intensity of the industry, the long gestation lags in the construction of plant, and the durability of physical assets. Thus, for example, to the extent that a regulated private monopolist would face uncertainty about the future course of regulatory policy, would be concerned that *ex post* welfare-maximizing regulators might not allow full recovery of sunk capital costs, and would be tempted to hold back investment programs so as to be in a better position to bargain with regulators (e.g. so as to argue that the necessary investment could not be financed without higher prices), there could be a tendency towards underinvestment coupled with a bias against more capital-intensive nuclear plant.

This concern about possible suboptimalities in investment programs—which is a concern associated with *all* systems of price regulation—is reinforced in this case by analysis of the incentives for a private monopolist to engage in strategic behavior aimed at influencing regulatory decisions. With only one firm in the market, when making its decisions the regulatory body must necessarily rely upon cost information from the monopolist, which information can be manipulated by the latter to its own advantage. The result is that the agency relationship between regulators and the monopolist involves a relatively unfavorable trade-off between cost efficiency and allocative efficiency, and this is one of the major deficiencies of the single-firm solution to the structural problem.

An associated weakness of the option under consideration is that it also enhances the ability of the incumbent firm to engage in anticompetitive behavior aimed at influencing the decisions of rivals. In particular, it tends to facilitate strategic moves to block or impede the entry of competing electricity generation companies. In our own view, it is upon this question of entry conditions that the relative merits of option A ultimately rest. In principle, regulatory policies could be introduced to limit this aspect of the market power of a dominant incumbent firm and, if successful, they would strengthen competitive pressures with respect to the construction of new capacity, which is precisely the area in which greater competition would be most beneficial. Moreover, entry threats would weaken incentives towards underinvestment in the industry and, over time, new entrants would provide valuable information to regulators. Thus, if potential competition can be increased, many of the disadvantages of the option under discussion will be reduced in significance.

We have already argued that the 1983 Energy Act had little impact on entry conditions because of the CEGB's ability to manipulate tariffs to the disadvantage of its potential rivals. In the United States, however, the Public Utilities Regulatory Policies Act (PURPA) has led in many States to substantial new entry into the industry. Indeed, if anything, the rate of new entry has tended to be excessive. The differences in results between the two countries are chiefly attributable to the fact that the terms and conditions of supply contracts are much more closely regulated in America. We conclude, therefore, that, if the CEGB's power stations are sold in a single block, it will still be possible to increase competitive pressures in electricity generation provided that strong regulatory measures are enforced to ensure that rival producers have access to markets on reasonable terms. However, as we will argue below, this difficult regulatory task would itself be facilitated if there was some initial restructuring of the CEGB.

Option B The creation of a group of regional generating companies from the existing assets of the CEGB would be a less straightforward administrative exercise than the creation of a single generating company. However, in comparison with option A, the advantages of this type of restructuring include the following:

(i) the immediate introduction of interutility competition in the market for bulk electricity;

(ii) an increased likelihood that bulk electricity prices would reflect regional variations in costs of supply;

(iii) a reduction in the market power of incumbent generating companies relative to potential competitors;

(iv) a reduction in the power of companies vis-à-vis the regulatory agency;

(v) an increase in the information available to regulators, facilitating the development of more effective regulatory incentive structures based on comparative yardsticks;

(vi) greater capital market pressures for internal efficiency arising from the increased information available to shareholders and the greater vulnerability of smaller companies to takeover threats in the event that their performance is poor.

These advantages would pertain whether or not existing transmission links were transferred to the new companies. Since it would lead to a decision-making structure rather similar to that adopted by the CEGB in the past, the integration of generation and transmission would facilitate the continued realization of coordination benefits, many of which occur at the regional level. Thus, the 1981 MMC report (Monopolies and Mergers Commission, 1981a) noted that the CEGB operated seven area grid control centers, and that

"... in the short term, costs are first optimised separately by each Area, including running spare, based on Area demand estimates. Costs are placed in a national context by means of inter-Area transfers."

On the other hand, compared with structures based upon the separation of generation and transmission, control over the high voltage grid would give privatized companies an enhanced ability to deter new entry. Although this ability could be limited by strict regulation of terms of access to the networks, the regulatory task would be rendered more difficult by the existence of vertical integration.

Whatever the decision concerning ownership of the high voltage network, as a consequence of transmission costs each generating company would possess market power in its own area of the country and, in the short to medium term at least, complete deregulation of bulk electricity prices would be undesirable if only because of existing bottlenecks in the transmission network. Nevertheless, given the short distances between the major centers of population in England and Wales, in the longer term this local market power would be attenuated by the threat of cross-entry, based either on the construction of new transmission lines or of new power stations in the locality to be served (on the assumption that any regional company would be allowed to construct incremental generating capacity in a market area served largely by one of its rivals).

In practice, however, competition among regionally concentrated generating companies might be restricted less by the magnitude of transmission costs than by the development of tacit collusion among the firms. Indeed, regionalization is almost an open invitation to the newly privatized companies to practice geographic market sharing, and regulators would need to be particularly vigilant in attempting to prevent this particular abuse of market power. In this task they would be supported by the competitive threats afforded by new entrants to the market and by profit-seeking distribution companies with incentives to promote the development of competing sources of supply, although it would likely take several years before these constraints on incumbent generating firms were fully effective.

One objection that has been made to regional restructuring of electricity generation is that there is currently a considerable mismatch of generation capacity and consumption among different regions of England and Wales (Henney, 1987). For example, the maximum demands of the London and South Western Area Boards in 1985–1986 were 3906 MW and 2324 MW respectively, while the capacities of plants within their areas were 976 MW and 431 MW respectively. Even if regional integration of generation, transmission, and distribution (the "power-board" approach) were being contemplated, however, the force of the objection is unclear: economic efficiency does not require that each region be self-sufficient. Thus, for example, it may be cheaper to meet growing demand in southern England by increasing the capacity of transmission links to areas of surplus generating capacity such as the Midlands or Northern France than to build more power stations in the South.

In fact, the existence of major interregional flows of bulk electricity is the basis of one of the arguments *for* regionalization, at least when the latter is compared with existing arrangements. At the moment the demand-related charges of the BST are uniform across the country and, given transmission costs, there is reason to believe that significant regional price discrimination is taking place (e.g. price–cost differentials may be lower in the south of the country than in the Midlands and North). The creation of independent generating companies would, however, provide incentives for the rapid elimination of these arbitrary disparities.

Option C While regionalization of electricity generation would initially leave the new companies with substantial local market power, it can be argued that a swifter transition to a more competitive market for bulk electricity would be possible if the CEGB were to be broken up into a series of companies which each possessed a geographically dispersed portfolio of power stations. Either the whole or a part of the generating assets of the CEGB could be disposed of in this way. For example, the CEGB owns eight relatively old nuclear reactors based on the Magnox design which are soon due for decommissioning, and which therefore might be considered inappropriate candidates for transfer to the private sector. Alternatively, *all* nuclear power stations could be retained in the public sector and a mixed-ownership system could be developed.

If option C were to be pursued, there would clearly be no case for transferring the national transmission grid to one of the newly privatized generating companies. Nor, unlike in the regionalization option, would there be any sensible way of dividing the grid among several firms. Either a separate transmission company/corporation would need to be created or, in the event of partial privatization, transmission functions could be entrusted to a publicly owned generating corporation (as in Sweden).

In deciding the initial number and sizes of the independent companies, policy makers are again confronted by the familiar trade-off between competition and scale and internal coordination benefits. Cost conditions in electricity generation are such that the creation of a large number of very small companies would almost certainly be undesirable, since it would lead to significant losses in operational efficiency and longer-term difficulties with respect to investment planning. However, precise determination of the optimal number and size of the generating companies is a matter on which it is hard to be confident. Henney (1987) suggests that 4–5 GW is about the right capacity level for each company—which is in line with earlier research in the United States (Christensen and Greene, 1976; Huettner and Landon, 1978)—but it should be noted that this view is based upon the assumed exclusion of nuclear plants from the privatization program.

Despite this uncertainty, in the longer run the costs of making wrong decisions about the initial post-privatization industrial structure may not be too severe. *If* effective competition is established, market structure can be expected to change over time: mergers can be allowed if it becomes clear that firms are inefficiently small, and entry can take place if an insufficient number of companies is created at the time of privatization. Industrial structures are not set in stone, and it is precisely because it provides more information about relative performance and greater flexibility of response to that new information that competition should be encouraged.

One of the major benefits claimed for option C is that, by facilitating the rapid introduction of strong competitive pressures into the industry, it

would open up prospects for the deregulation of wholesale electricity prices. Regulatory policy could then concentrate its attention on distribution and transmission activities, where the natural monopoly problem is significant. There is a certain amount of question begging in this line of argument, however, and it is appropriate to draw attention to some of the limitations of the proposal.

First, of the three privatization options under discussion, it would involve the most severe administrative problems, and it could prove difficult to arrange the transfer of the bulk of the CEGB's assets on a single date. On the other hand, if privatization proceeded in stages the first private companies to be established would find themselves competing with a dominant and potentially hostile public corporation which might still have control of the transmission grid. Close and strict regulation of the wholesale electricity market during the transitional phase would therefore be desirable.

Second, and of rather greater significance, is the problem of ensuring that the coordination among generators of electricity—which is necessary for the attainment of secure supplies of electricity at least cost—is accomplished by methods that do not facilitate anticompetitive collusive behavior. As noted earlier, one of the features of electric power systems is that demand and supply must instantaneously be balanced throughout the network if system security failures are to be avoided. Thus if, at a given time and a given location, demand runs ahead of supply, the consequence will be cessation of supply over some given section of the network. Put more technically, failure of markets to clear imposes substantial external costs: hence the preoccupation of engineers with system security.

In principle, coordination problems can be solved by means of contracts between independent generation, transmission, and distribution companies. However, given the existence of external effects and technologies dependent upon large inputs of durable and specific capital equipment, there are few grounds for confidence that decentralized contractual processes will lead to particularly efficient outcomes (see Williamson, 1975). Moreover, the problem is exacerbated by the fact that parts of the industry (distribution and transmission) will necessarily be regulated, so that downstream regulatory distortions could easily induce upstream inefficiencies in electricity generation. Finally, to the extent that contractual problems are overcome, the result may be associated with relatively weak competition amongst the supplying firms. It is worth noting, for example, that the existence of several firms engaging in similar economic activities is neither a necessary nor sufficient condition for effective competition, and that an unregulated cartel would not be a particularly attractive outcome.

We conclude, therefore, that while there is a strong case for reducing horizontal concentration in electricity generation it would be wise to proceed with some caution in this direction. Exclusive reliance on structural remedies would carry many risks and, in particular, immediate deregulation of bulk electricity prices would be unlikely to induce a swift transition to a competitive and efficient industry.

Vertical integration of generation, transmission, and distribution Thus far, whilst addressing some of the issues connected with the integration of generation and transmission activities, we have only examined policy options that are based upon maintenance of the current separation between generation/transmission and distribution. It remains to be considered whether or not there are merits in proposals that envisage further vertical integration in the industry.

The case for the integration of the upstream and downstream parts of the ESI rests upon the existence of interdependences between the activities of the distribution and generation companies. For the most part, these pertain to longer-run investment decisions. Decisions concerning the construction and location of new power stations are necessarily affected by the likely evolution of the transmission and distribution systems, and vice versa. Thus, in meeting incremental demand, explicit cooperation between upstream and downstream companies may yield long-run cost savings. Such coordination may, of course, be perfectly feasible via the market transactions of independent companies and, on the whole, the major interdependences that occur are between investments in generation and transmission capacity, rather than investments in generation and distribution (i.e. lower voltage) capacity. Nevertheless, the existence of vertically integrated electric utilities in the U.S. and elsewhere (including Scotland) suggests that the possible benefits of such arrangements cannot entirely be discounted.

With respect to vertical integration, there are two options for restructuring the ESI that deserve brief consideration: D, the creation of a single fully integrated electric utility company; E, the creation of regional fully integrated utility companies.

Of these, the former would be much the easier to implement. Informal vertical integration already exists in the ESI, in that coordination of activities takes place through the Electricity Council. Amalgamation of the CEGB and the Area Boards would be a relatively straightforward operation, and, since the Electricity Council produces consolidated accounts for the industry, the resulting company could be presented to the capital market as an organization that already has a performance track record.

In all other respects, however, we believe that option D is dominated by each of the other alternatives we have put forward, including E. For example, in comparison with option A, it would preclude the development of competition in the purchasing of wholesale electricity, raise entry barriers, and prevent the use of regulatory yardsticks in electricity distribution. In compensation for these clear and obvious detriments, full horizontal and vertical integration of the industry would offer some potential, if speculative, benefits by way of possible economies of coordination, but most of the latter could be realized if a privatized CEGB were allowed to own and operate the transmission system.

Similarly, the bulk of the gains from internalized coordination could be achieved through the establishment of regional vertically integrated companies. With respect to option E, the six advantages of regionalization (relative to A) which were listed earlier would also continue to hold. Each of the benefits, however, is attenuated by the vertical integration of generation, transmission, and distribution. Thus, for example, relative to the regional solution based on vertical separation, the absence of independent distribution companies would lead to less competition in the wholesale electricity market, increase the market power of the private companies, and reduce information flows to the regulatory body.

Whether or not the coordination benefits of vertical integration at the regional level are sufficiently large to offset these losses is a question that is difficult to resolve on the basis of available evidence. The past performance of the (fully integrated) South of Scotland Electricity Board compares reasonably favorably with that of the CEGB, but the relevance of this observation is limited by the fact that it pertains to a different framework of regulation and competition than the one envisaged for the industry in the post-privatization period. Because of implications for competition and regulation, however, we would suggest that any initial presumption should be in favor of the organizational separation of electricity distribution.

Transmission If the Area Boards are privatized separately, a decision to sell CEGB's full complement of generating capacity as a single block would weaken the case for separating its transmission assets. Vertical separation of transmission activities might tend to increase short-run operational costs and hinder the development of an efficient pattern of investment in new plants and transmission lines. Set against these losses could be benefits from increased competitive pressures (it would be easier to arrange fair terms of access to transmission links for rival electricity generating companies) but these latter advantages would be restricted by the continued existence of a dominant incumbent CEGB with considerable market power and, in any case, smaller new entrants could bypass the national transmission system by supplying directly to distribution companies. In this case, therefore, there is respectable argument for leaving both generation and transmission with the CEGB and simply introducing stricter regulation of the terms on which the transmission facilities of the dominant company are made available to others.

A similar point can be argued with respect to the regionalization option: the simplest approach would be to divide up existing transmission facilities among the new companies on an area basis. Each company would then be responsible for the despatch of power stations in its own locality and for negotiating interutility transfers of power. However, in this case the arguments for the vertical integration of generation and transmission carry less force. Thus, particularly in the light of the existing disparities between capacity and demand in different regions of the country it might be more efficient to establish a national system of coordinating supplies based upon the creation of a private company or public corporation that would own and control the national grid.

Establishment of a separate national transmission and control company becomes a more interesting option in the event that the Government decides to split the CEGB into several independent generating companies that are not regionally concentrated. The transmission company (or public corporation) would own the national grid, organize central despatch of generating units, coordinate maintenance schedules for power stations, arrange for financial payments to utilities based upon cost savings arising from central despatch, and provide for the maintenance and development of the transmission system. It is clear that the resulting entity would have considerable market power, and that its ownership structure and methods of operation would be of crucial importance for the overall performance of the industry.

In the United States the activities outlined are most frequently organized by means of power pools (i.e. formal and informal arrangements among independent utilities to coordinate some or all of their investment and operating activities). Adopting a similar model in the U.K. would involve some or all of the private generating and distribution companies taking ownership stakes in the transmission company. The participation of

generating companies and, perhaps also, distribution companies in this exercise does, however, raise fundamental questions about the feasibility of increasing effective competition in wholesale markets. Again we stress the conflict between the desire to coordinate the activities of individual utilities (so as to obtain the cost advantages associated with efficient use of an integrated network) and the desire to promote more individualistic decision making (so as to promote interutility competition). As a result of this problem, there is a danger that close control of the coordination activities of the transmission company by the generating and distribution utilities would facilitate collusive anticompetitive behavior by incumbent firms. To illustrate, established generating companies could seek to exclude new entrants to the industry by setting unfavorable terms for the services offered by the transmission company to newcomers.

Although distribution companies would not have similar incentives to reduce competition in the supply of bulk electricity, ownership and control of transmission activities by these firms would also present certain difficulties. In particular, it would promote collusion on the buying side of the wholesale market and tend to increase monopsony power. Given the substantial sunk costs in electricity generation, such buying power can have substantial damaging effects on economic efficiency. For example, the ability of distribution companies to drive down prices towards short-run marginal costs can cause underinvestment problems in electricity generation that are closely akin to those described in section 4.2.3. Although long-term contracts provide one means of alleviating this difficulty, the costs of contract specification and enforcement are such that it is difficult to imagine all supplies being provided on this basis; spot markets would be retained to allow flexibility of response to unforeseen contingencies. Hence inefficiencies associated with monopsony power could well remain. (In this context it can be noted that the performance of the British gas industry—where producers supply a single buyer and long-term contracts are the norm—is not entirely encouraging.)

In the light of these various points, we believe that, if a separate transmission firm is to be established, there is a strong case for independent ownership (possibly public) and control of the resulting entity. The independence of the firm from the generating and distribution companies would assist in the development of a more competitive market in bulk electricity, and public ownership might be the best way of dealing with the considerable market power that the firm would possess.

However, irrespective of whether an independent transmission company is a regulated private monopoly or a public monopoly, there remains considerable doubt as to whether suitably strong incentives for efficient operation can be established and, given the importance of the role that such an entity would be expected to play, this is a point of some significance for the future development of the industry. In principle, vertical separation has much to recommend it, but in practice the technology of the ESI points to the conclusion that there are no easy ways of improving the fundamental economic trade-offs. Again we would warn against excessive reliance on structural remedies alone. Whatever structural option is chosen, it is likely to be the conduct of regulatory policy that will have the most significant effect on industrial performance.

Privatization in Scotland The ESI in Scotland is about a tenth the size of the industry in England and Wales and is characterized by full vertical integration of generation, transmission, and distribution, with the two Scottish Electricity Boards operating a power-pooling arrangement. The South of Scotland Electricity Board (SSEB) is much the larger of the two Scottish public corporations, and has a plant mix more heavily weighted towards nuclear stations than that of the CEGB: in 1986–1987 the SSEB obtained nearly 50 percent of its requirements from nuclear stations, and a further 1.4 GW of nuclear capacity, equivalent to about 30 percent of the current maximum demand, is under construction. As its name suggests, the North of Scotland Hydro-Electric Board (NSHB) concentrates on generating power from hydroelectric capacity in the Highlands.

With a maximum demand in 1986–1987 amounting to less than 5 GW, the Scottish market is too small to permit the creation of several competing generating companies without simultaneously incurring significant cost penalties. One option for privatization would be to split distribution and generation and attempt to encourage competition in the wholesale market between the privately owned Scottish generating company (or companies in the event that the NSHB is sold separately) and the newly created generating company or companies in England. The SSEB is already connected to the grid in England and Wales and there is some trading of supplies with the public corporations further south. The capacity of the transmission link is extremely limited, however, and in the foreseeable future there appears to be little prospect of strong competition being developed in this way. Similarly, given that there is soon likely to be very substantial excess capacity in Scotland and that the plant mix is heavily weighted towards nuclear sets with relatively low marginal operating costs, the prospects for significant new entry of smaller producers (via combined heat and power schemes, for example) are also poor.

With respect to the Scottish market, therefore, it should be recognized that the opportunities for increasing competition in in the short to medium term will be limited, and hence that the case for any immediate restructuring of the industry is weaker than in England and Wales. If privatization proceeds on the basis of existing organizational structures, however, this lack of competition points to the need for stringent regulation of the industry. Thus, for example, the private firm(s) should be required to provide separate accounts for its generation, transmission, and distribution activity, so that the regulatory authority can more easily compare its performance in each operation with that of (nonintegrated) companies in England and Wales, and, in addition to control of average prices, regulators should be active in attempting to monitor price *structures*.

Provided that the "regulation with a light hand" precedent, which was established during the course of privatization of the gas industry, is not followed and that electricity generation and distribution continue to be the responsibilities of different firms in England and Wales, retention of a vertically integrated structure in Scotland also has some positive aspects. The effects of changes in the structure of ownership, regulation, and competition that are currently envisaged for the industry in England and Wales are difficult to predict, partly as a result of the fact that much of the experience and knowledge gained from observation of past performance will be of only limited value in the new environment. In these circumstances there is a sound case for allowing some structural diversity: performance under different conditions can be assessed empirically, and lessons for the subsequent development of public policy can be learned. In particular, if separate distribution companies are to be retained in England and Wales, the performance of the Scottish company might cast some light on the question of the relative merits of vertical integration.

This last point is one aspect of a more general set of arguments that is as relevant to the future of the industry in England and Wales as it is in Scotland. The changes likely to be brought about by privatization are substantial and will lead to a period of rapid learning. The encouragement of diversity in the industry will not only increase the rate of acquisition of policy-relevant information, but will also tend to facilitate structural changes that may later be deemed desirable in the light of the new knowledge. That is, in periods of rapid learning flexibility of response is at a premium, indicating that it would be unwise for the Government to commit itself wholeheartedly to an industrial structure that is likely to be resistant to change.

9.3.5 Assessment

Throughout our discussion of the ESI we have emphasized the fundamental policy trade-off between the benefits of coordination among electric utility companies and the benefits of greater competition in the industry. Each of the five options we have considered seeks to resolve this trade-off in a different way, based upon a particular mix of horizontal and vertical integration in the industry.

On balance, we believe that horizontal integration has been carried too far in Britain and that there is a strong case for promoting the development of more competition in the market for wholesale electricity. The size of the CEGB's operations appears to be well in excess of empirical estimates of the minimum efficient scale for a generating company and, although international comparisons of performance must always be handled with care, the past record of the U.K. public corporation, relative to less concentrated industries overseas, affords little support for the claimed benefits of horizontal integration. These points also apply *a fortiori* to the possibility of creating a private monopoly responsible for generation, transmission, *and* distribution, the solution least conducive to the development of competition in the industry and the one that would lead to the most severe regulatory problems.

Unfortunately, the links between industrial concentration and the degree of competition in the marketplace are by no means straightforward, and the technology of the ESI creates pressures towards collusive behavior. For this reason, we are skeptical of proposals to increase competition and improve efficiency that place nearly all the emphasis on structural reforms. Rather we see the conduct of regulatory policy as being the most important single influence on the future performance of the industry. In particular we would stress the contributions that regulatory policy can make (a) to increasing rivalry among electricity distribution companies via the use of yardstick competition and (b) to creating a "level playing field" on which new entrants can compete fairly against incumbent generating companies. In the absence of measures to achieve these two goals, structural remedies are likely to have disappointing effects, whereas if the two goals can be attained competition in bulk electricity markets will be substantially increased regardless of the initial structural conditions. On balance, we favor some divestiture of CEGB assets prior to privatization simply because, by improving information flows to regulators, it would facilitate the development of more effective regulatory policies, *not* because it is likely *per se* to have substantial effects on competition in wholesale electricity markets.

We would also suggest that the trade-off between coordination and competition also points to the potentially beneficial effects of retaining parts of the ESI in public ownership, particularly if the Government decides to separate electricity generation and transmission. In that event, there would be merit in keeping coordination activities (associated with the operation of the transmission system) in the public domain so as not to facilitate collusion amongst incumbent privately owned utilities, including collaboration to impede new entry. In many countries electricity supply is characterized by a mix of public and private ownership, and to treat privatization as an all-or-nothing issue is to create an arbitrary and unnecessary constraint on policy decisions. Indeed, one of the weaknesses of the U.K. privatization program to date has been that, in its enthusiasm for private ownership, the Government has opted for policies that allow the rapid transfer of complete industries to the private sector, frequently with scant regard for the more fundamental issues of competition and regulatory policy.

Our own perspective is somewhat different. For the most part, we see the introduction of privately owned companies into industries such as electricity supply as one instrument (among several) for improving industrial performance indirectly through the promotion of greater competition and better regulation. In the particular case of the ESI, we believe that this points to partial step-by-step privatization, involving limited asset disposals (to increase actual competition and regulatory information immediately) and strong regulation by an independent body (to prevent monopolistic abuses and increase the effectiveness of potential competition). Both sets of measures would be consistent with the continuation of a significant level of public ownership in each part of the ESI (i.e. in generation, particularly nuclear, and distribution, as well as in transmission). By creating greater diversity, a mixed-ownership system would also facilitate the acquisition of policy-relevant information and make it easier to adjust industrial structure as knowledge and circumstances change. Moreover, that such an approach is feasible is shown by the structure of the industry in Sweden.

Finally, it is relevant to note that questions arising from the proposed privatization of the ESI should not be considered in isolation from other major issues of energy policy. Thus, we have drawn attention to problems connected with the future of nuclear power in Britain. Roughly speaking, privately owned generating companies are likely to be less favorably disposed towards nuclear power than the CEGB has been in recent years (discount rates used in investment appraisals will tend to rise), and the magnitude of this change in incentives is likely to be greater the smaller is the private company. In turn, decisions concerning the choice of generating technologies will have major implications for the future of the British coal industry (to be discussed in section 9.5). If coal import policy is liberalized, privately owned electricity generation companies would exert strong pressure on British Coal to reduce its prices toward international price levels. In similar circumstances, however, a publicly owned generating board is likely to pursue exactly the same policy (the CEGB has already demonstrated its desire to move in this direction). Other things being equal, therefore, the net effect of privatization on the demand for domestically produced coal could well turn out to be positive. Perhaps, then, it is the National Union of Mineworkers and antinuclear environmentalists—rather than a strongly pronuclear government—who should be the strongest advocates of a change of ownership of the ESI!

9.4 The Oil Industry

In terms of both the number of share flotations and the net proceeds realized from the sales, between 1979 and 1987 disposals of oil assets accounted for a larger fraction of the privatization program than any other single industry. The sale of British Petroleum shares in 1979 was the first of the major flotations of this period, and the 1987 disposal of the residual 31.5 percent Government stake in that company (together with the associated rights issue) was at the time the largest ever equity offering on any of the world's stock markets. Substantial proceeds were also obtained from the privatizations of Britoil and Enterprise Oil (see section 7.1).

In this section we will first set out some background information on the development of the U.K. offshore oil industry (in section 9.4.1), before going on to examine public policy toward the industry in general (in section 9.4.2), including the growth of public ownership during the 1970s, and the later privatization policies in particular (in section 9.4.3). Finally, section 9.4.4 comprises our assessment of the contribution of oil privatization to the attainment of the Government's objectives and an account of the key role played by oil asset sales in the evolution of the privatization program.

9.4.1 Historical Background

Public ownership of parts of the oil industry dates from before the outbreak of the First World War, when the U.K. Government took a controlling interest in British Petroleum (BP) with the purpose of promoting greater security of supply of oil, principally for the Navy. Domestic production of oil has, however, only occurred on a significant scale since the mid-1970s, the first reserves of oil in U.K. waters having been discovered in 1969. We will therefore restrict our attention to this relatively recent period.

The early development of the U.K. offshore industry was stimulated by two factors: the Gröningen gas discovery in the northern Netherlands at the end of the 1950s, which increased the perceived likelihood of the existence of substantial reserves of oil and gas below the North Sea, and the 1958 Continental Shelf Convention. Once ratified by a sufficient number of nations, the latter enabled governments to settle international boundaries, extend national petroleum legislation to offshore areas, and issue petroleum exploration and production licenses.

In Britain, the first round of licensing took place in 1964. The U.K. sector of the North Sea was divided into quadrants of one degree latitude and longitude, each of which was subdivided into thirty blocks of approximately 10 km × 20 km. The Department of Energy invited companies, either individually or as consortia, to apply for the right to explore the designated blocks, and 348 such blocks were initially allocated. Since 1964, there has been a succession of licensing rounds and, for the most part, rights have been awarded on a discretionary basis whereby applicants are judged on factors such as technical competence, financial standing, operational record, and proposed exploration programs. On a few occasions, however, a small proportion of the available blocks has been allocated by means of an auction.

The earliest UKCS discoveries, starting in 1965, were of gas fields but, between 1969 and 1974, 18 oil fields were found in the U.K. sector, and the recoverable reserves from these deposits eventually allowed Britain to become self-sufficient in oil. The first oil to come ashore was from the Argyll field, in June 1975, to be quickly followed by oil from the large Forties field in December of that year. By the end of 1980, a total of 15 fields was on stream, producing about 1.6 million barrels of oil per day.

By the end of 1985 over 1,000 exploration wells had been drilled in the U.K. sector, leading to over 200 significant discoveries of oil and/or gas. Thirty offshore oil fields were in operation, and the production level had reached 2.65 million barrels of oil a day. However, by the mid-1980s, it was believed, possibly prematurely, that most of the major oil fields in the "mature" areas of the North Sea (the Central and Northern North Sea Basins and the East Shetlands Basin) had already been discovered. In their exploration activities, therefore, oil companies have been turning increasingly to the "frontier" areas of the UKCS, where water depths are frequently greater, and to the development of improved technologies for extracting oil from smaller marginal fields.

9.4.2 Public Policy and Public Ownership

Public policy towards the offshore oil industry in the 1970s appears to have had two principal objectives: first to secure financial returns for the Exchequer, and second to exert some control over the production companies with respect to matters such as the rate at which new fields were brought on stream, the subsequent output (and, hence, depletion) rates, and the destination of the final output (security of supply having become an important policy consideration in the wake of disruptions in the international market in 1973). In pursuit of the first objective, the Government relied largely on fiscal policy in the form of a system of taxation uniquely applicable to the offshore industry and designed, among other things, to recover rents accruing from the rights granted to companies to exploit the oil and gas fields.

In brief, the offshore tax regime has comprised three main elements:

(i) a royalty levied at a rate of 12.5 percent of the value of deliveries of oil;

(ii) petroleum revenue tax (PRT), initially set at 45 percent in 1975 and increased in stages to 75 percent in 1983, which is charged on the revenues less expenses (including royalties) arising from offshore production;

(iii) corporation tax, charged in the standard way but with royalties and PRT counting as allowable deductions.

The oil taxation regime also contains a large number of special provisions that need not detain us here. The main point to note is simply that the Government has generally sought to obtain rents from the industry only after the oil and gas have been landed. That is, unlike in the United States, auctioning of natural resource rights has not been a preferred method of raising revenue. This approach has been popular with the offshore producers because it both delays rental payments and transfers some of the exploration risk to Government.

With respect to Government control over exploration, production, and sales, the years since the first licensing round in 1964 can usefully be divided into three periods. From 1964 to 1974 rapid expansion of exploration activity was encouraged, and a total of 863 blocks were allocated in four rounds of licensing. Between 1974 and 1979, a period of Labour Government, the exploration process was restrained, and only 86 blocks were allocated in two rounds (1977 and 1978). The mid-1970s also saw the introduction of two major pieces of legislation: the Oil Taxation Act 1975, which established PRT, and the Submarine Pipelines Act 1975, which, among other things, introduced depletion controls to enable the Government to cut back production from developed fields if it so wished

and conferred powers to set up the British National Oil Corporation (see below). The third period, which commenced in 1979, has been characterized by a withdrawal of the Government from direct involvement in exploration and production activities and, particularly since 1983, the introduction of tax concessions for new fields, designed to increase the level of exploration.

Public ownership in the offshore oil industry has occurred in three ways:

(i) through the Government's equity stake in BP, one of the leading North Sea exploration/production companies;

(ii) through the stakes in oilfields held by the BGC and the National Coal Board;

(iii) through the holdings of the British National Oil Corporation (BNOC).

In each case, ownership has (a) supplemented the Government's tax returns from the offshore industry and (b) provided a means by which, in theory, it could influence the development of the industry. Only in the case of BNOC, however, was public ownership specifically established for these purposes.

In creating BNOC, it was the then Labour Government's intention that it (BNOC) should take a 51 percent stake in all North Sea oil developments. BNOC had an initial capital of £600 million and was required to pay all its revenues into a new account, called the National Oil Account, into which the royalties due from private sector offshore activities were also to be paid. BNOC was allowed to draw on this account to finance its activities, and was given a number of other advantages relative to private sector companies, including exemption from PRT.

In the event, because of anxieties that nationalization of 51 percent of the oil industry would seriously weaken the incentives for private sector exploration and development activities and anxieties about the financial burden on the Exchequer implied by a commitment to meet 51 percent of the development costs of all new fields, BNOC's original objective was watered down. Existing North Sea operators were required to conclude agreements with BNOC that gave the latter rights to participate in the developments (but not necessarily an ownership stake) and to purchase 51 percent of the resulting output at market prices. The right of purchase was justified in terms of the national interest in obtaining secure supplies of oil.

Nevertheless, despite this backtracking by the Government, BNOC did acquire substantial North Sea interests during the second half of the 1970s, and both retained and augmented many of its original privileges. In 1975 BNOC obtained the oil interests of the National Coal Board under the provisions of the Petroleum and Submarine Pipelines Act, and purchased

16 percent and 20 percent stakes respectively in the Thistle and Ninian fields from the financially distressed Burmah Oil Company. By June 1976 it had acquired stakes in the Hutton, Dunlin, Murchison, and Brae fields, and was later given a 51 percent stake in the 86 blocks allocated in the fifth and sixth licensing rounds. Finally, in 1978, BNOC's privileges were further extended when it was given first right of refusal to buy stakes in blocks awarded to private companies in earlier licensing rounds whenever such stakes came on to the market.

By 1979, then, the activities of BNOC comprised two quite distinct types of operation. BNOC had quickly become a substantial exploration/development/production enterprise in its own right. In addition, however, it was also a major oil-trading enterprise, buying oil from other producers under the terms set out in the various participation agreements that had been concluded, and selling the product on into competitive markets.

9.4.3 Privatization in the Oil Industry

In opposition, the Conservative Party had declared its intention to dispose of assets acquired by BNOC during the 1970s. The return of a Conservative Government in 1979, however, coincided with a period of both rapidly rising oil prices and increasing anxieties about security of supply, stimulated largely by unfolding political developments in Iran. It was decided, therefore, that in the short term at least BNOC should remain in business as both a production and trading operation. The immediate changes in public policy were consequently rather modest. The Government placed a fraction of its equity stake in BP on the market in October 1979, following the precedent set by the Labour Government in 1977, to raise finance for its expenditure programs (net receipts totalled £276 million). In addition, an emergency program was introduced that included taking royalties from the private sector in oil rather than in cash, suspending restrictions on gas flaring (which served to limit production in some fields), organizing a new more extensive licensing round to encourage further exploration, and ordering companies to cut their exports from the U.K.

Although BNOC was retained, the Secretary of State for Energy announced in 1979 that it was to be stripped of a number of its powers. Henceforth, for example, it would have no right to sit on an operating committee in the industry if it had no ownership interest in the relevant field, it would lose its privileged position in the licensing rounds, and it would lose its special access to the National Oil Account (see Redwood, 1984). Partially to compensate for the loss in Government revenues

associated with deferral of asset sales, about £610 million of BNOC oil was sold forward in 1979–1980 for the short-term benefit of the public account (an exercise that was repeated in 1980–1981). Proposals to issue an oil revenue bond, with interest payments linked to BNOC's performance, were also considered.

Throughout this period, however, there was no abandonment of the earlier plans to dispose of BNOC's North Sea assets. By 1981, conditions in international oil markets were more settled, and the higher prices that were then prevailing had the advantage of making BNOC a very profitable enterprise that would be attractive to private investors. Moreover, the gradual expansion in the scope of the Government's privatization program led to the development of more ambitious plans for asset sales in the offshore industry. Thus, when the pre-privatization policy measures eventually arrived, they encompassed the oil interests of the BGC as well as those of BNOC.

In August 1982, the production assets of BNOC were transferred to a new company, Britoil (leaving the trading interests of the BNOC still in place), and in November 1982 51 percent of the shares in Britoil were sold to the public, yielding net proceeds of £536 million to the Exchequer. At that time, the share issue was, by a substantial margin, the largest undertaken as part of the privatization program. Further sales of offshore interests then followed in quick succession. The year 1983 saw the disposal of additional Government shares in BP (generating net proceeds of £556 million), and the establishment of Enterprise Oil, the company formed from the oil interests of the BGC under the terms of the 1982 Oil and Gas (Enterprise) Act. In June 1984 Enterprise Oil was sold, yielding net proceeds of £381 million, and, later in the same year, disposal of BGC's interests in the (onshore) Wytch Farm oil field produced a further £82 million. In August 1985, £450 million (gross) was obtained from the sale of the remaining 49 percent Government holding in Britoil, and, finally, the sale of the residual Government stake in BP in 1987 yielded £5,725 million (gross).

As noted above, the creation of Britoil did not involve the simultaneous winding up of the trading activities of BNOC, and, up until 1985, BNOC continued to buy and sell oil and to exercise its influence over North Sea developments through those of its powers, afforded by the various participation agreements, that remained. In 1985 this residual form of direct Government intervention in the marketplace was ended by the abolition of BNOC and its replacement by the Oil and Pipelines Agency (OPA). The function of the OPA is to administer the Government's pipeline and storage system and the disposal of royalty in kind, and to maintain emergency lifting arrangements which become effective in the event of a threat to the U.K.'s oil supplies. Thus, although the disposal of royalty in kind necessitates the continuation of some Government trading activities, the intention was, and still is, that these will be conducted at a relatively low level compared with the scale of operations of BNOC.

9.4.4 Assessment

Initial plans to dispose of North Sea assets, formulated during the period between 1974 and 1979 when the Conservative Party was in opposition, appear to have been strongly motivated by the view that the public ownership of stakes in offshore exploration, development, and production activities was inimical to the efficient development of the industry. Thus it was argued that public corporations would be inefficient in their own operations and would impede the activities of private producers in a competitive market. In support of the case against public ownership, it can also be argued that such ownership was not and is not a necessary condition for the exercise of general control over the initial build-up and later decline in offshore operations. Thus, rates of exploration, development, production, and depletion can be influenced by Government control over licensing round allocations, the tax regime, and the regulatory framework surrounding the industry. In particular, for example, in emergency any government can take powers to force private companies to obtain and move oil in ways that serve to protect national supplies.

Given that UKCS producers have little influence on international oil prices, there are few grounds for concern that privatization of oil assets has led, or will lead, to abuse of market power in the final product market. Nor in examples such as those of BP and Enterprise Oil are there reasons to oppose privatization on regulatory policy grounds: in neither case was public ownership of the relevant assets a major factor in the development of public policy towards the industry. In these cases, then, the decisive factor should indeed be the likely effects of ownership on internal efficiency, and the case for privatization is consequently a strong one (although we are doubtful that the resulting gains will be particularly large: BP, for example, was already a quoted company operating at arm's length from the Government).

The situation with respect to BNOC, however, was rather different in that BNOC was specifically designed to be an instrument of regulatory policy. In assessing the privatization of BNOC, it should first be noted that, as in other examples of economic regulation, the relationships between the

Government and UKCS producers can be viewed as giving rise to a particular set of agency problems. In its dealings with the oil industry, the Government's objectives have included the appropriation of rents associated with the valuable natural resources in the UKCS and the achievement of production plans that are consistent with balance of payments goals and with the maintenance of secure supplies. As in all agency problems, however, the attainment of these objectives depends heavily upon the quality of information that is available to the Government. Thus, one argument in favor of some public ownership of the industry is that the nationalized enterprise(s) can be used both to gather policy-relevant information and to impede strategic manipulation of information flows by colluding private producers.

On this view, perhaps the most useful function of BNOC was to improve the efficacy of the regulatory process by acting as the "eyes and ears" of the Government in the offshore industry. Hence, even if the public corporation was not efficiently managed and did, through its operations, make life more difficult for private producers, these points do not, by themselves, constitute a decisive case against state ownership: any detriments have to be set against the potential information gains. Moreover, given the large magnitudes of the rents associated with UKCS oil reserves, the fact that many North Sea operators are foreign owned, and the importance of oil as a primary fuel input, the economic value of additional information to the U.K. Government is likely to be substantial. We conclude, therefore, that the detriments of public ownership would need to be demonstrably high before it could safely be concluded that public ownership of some parts of the offshore industry was unmerited.

Perhaps the best epitaph for BNOC has been supplied by Redwood (1984), who has been one of its strongest critics. In his assessment, Redwood concludes that BNOC "made no net positive contribution at all to the development of the North Sea," but he also states that

> "... BNOC carried out the task to which it was appointed by the Labour Government with distinction and verve. It did get its hands on assets; it did, in the end, attract staff from various quarters who were able to make their contribution to North Sea development. Its asset position was strong. It did in the end enable the Conservative administration to sell off shares at a very good price."

In the light of this performance record and because of the high value of oil industry information to Government, we would be more reluctant than Redwood to conclude that BNOC made no net positive contribution to public policy. More to the point, we conclude that it is unlikely that privatization of BNOC has made, or will make, significant positive contributions to the better conduct of regulatory policy towards the industry.

This, however, is not the whole story. Although the impetus for plans to wind up BNOC may have had their origins in particular views about regulatory and industrial policies, following the election of the Conservative Government in 1979 the emphasis rapidly shifted towards the contribution that asset sales could make towards the financial objectives of the Government. Thus, the disposal of shares in BP, the forward sales of BNOC oil, the creation and sale of Enterprise Oil, and the sale of the BGC stake in Wytch Farm can all be interpreted as decisions motivated chiefly by the desire of the Government to reduce the public sector borrowing requirement (PSBR), a motivation that is most clearly revealed in the case of the forward sales of BNOC oil.

Nevertheless, from a wider perspective, it is possible that the oil privatizations have had important *indirect* effects on the conduct of microeconomic policy, and that their historical significance is far greater than our narrowly focused evaluation would imply. Thus the oil asset sales served as a link between the earlier policies of the 1974–1979 Labour Government and the major privatizations of the utility industries that commenced in 1984 with the sale of BT. The initial disposal of BP shares in 1979 followed the precedent set by the Labour Government in 1977, and, as with the development of many other aspects of economic policy (including the use of monetary targets and the introduction of cash limits for nationalized industries), represented a continuation and extension of pre-existing approaches rather than a radical break with what had gone before. Likewise, the forward sale of BNOC oil was a relatively small incremental change, but it led fairly easily towards the notion of privatization which, in the case of Britoil, might be seen as the ultimate forward sale.

Prior to privatization, and again motivated by the objective of reducing the PSBR, the Government toyed with the idea of introducing a BNOC oil revenue bond, the returns on which would be linked to the Corporation's performance. A similar option was considered for the then publicly owned BT, the activities of which were also causing concern because of the level of borrowing entailed by its substantial investment program. The facts that, in the end, privatization of BNOC appeared preferable and that, even in difficult market conditions arising from falling oil prices, a large share issue was managed with reasonable success almost certainly gave some encouragement to the Government to pursue a similar course in the telecommunications industry. Thus, while privatization of BT was indeed a radical departure from the earlier policy tradition, the path towards it was smoothed, and no doubt made to appear less daunting, by the history of oil asset sales.

9.5 The Coal Industry

The coal industry is the only part of the energy sector which, by the end of 1987, had been left untouched by actual or proposed privatization policies. However, there is every reason to believe that the Government is attracted by the prospect of at least partial privatization of the industry at some future date. To complete our discussion of the energy sector, therefore, in this section we consider some of the options that are available to the Government with respect to the conduct of policy towards the industry. We start (in section 9.5.1) with an outline of the rationale for the creation of the National Coal Board (NCB) in 1946 and an analysis of some of the general characteristics of the NCB's subsequent behavior. (In 1987 the NCB was renamed the British Coal Corporation but, for convenience and to avoid possible confusion, we will use the older title throughout the discussions.) This is followed (in section 9.5.2) by an outline of major policy developments in the period since 1946. Finally, we consider the prospects for implementing policies of liberalization and privatization in the industry (section 9.5.3).

9.5.1 Coal Nationalization

The British coal industry was taken into public ownership in 1946. Before nationalization the structure of the industry was atomistic: production was undertaken by a large number of relatively small private companies. However, since cost conditions are far removed from those that characterize a natural monopoly, for the most part the case put forward for nationalization was not based upon perceived economies of scale resulting from increased concentration. Rather, the principal motive for the introduction of public ownership was to provide an institutional structure conducive to the implementation of the Government's policies for an industry that had suffered a substantial decline in its fortunes.

The production of coal in Britain peaked in 1913 at a figure of 292 million tonnes per annum. During the interwar years the industry was in steady decline so that, by the mid-1940s, output had fallen to around 190 million tonnes per annum. The drop was almost entirely attributable to losses in export markets, as domestic consumption of coal had remained roughly constant over the period. Partly as a consequence of depressed market conditions, there was little investment in the industry and the capital stock became gradually more dilapidated. According to Robson (1960): "Poor leadership, conservative management, backward technology and inadequate investment characterized the British coal industry during the twenty-five or thirty years prior to nationalization."

The output fall which resulted from the loss of international markets placed strong downward pressures on the the wages of mineworkers during the interwar period, leading to embittered labor relations that culminated in the major national strike of 1926, an event of great political and economic significance in British twentieth century history. One of the policy responses to these problems was the Coal Mines Act of 1930, introduced by the Labour Government of the time to create a "distress cartel" in the industry. Among other things, the Act fixed a maximum permitted output for the country as a whole, and established procedures for allocating quotas to individual collieries and for penalizing deviants. Firms were allowed to trade in production rights but, since quotas were fixed on a quarterly basis, there were strong incentives for less efficient mines to be kept open so as to maintain their commercially valuable allocations.

One aim of the 1930 legislation was to hold up the price of coal and thereby alleviate the pressure on mineworkers' wage rates. However, cartelization exacerbated the longer-term problems of the industry by delaying the exit of uneconomic capacity and reducing the incentives for new investment in the more efficient coal mines. By the mid-1940s, therefore, the Government faced a choice among three major policy options: (a) continued state intervention to support prices in a privately owned industry, (b) deregulation to allow market forces to impose the required structural adjustments, and (c) nationalization. The first option would have delayed the "modernization" of the industry, while the second would have opened up major conflicts in the labor market. The Attlee Government therefore had no hesitation in choosing nationalization, by which means it hoped to be able to combine a program of new investment with continued support of mineworkers' wages. At that time, given the difficulties faced by the industry, the move was not particularly controversial: the Conservative opposition did not resist nationalization with any vigor.

Transfer of the coal industry to the public sector was accomplished by the Coal Industry Nationalisation Act of 1946. This established the NCB as a monopoly supplier in Britain, and the relevant statute contains one of the most famous phrases in the legislative history of the nationalized industries: the NCB was given the duty of "... working and getting the coal

in Great Britain, to the exclusion (save as in this Act provided) of any other person." A further provision of the Act required the NCB to supply coal "at such prices as may seem to it best calculated to further the public interest in all respects." However, as in the statutes of the other major public corporations, the legislation placed restrictions on pricing policy in the form of a break-even constraint: the NCB was required to operate "so that its revenues shall not be less than sufficient to meet its outgoings properly chargeable to revenue account (including interest) on an average of good and bad years."

Given the political background to coal nationalization, in the years following 1946 the NCB appears to have interpreted the public interest guideline with respect to pricing policy as meaning that, as one of its aims, it should seek to promote as favorable a trade-off as possible between miners' wage rates and employment in the industry. Thus it would not be wholly inaccurate to characterize the Board's pricing/output objective as the maximization of output subject to the break-even constraint, and the consequences of this policy are illustrated in figure 9.1.

In the diagram, MC is the industry's marginal cost curve at a given wage rate. The marginal cost curve is drawn with an upward slope because of the existence of disparities in the costs of production among mines (which in turn are the result of, for example, site-to-site variations in geological conditions). The curve DD′ shows the demand curve for the NCB's output. Equilibrium price p and output q are determined by the condition that the shaded area between the price line and the marginal cost curve to the left of

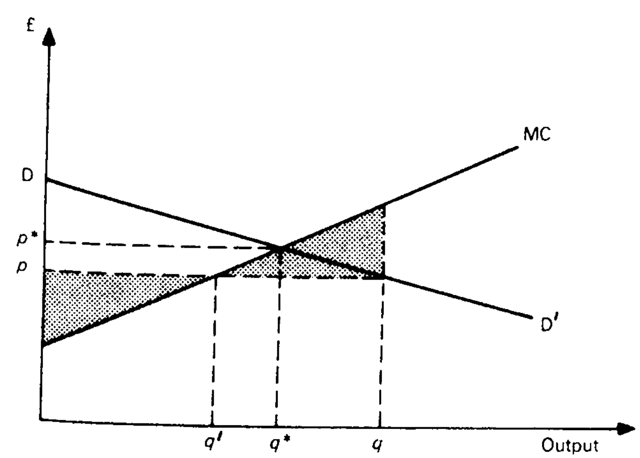

Figure 9.1 Output determination in the coal industry

point q' is equal to the equivalent shaded area to the right of point q' (the break-even constraint). Thus, relative to the allocatively efficient equilibrium, shown by (p^*, q^*) and characterized by the equality of price and marginal cost, price is lower and output is higher.

Changes in wage rates will shift the marginal cost curve and hence influence the equilibrium levels of price, output, and employment. However, at any given wage rate, employment is higher than in the case of marginal cost pricing, so that the National Union of Mineworkers (NUM) is presented with a more favorable trade-off between wages and employment in its bargaining with the NCB. In other words, the derived demand curve for labor is shifted outwards, as illustrated in figure 9.2, which shows wage/employment equilibria for union preferences that are represented by indifference curves linking the two variables.

In economic terms, what has happened in the industry is that the rents available from production at low cost sites have been used to subsidize high cost capacity. It is not necessarily the case, however, that the rents have been fully dissipated by the maintenance of this high cost capacity. As figure 9.2 shows, it is likely that part of the rents have been captured by workers in the form of higher wages. An underlying cause of this outcome has been the failure of Governments to impose any charges or compensatory taxes on the NCB in return for its rights to extract coal: the 1946 Act simply allocated ownership rights in all deposits to the Board.

Returning to the diagrams, it should immediately be apparent that the

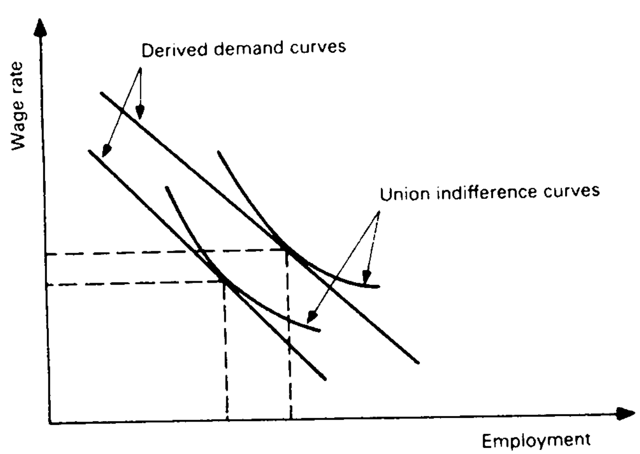

Figure 9.2 Wage and employment determination

NUM stands to benefit from any outward shift in the demand curve or loosening of the break-even constraint. To the extent that NCB managers prefer higher to lower output and obtain benefits from the quieter life associated with the satisfaction of workers' interests, they too will stand to gain from such changes. What the diagrams do not capture is the ability of the NCB and NUM to influence public policy in ways that ease the pressure of the demand and financial constraints confronting the industry, but we will return to this point in the discussion below.

9.5.2 Policy Developments since 1946

Following nationalization, coal output in Britain increased to a postwar peak in the mid-1950s. Thereafter output declined rapidly until the early 1970s and more slowly in the period up to the year-long miners' strike in 1984–1985 (see table 9.7). The first part of the fall is largely attributable to the drop in home consumption of coal caused by the availability first of relatively low priced oil and later of natural gas (which not only competed with coal in markets for final consumers but also eliminated the derived demand for coal arising from the production of town gas). The oil price shock of 1973 helped restore coal's competitive position but, although the NCB was subsequently able significantly to slow the rate of decrease in its share of the domestic energy market, falling energy demand meant that output continued to decline, albeit at a slower pace than before.

The response of successive Governments to these trends in energy markets was to continue and extend the protection afforded to the domestic coal industry. As already explained, the NCB was protected against

Table 9.7 Output from NCB mines

Year	Output (million tonnes)
1947	187.5
1950	205.6
1955	211.3
1960	186.8
1965–1966	177.0
1970–1971	135.5
1975–1976	114.5
1980–1981	110.3
1981–1982	108.9
1982–1983	104.9
1983–1984	90.1
1984–1985	27.6
1985–1986	88.4
1986–1987	99.0

Source: *British Coal Corporation, Annual Report and Accounts* (1987).

competition from other domestic coal producers by the monopoly position established for it by the 1946 Act. A small private sector did survive, but has, in effect, been regulated by the public corporation. At the time of nationalization there were about 1,400 collieries in Britain, and the NCB granted licenses to nearly 500 of the smallest (i.e. those having no more than 30 workers underground) to continue in private production. Similarly, while the production of opencast (strip-mined) coal has remained in the private sector, the NCB's property rights in coal reserves give the public corporation overall control of the operations. On larger sites the private producers act as contractors for the NCB; on smaller sites they are licensed by the NCB to produce *and* sell the coal. As in the case of deep-mined coal, however, the private licensees must pay royalties to the NCB, the levels of which are wholly at the discretion of the latter. In 1986–1987, opencast mines had an output of 13.3 million tonnes and licensed mines contributed a further 2.0 million tonnes.

Since it rapidly became clear that this monopoly position would fail to protect the NCB against further substantial declines in output and employment, the period since 1946 has witnessed a series of supplementary policy measures designed to afford additional support to the domestic industry. Steps to increase the demand for domestically produced coal have included the following.

(i) Government pressure on the publicly owned electricity industry—which is by far the largest customer of the NCB—to purchase more coal from the NCB. (NCB sales to the CEGB and SSEB totalled 79.5 million tonnes in 1986–1987.) This has been done in two ways. First, at various times ministers have used their powers to influence the CEGB's investment program towards greater reliance upon, and earlier construction of, coal-fired generating stations. Second, the CEGB has been discouraged from purchasing a greater fraction of its coal inputs from lower-cost overseas suppliers. Thus, for example, in response to a threatened coalminers' strike in 1981, the Government "persuaded" the CEGB to limit its imports of coal to around 3 to 4 million tonnes per annum, against a backgound of an import level of about 7.5 million tonnes in 1980 and of CEGB plans to build one or more terminals to increase its import capacity to something of the order of 15 million tonnes per annum (Robinson and Marshall, 1988). Thereafter, under the terms of the revised joint understanding (between the CEGB and the NCB) which was to run for a period from 1983 to 1987, the CEGB undertook to purchase at least 95 percent of its estimated coal requirements from the NCB (Boyfield, 1985).

(ii) Specific taxation of fuel oil, a substitute product that had become increasingly price competitive during the 1950s and 1960s.

(iii) Government grants to firms that convert to coal from oil and gas.

Support for the domestic coal industry has also been forthcoming in the form of a variety of supply-side policies. These have included the ready provision of finance for major investment programs, even when the latter have been based on highly optimistic demand projections, and the provision of various types of subsidy, including the implicit subsidies contained in relatively undemanding financial targets. The best example of the supply-side approach is the *Plan for Coal*, drawn up in 1974 following the oil price hike of 1973, the coalminers' strike of 1973–1974, and the arrival of a new Labour Government.

The *Plan for Coal* set various targets for investment, capacity, and output over the ten-year period from 1975 to 1985. It was estimated that total home energy demand would reach 400 million tonnes per annum of coal equivalent in 1983, and that, of this total, the NCB's deep mines would account for 120 million tonnes. Accordingly, to offset closures of older collieries, estimated to run at an average of 4 million tonnes of capacity a year, a major investment program to develop new capacity was set in place. At the same time, it was projected that labor productivity would grow at a rate of 4 percent per annum.

The outcome was that, by 1983, the last full year before the statistics became distorted by the 1984–1985 strike, domestic energy demand was only 330 million tonnes of coal equivalent per annum (17.5 percent below the forecast), of which, despite the effect of CEGB purchasing policy, NCB deep mines contributed about 100 million tonnes (16.7 percent below forecast). Although real investment expenditures were well in excess of those called for in the *Plan*—£6.5 billion in 1983 prices, against a projection of approximately £4.4 billion—the targets for capacity expansion were not met. Closure of older capacity averaged only about 1.7 million tonnes per annum, and, partly as a consequence of this, labor productivity growth averaged around 2 percent per annum (see Boyfield, 1985).

In recent years, mostly as a consequence of the combination of overinvestment in new capacity and the relatively slow rate of closure of inefficient collieries, the NCB's continued viability has depended upon large injections of Government finance. In 1983–1984, for example, operating losses were covered by subsidies, known as deficit grants, amounting to £875 million. There were also separate social grants, totalling £459 million, intended to help in meeting costs incurred in closing

Table 9.8 NCB financial results, 1985-1986 and 1986-1987 (£ million)

	1985-1986	1986-1987
Turnover	5,340	4,515
Other income	4	1
Operating costs (net)	(4,719)	(4,147)
Operating profit	625	369
Interest charges	(437)	(386)
Social costs	(691)	(798)
Terminal depreciation	(66)	(62)
Tax	(1)	(0)
Extraordinary items	(0)	(12)
Minority interests	(1)	(0)
Profit (loss) after tax, interest, and restructuring costs	(571)	(889)
Grants		
Social grants	513	594
Readaptation grants	8	7
Deficit grants	50	288
	571	889

Source: *British Coal Corporation, Annual Report and Accounts* (1987).
A £342 million strike recovery provision has been deducted from operating costs in 1985-1986. All figures are on a historical cost basis.

uneconomic capacity, encouraging the movement of miners from one colliery or coalfield to another, and improving the pension benefits of miners willing to accept voluntary redundancies. The total level of explicit subsidy was therefore £1.334 billion. More recent figures are shown in table 9.8. Thus, in 1985–1986 and 1986–1987 social grants plus deficit grants amounted to £563 million and £882 million respectively, although the former figure is slightly distorted by the carry-forward from the previous financial year of £342 million provision for strike recovery costs.

The 1984–1985 miners' strike was principally a conflict about the rate of closure of older less efficient collieries, with the NUM resisting the plans of the NCB's new chairman, Ian MacGregor, to improve the financial position by reducing the "tail" of highly unprofitable mines. After a year-long and very bitter struggle, the NUM lost the battle, and closures have since proceeded at a more rapid rate. In the short run the strike imposed severe financial costs on the Exchequer. The NCB's deficit rose to £2.225 billion in 1984–1985, and there was also a sharp deterioration in the financial positions of the nationalized electricity and steel industries. This deficit forced the enactment of the Coal Industry Act 1985 which allowed

the Government to fund NCB losses up to a total of £2 billion and provided additional finance to compensate redundant miners and to defray the costs of colliery closures.

In the longer term, the accelerated rate of closure of higher-cost capacity can be expected to lead to some improvement in the finances of the NCB as unit costs are reduced. However, the NCB still has ambitious programs for the development of new larger collieries on greenfield sites with substantial relatively accessible reserves. If the NCB is to remain in public ownership, therefore, there will continue to be substantial calls on the Exchequer for funds to finance these developments.

9.5.3 Prospects for Liberalization and Privatization

Since coal is an internationally traded commodity and since the industry is not, in any case, a natural monopoly, there is considerable scope for increasing competition in the U.K. market. This could be achieved in the context either of public ownership or of full or partial private ownership. We will therefore first assess the measures that might be taken to promote greater competition, together with the likely consequences of those measures, before going on to consider the ownership question.

The simplest, and probably the most powerful, pro-competitive policy change that could be implemented would be to lift the implicit limitations on imports, thereby substantially reducing barriers to entry into the U.K. market. In practical terms, the most important effect of such a move would be that the CEGB would be free to obtain its coal from the cheapest source, which in turn would remove one of the sources of distorted electricity prices (see section 9.3.2). More generally, U.K. coal prices would be driven down towards levels prevailing on international markets. Although the average production cost of NCB deep-mined coal is substantially above that of major exporting countries such as the United States, Australia, and South Africa, a free-trading policy would not lead to the swift demise of the domestic industry, for two reasons. First, transport costs, particularly to inland sites, give the NCB an offsetting cost advantage in delivering coal to domestic power stations, many of which were built in or around the coalfields precisely so as to minimize these costs. Second, there are wide intercolliery variations in unit production costs, so that many mines could continue to operate profitably at the lower prices. Moreover, the great majority of the larger coal-fired power stations are located close to the lower-cost coalfields, particularly in the Midlands and parts of Yorkshire, so that the two factors tend to reinforce one another. For these reasons, Robinson and Marshall (1988) estimate that the level of imports would be unlikely to exceed 20 million tonnes per annum for at least a decade (imports amounted to 12.1 million tonnes and 9.9 million tonnes in 1985–1986 and 1986–1987 respectively).

In the absence of increased subsidies, however, the fall in selling prices induced by liberalization would increase the speed at which higher-cost uncompetitive mines were closed, leading to a more rapid contraction in output and employment. Given lower labor productivity in these mines, the consequences would be substantially greater for employment than for output. At this stage the Government would, as now, be faced with choices concerning the level of subsidies and grants. Unfortunately, the social costs of a rapid contraction in employment are likely to be high (which is a major reason why successive Governments have chosen to support the industry). Employment in the industry is concentrated in villages and small towns away from the main urban centers and in regions of the country where unemployment has tended to be higher than the national average. In many cases, therefore, redundant mineworkers face poor prospects of finding alternative jobs. Put another way, the resource cost of labor (i.e. other outputs foregone) is lower than the wage rate.

On balance, we favor liberalization because it would make the trade-off between the social costs and benefits of support more explicit than is currently the case (and thereby facilitate more informed decision making) and would avoid unnecessary allocative inefficiencies in the fuel choices of the industry's customers. This position is, however, conditional upon liberalization being accompanied by policies designed to correct distortions between private and social costs. Resource costs of labor that are below existing wage rates provide a justification for employment subsidies in the short to medium term, while the distributional effects of contraction call for the continuation of redundancy payment schemes in those cases where efficiency considerations do, nevertheless, point to colliery closures. Above all, public policy in this area should be based upon calculations of the avoidable social costs of production, rather than on the often arbitrary financial costs appearing in the NCB's internal accounts.

Turning to domestic competition in the industry, there appears to be little case for the preservation of a system in which the NCB can effectively control the activities of its potential rivals. In particular the limitations on the sizes of private licensed producers of both deep-mined and opencast coal should be abolished. The MMC (1983b) recommended that the limit on the size of reserves that can be worked by private opencast operators be raised to 100,000 tonnes (from the 50,000 tonne figure established in 1981, which in turn represented an increase on the previous 35,000 tonne limit), but, since environmental effects can be taken into account on a case-by-case basis, it is difficult to see the case for any *general* limit.

Unfortunately, such measures are unlikely to have much effect on competition if the NCB retains its monopoly control over the issuing of licenses and the setting of royalty levels since it can use these instruments to restrict competition. This point goes to the heart of the liberalization issue. At present the NCB is accorded a regulatory role that is inconsistent with the development of fair competition between it and rival producers. Thus, whether or not the NCB is eventually to be privatized, we would advocate that it be stripped of these powers by removing its property rights over unworked coal reserves.

One solution to the problem would be to vest the property rights in the Crown, as is done in the case of oil and gas reserves. The regulatory function would then be restored to the state, which would allocate rights to work the coal and, in the process, set taxes, royalties, working obligations, and environmental constraints. In this framework, the NCB would compete on equal terms with any other firm wishing to exploit coal reserves, whether by deep-mining or strip-mining methods. Royalties and taxes would accrue directly to the state, which would derive additional revenues if, as would be preferable, the rights were allocated by auction rather than by discretionary methods.

By freeing existing producers from direct control by the NCB, these changes in the licensing system would immediately increase domestic competition. Opencast mining currently accounts for about 13–14 million tonnes of output and, adding in the small amount of privately produced deep-mined coal, the competing private sector would account for around 13 percent of domestic consumption of the commodity. In the longer term, private producers could compete with the NCB for the development of the substantial unworked reserves that are known to exist in the U.K. and, as the NCB closes its higher cost capacity, could be expected to achieve a growing market share. Such competition also leaves open the possibility of joint ventures between the NCB and private companies, particularly in the exploitation of major reserves, where a combination of the NCB's technical expertise and private sector managerial expertise and finance might sometimes be an attractive proposition.

The remaining question to consider is whether privatization of the NCB, either in its existing form or on a part-by-part basis, would generate significant benefits over and above those likely to emerge from liberalization. Given the existing financial state of the industry and the undoubted hostility of the NUM, there is little prospect that capital markets would view a single flotation of the NCB as an interesting proposition. The figures in table 9.8 illustrate some of the difficulties, but they do not reveal the full extent of the problems. Thus, in 1986–1987, before allowing for social costs of £798 million, the NCB's mining activities had an operating profit of £311 million, of which no less than £244 million was contributed by opencast operations (equivalent to a rate of return on average capital employed in opencast operations of 118.9 percent). Moreover, on a CCA basis operating profit in that year was only £62 million, largely because of the much larger depreciation provisions implied by the CCA method. Finally, none of these figures take account of the implicit subsidy associated with CEGB purchases of coal at prices well in excess of international market levels, which has recently been estimated by the CEGB to amount to about £750 million per annum. The NCB's deep-mining activities are therefore still highly unprofitable at competitive price levels.

While it might technically be feasible to find investors who would place a positive price on NCB shares on the basis of Government promises to continue industrial support for a designated period, there would be consequential moral hazard problems and the danger that the creation of a heavily subsidized private industry would create an unappealing precedent. For these reasons, full privatization is an option that the Government appears to have ruled out within the near future.

In the longer term, if a slimmed-down coal industry can be restored to profitability, a flotation of the public corporation might become a more attractive option. It can be argued that in these circumstances there would be something to be gained—in terms of internal efficiency, improved investment appraisal, and the like—from the introduction of the profit motive. Given that we have earlier argued that, as a general principle, a presumption in favor of private ownership is justified where effective competition exists and where other forms of market failure are insubstantial, and given that a restructured coal industry may eventually satisfy these conditions, we have some sympathy with this view (but see the caveat in the final two paragraphs of this section). It is, however, ironic that it would be necessary for the major problems to be resolved and for the major internal efficiency gains to be attained in the context of public ownership *before* the benefits of private ownership could be realized.

Although the financial position of the NCB as a whole inhibits early flotation as a single entity, the existence of collieries, and even whole coalfields, that are profitable at existing prices, and at least potentially profitable at the prices that would prevail in a more competitive market,

implies that partial privatization is feasible in the shorter term. However, whilst recognizing that the survival of very small privately owned deep mines shows that large scale *may not* be a necessary condition for low cost production, we believe that the creation of an atomistic ownership structure, which would return the industry to its pre-nationalization form, would not be the best option. Although coal production is not a natural monopoly, some economies of scale do appear to exist in areas such as management and research and development. Thus, as the pre-nationalization record shows, a highly fragmented market structure might deliver rather poor performance.

If early privatization were to be favored, therefore, a better alternative would be to transfer collieries to private ownership in blocks, where the size of a single block might be as large as a whole coalfield. High cost mines and coalfields would continue to be publicly owned, but their significance would diminish over time as they were closed at a rate that reflected the Government's evolving perceptions of the balance between social costs and benefits of closure. Coupled with policies of liberalization, this type of approach would lead to the rapid emergence of strong competition in the domestic market, without necessitating the abandonment of significant scale economies.

In practical terms, however, associated with *all* of the ownership transfer options we have considered is an underlying danger that makes it appropriate for us to conclude by sounding a warning note. As pointed out earlier, the proceeds from privatization are higher the greater the degree of monopoly afforded to the newly created company or companies. In the case of coal, preoccupation with this financial point could be particularly significant, not because Government is likely to want to maximize the proceeds from the transaction(s), but rather because the *feasibility* of privatization is dependent upon the creation of profitable companies.

Given that, even in the absence of effective competition, many collieries are unprofitable, if a high priority is given to privatization public policy will be biased towards measures that serve to enhance the industry's financial performance. To the extent that such measures involve policies to reduce unit private costs there are grounds for concern that divergences between private and social costs will be discounted. Moreover, policies that protect the domestic industry from competition also serve to enhance financial performance and therefore increase the prospects that flotation(s) would find favor with the capital market. Thus, as the experience with BT and British Gas demonstrates, preoccupation with ownership transfer might work against the adoption of the most effective policies for regulatory reform and the promotion of competition. We therefore conclude that it is appropriate to give priority to the latter policies. In particular, implicit restrictions on imports should be lifted and the regulatory functions of the NCB with respect to the issuing of licenses and the setting of royalties should be transferred to the state. Only after these issues (together with associated questions concerning appropriate levels of subsidies and grants) have been settled should the issue of privatization be considered.

9.6 Concluding Comments

Evaluation of past and prospective privatizations in the U.K. energy industries raises a wide and disparate set of economic issues. For example, in gas and electricity policy makers are faced with classic natural monopoly problems, in coal the issues center on the problems surrounding an industry in decline, and in oil Governments have been concerned to maximize their revenues from the offshore industry while promoting the rapid development of domestic production to improve the balance of payments position and guarantee secure supplies. Each case, however, illustrates the importance of one or more of the general economic arguments that run throughout our analyses. Thus, as elsewhere, the energy industries demonstrate the crucial roles played by public policies with respect to the encouragement (or discouragement) of competition and the development of appropriate regulatory frameworks, underlying both of which are fundamental questions concerning the links between information, incentives, and economic performance.

Our first general conclusion is that too little has been done to promote increased competition in the gas, electricity, and coal industries. Since 1979 there have been some moves towards liberalization, but these have generally been ineffective. In gas and electricity the intentions of the Oil and Gas (Enterprise) Act and the Energy Act have been thwarted, largely because the legislative provisions left dominant incumbent firms with considerable discretion over terms of access to the distribution networks and did virtually nothing to restrict predatory behavior in the event that, access problems notwithstanding, entry does actually take place. The outcome must therefore be classed as a policy failure. Privatization of British Gas did nothing to remedy this defect and, if anything, has made the position worse by strengthening the incentives of the incumbent firm to deter new entry. Further, opportunities to increase competition in gas by restructuring the industry at the time of privatization were not taken.

In the coal industry case, there is a long record of protectionist measures

designed to insulate the domestic industry from competitive pressures. Over time, these have imposed considerable resource costs on the U.K. economy by delaying the reduction in production capacity. On social cost grounds, the case for policy interventions to smooth the transition to a lower production base is a good one, but the adjustment process, extending over most of the twentieth century, has been unduly protracted. Moreover, the instruments adopted (e.g. the allocation of monopoly rights to the NCB and the restriction of imports) have been inappropriate; it would have been better to allow more competition and to deal with the consequences by direct financial subventions. In section 9.5.3 we set out various means by which competition in domestic markets can be increased. If implemented, these would lead to an increase in private production in the industry, but they do not require that the NCB be privatized. Indeed, to the extent that preoccupation with early privatization would lead to the assignment of a higher priority to measures aimed at increasing the (private) profitability of the industry, it might actually stand in the way of desirable developments in public policy.

Turning to regulatory issues, our judgment is that the framework of control established for British Gas represents, to date, the nadir of the U.K. privatization program. Not only did the Government fail to learn the lessons from the BT case but also regulatory policy appears to have taken a step backward. In pursuing the objective of "regulation with a light hand," the Government has created a private monopolist with even more market power than BT and a regulatory body, Ofgas, with rather less power than Oftel. Thus, for example, the ability of Ofgas to promote competition will be extremely limited and its accounting information will be poor.

A similarly cavalier attitude towards the problem of acquiring better policy-relevant information is also evident in the Government's approach to the oil industry. Although several of the asset sales (e.g. BP, Enterprise Oil, and Wytch Farm) give no substantive grounds for concern about the future conduct of regulatory policy, this conclusion does not hold in the important case of BNOC/Britoil where little weight seems to have been given to the information-gathering role that can be played by a publicly owned offshore operating and trading company.

For the future, the prospects may be a little brighter. There has been no great rush to privatize the electricity and coal industries and, in the former case, the signs are that a thorough appraisal of the policy alternatives, including possible restructuring of the industry, will be conducted before final decisions are made. Such appraisals are particularly to be welcomed since, as we have explained, striking an appropriate balance between competition and regulation is perhaps more difficult in electricity supply than in any of the other industries we have considered.

Unfortunately, however, there remains a variety of pressures against adoption of radical measures to increase competition in, and to strengthen the regulation of, industries such as electricity supply. These include political preferences for speedy privatization to meet Parliamentary timetables and both increase and bring forward the realization of sales proceeds, managerial preferences for the preservation of large organizations with monopoly power, and investor preferences for the flotation of companies with predictable profit streams and observable (past) track records. In the past, when they have come into conflict with policy proposals aimed at establishing greater competition and/or tighter regulation—as they did in the telecommunications and gas cases—these pressures have generally prevailed, and the November 1987 Government announcement of increases in real electricity prices over the next two years is indicative that they are still at work. There is therefore a chance that the prospect of a brighter future may turn out to be a mirage. Indeed, by creating a new interest group (shareholders) that is well disposed to monopoly power and regulation with a light hand, and by strengthening the preferences of Government for these same outcomes (because they facilitate the administrative process accompanying privatization and permit the early realization of *capitalized* monopoly rents), there is a danger that privatization could lead to a less competitive and more poorly regulated industry than the one that might be expected to develop if the current policy approach—based on the rapid and complete transfer of state assets to the private sector—were to be abandoned. Although they have proved elusive in the past, increased competition and improved regulation might, in fact, more readily be achieved in the context of continuing public ownership of a part, but not the whole, of the ESI (and, indeed, of the other energy industries).