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## THE EXCHANGE AND ENFORCEMENT OF PROPERTY RIGHTS\*

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OUR economic system, with its specialization of economic activities into separate ownership and decision units, requires both control over goods and exchange of goods if it is to cope with the diversity of wants of specialist producers. This paper is concerned with the fact that the exchange of goods and the maintenance of control over the use of goods impose costs on traders and owners. It is also concerned with the cost of government alternatives to the market place. We seek to establish both the importance and the wide role of these costs in economic life.

A large part of our argument will be illustrated by two important controversies in welfare economics in which we will show, on the one hand, that zero pricing of scarce goods need not result in inefficiency, and, on the other, that zero pricing of "public" goods may result in inefficiency. The standard criticisms of resource allocation by the market, which turn on the market's failure to price "external" effects and on its tendency to price "public" goods, are shown to be invalid. To do this we extend the well known axiom that there is no such thing as a free scarce good by including such goods as markets, government bureaus, and policing devices.

Throughout this paper, our attention is confined to the problem of efficiency within the framework of smoothly running markets and governments, in the sense that we assume that persons, whether in their capacity as civil servants or as private citizens, do not make arithmetic errors in calculating, or, at least, that they do not tend to make more errors in one role than in another. We do not concern ourselves with problems of monopoly by either a firm or the government, but the problem of imperfect knowledge is treated.

Instead of "external effects" or "neighborhood effects" we will use the phrase "side effects" to identify those for which no account *seems* to be taken in the market place. This avoids the flavor of location and of being *necessarily* outside of the market place that seem to be associated with the more common names for these effects.

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## I. EXCHANGE COST

*Recent Developments.* R. H. Coase,<sup>1</sup> in an important article written recently for this *Journal*, demonstrates that there is, in general, nothing special about side effects that rules out the possibility of their being taken account of by the market. These effects can be taken into account by market transactions between the parties affected once the courts have established who has what right of action. Under competitive conditions and assuming zero exchange costs, these transactions will result in an efficient solution to the scarcity problem. Thus, if ranchers are given the right to allow their cattle to roam and the cattle stray accidentally onto unfenced farm land, it will be in the farmer's interest to bring the damage they cause to the rancher's attention by offering to pay the rancher to reduce the number of cattle foraging nearby. If the rancher disregards this offer, he sacrifices a potential receipt equal to the crop damage. Thus, the crop damage becomes a private cost to the rancher of raising additional cattle and will be taken account of in his calculations. Moreover, Coase points out the efficiency of the solution with respect to the number of cattle and the size of the crops in the absence of exchange costs is independent of whether the farmer or rancher is legally liable for the damage. The party not held liable, of course, acquires the right to act in ways which may have harmful side effects. The assignment of the liability for crop damage to the rancher would lead to a direct accounting for this cost in his operations and he would need to decide whether to reduce his herd or pay the farmer to reduce the crop he plants. Whether the farmer will find it worthwhile to pay enough to the rancher to reduce his herd or whether the rancher can pay enough to the farmer to reduce the area he cultivates depends on whether the value lost because of the crop reduction is greater or less than the value lost because the size of the herd is reduced. Whichever way the rights are initially assigned, the outcome of the subsequent bargaining will be that which maximizes the value of output.

Coase has advanced the analysis of the roles that can be played by the market and the government a step beyond its previous position. For now Coase has shown that if exchange costs are positive, it is necessary to ask whether government can take the harmful effects of an action into account at less cost than can the market or, indeed, if the resulting resource realignment is worth the cost of taking the side effects into account at all.

*Misapplication of Optimality Theorems.* The question which asks whether or not realignment is worthwhile brings to light an improper usage to which we frequently have put our optimality theorems. The cost of using the market relative to the cost of using a political mechanism has seldom been considered explicitly or in detail in the bulk of the theory of welfare economics. This

<sup>1</sup> Coase, *The Problem of Social Cost*, 3 *J. Law & Econ.* 1-44 (1960).

has led to an improper usage of those theorems. As a consequence of the conventional approach to these problems, it has not been recognized that the very conditions under which side effects are believed to lead to inefficiency are those conditions for which the welfare theorems used are inapplicable.

The usual analysis of market inefficiency in such cases attributes the difficulty to the absence of markets in which "appropriate" prices for measuring side effects can be revealed.<sup>2</sup> But absence of a market or of a price can be consistent with efficiency when optimality theorems are appropriately interpreted. For *produced goods*, the optimality theorems require equalities among various marginal rates of substitution. These same optimality conditions, however, do not require such equalities for goods and services that are *not produced* in the final efficient equilibrium; for these we have corner solutions involving inequalities. Thus, a basic premise in requiring equalities is that we are talking about goods which we require to be produced in positive quantities.

We then turn to the competitive model and observe that market prices will often bring about the equalities required for produced commodities and services. But, we ask, what if some goods produce side effects which are not exchanged over a market? We answer that the market fails to provide us with incentives which will guide behavior to take account of the side effects and that, therefore, the required equalities will be absent. The allegation is that even perfectly competitive markets fail to achieve efficiency. But, this reasoning generally fails to take account of the fact that the provision of a market (for the side effect) is itself a valuable and costly service. Where a market, or the political action which would be its counterpart, does not exist, this service is not being produced. If this service is not being produced some *inequalities* (instead of the equalities required for produced goods) among our marginal rates of substitution and marginal rates of transformation may be consistent with efficiency, as will be the case if the cost of taking account of side effects through either the market or the government exceeds the value of realigning

<sup>2</sup> Cf. Arrow, Uncertainty and the Welfare Economics of Medical Care, 53 Am. Econ. Rev. 941, 944-45 (1963):

An individual who fails to be immunized not only risks his own health, a disutility which presumably he has weighed against the utility of avoiding the procedure, but also that of others. In an ideal price system, there would be a price which he would have to pay to anyone whose health is endangered, a price sufficiently high so that the others would feel compensated; or, alternatively, there would be a price which would be paid to him by others to induce him to undergo the immunization procedure. . . . It is, of course, not hard to see that such price systems could not, in fact, be practical; to approximate an optimal state it would be necessary to have collective intervention in the form of subsidy or tax or compulsion.

and Bator, The Anatomy of Market Failure, 72 Q.J. Econ. 351, 353-54 (1958):

Pareto-efficient . . . points . . . are characterized by a complete set of marginal-rate-of-substitution . . . equalities (or limiting inequalities) which, in turn, yield a set of price-like constants. Where no such constants exist, reference will be to *failure of existence* (of prices, and hence, of efficiency). (Parenthetic phrase added.)

resources. In such cases zero amounts of market pricing or the government equivalent will be efficient. In asking the implications of the nonexistence of some markets, we seem to have forgotten the cost of providing market services or their government equivalent. The existence of prices to facilitate exchange between affected parties has been too much taken for granted. A price for every produced good or service is not a necessary condition for efficiency, so that the absence of a price does not imply that either market transactions or substitute government services are desirable. If we insist either that all actions (services or commodities) be priced in the market or that the government intervene, we are insisting that we do not economize on the cost of producing exchanges or government services. Thus, most welfare propositions concerned with side effects are based on an invalid use of the standard optimality theorems, i.e., they ignore the cost of some of the goods.

*Some Examples.* We shall consider two examples to illustrate our point. In the first rights of action are clearly defined; in the second they are not.

Our first example is zero-priced parking at shopping plazas in which unpaid-for benefits exist insofar as shoppers, in the prices they pay, confer benefits on nonshopping parkers. Most economists, regardless of their philosophical persuasion, would probably argue that the number of spaces is nonoptimal. But, when we say nonoptimal, we must have some idea of what is the optimal number of spaces. Assuming the absence of increasing returns, the less careful of us are apt to reply that the proper number of spaces is the number that would clear the market when a charge is levied to cover construction cost. A more careful reply would include exchange costs in the charge. *Neither* answer is necessarily correct.

It is true that the setting and collecting of appropriate shares of construction and exchange costs from each parker will reduce the number of parking spaces needed to allow ease of entry and exit. But while we have reduced the resources committed to constructing parking spaces, we have increased resources devoted to market exchange. We may end up by allocating more resources to the provision and control of parking than had we allowed free parking because of the resources needed to conduct transactions. By insisting that the commodity be priced, we may become less efficient than had we allowed persons to ration spaces on a first come, first serve basis. Similarly, rationing by government involves its own costs and may be no better. Those who purchase merchandise and indirectly pay for parking spaces may prefer to substitute the smaller total cost of constructing additional spaces to accommodate free-loaders rather than ration out the nonbuying parkers by paying the required exchange costs minus the savings of constructing fewer parking spaces. Since the cost of providing additional parking spaces depends largely on the price of land, it follows that we should expect to observe free parking allowed more frequently in suburbs than in the center of towns because of

the differential prices of land. Given this differential, both methods of allocating parking may be efficient.

Is this example consistent with competition? Will not competing stores open nearby and charge lower prices because their customers use a free parking lot supplied by a competitor? Will they, thereby, force their competitor out of business? The desirability of providing parking spaces implies that we are dealing with a world of finite dimension in which all cars cannot be parked at zero cost on a dimensionless point. For this reason, differential land rent will be taken into account. Owners of land surrounding the free parking lot will enjoy windfall profits, a question of wealth redistribution, but potential competitors will have the advantages of the nearby lot capitalized and included in the rent they pay; they will enjoy no competitive advantage. The equilibrium is a stable competitive one although it gives rise to differential land rent. If the windfall is expected to be large enough to warrant the additional transactions required to purchase surrounding land, the (prospective) owners of the shopping plaza could take account of these gains in their calculations by purchasing the surrounding land before free parking is allowed. This option, which Coase refers to as extending the role of the firm, is alternative to both exchange and government action.<sup>3</sup>

In this particular example, the efficiency of producing this costly but zero-priced parking depends on the supplier being able to recoup the cost by other means, namely in the prices of his merchandise. This method of financing the parking lot becomes economically superior *only* if demand interrelations are such that a sale in combination arrangement reduces exchange costs sufficiently. Both the loose combination sale (not all parkers need to buy merchandise) as well as tighter tie-ins may, in fact, be methods which reduce the cost of allocating and which lead to optimal quantities of goods. We will have more to say on the relevance of this for the problems posed by public goods.

For contrast, our next example, one that has become a favorite, involves neither tie-in arrangements nor defined rights of action. It is the case in which market transactions do not take place in the use of nectar by bees, so that prices do not arise which reflect the beneficial effects of apple blossoms on the productivity of bees. Clearly, as Coase would probably point out, it is possible for beekeepers and apple growers to strike a bargain over how many trees are to be planted, the bargain taking account of an apple tree's con-

<sup>3</sup> The existence of unique locations does not necessarily imply the inefficiency usually associated with monopolistic competition. Cf. Demsetz, *The Welfare and Empirical Implications of Monopolistic Competition*, 74 *Economic J.* 623-41 (1964). It should also be noted that if the landowners could know of the differential land rents that would result from the superior technology offered by free parking, they would be inclined to enter into an agreement sharing the differential rent accruing to land adjacent to the shopping plaza. If they did not enter into such an agreement there would be an inclination to let the free parking facility be built on the other man's property.

tribution to honey production and a bee's contribution to cross-fertilization of trees. Further, were there significant predictable benefits from the interaction, significant enough to offset any diseconomies of underspecialization, beekeeping and apple growing would be carried on by the same farmer. However, the benefits may be small relative to the costs of forsaking specialization. Merger will not then be the solution. Suppose, also, that estimates of benefits are small relative to estimates of the cost of developing the science of the apple-bee interaction and to either the costs of transacting in the market or providing substitute government services. Then efficiency requires that bees be allowed to "help themselves" on a first come, first serve basis, which is, after all, an alternative arrangement for settling scarcity problems.

Here no combination sales are directly involved. A valuable and costly good, nectar, is provided free of charge because it would be too costly to take account of the indirect benefits to beekeepers. In contrast to the parking and merchandising example, the separate marketing of the two products, apples and blossoms, is costly. Hence a zero-priced good may be efficient even though no combination sale is used. Since no low cost combination sale seems possible, the good (nectar) will be provided free if apples, *per se*, are worth producing. If apples are not worth producing, our recognition of the existence of a benefit to beekeepers will not make the production of apples desirable, for the cost of inducing the apple grower to take this benefit into account is too high to make it worthwhile.

## II. POLICE COST

Up to now we have largely limited our attention to situations in which direct bargaining between individuals requires an exchange cost that is larger than the benefits derived from the exchange. To take account of these side effects, the interested parties, therefore, resort to combination sales, to extensions of the firm, or they find it expedient not to modify these effects. All of these alternatives are consistent with efficiency and yet all fail to exhibit a market in the side effect. There are situations, however, which are somewhat different in that the cost of *policing* the effects of actions, rather than the cost of exchange, may be so high as to cause additional complications. The following discussion of these situations is designed to reveal the roles played by police cost and private property and to help clear up some public good problems.

*Property Rights and the Valuation Problem.* There are two tasks which must be handled well by any acceptable allocative mechanism. These are, firstly, that information must be generated about all the benefits of employing resources in alternative uses, and secondly, that persons be motivated to take account of this information. To the extent that both these tasks are solved by the allocative mechanism, the problem of attaining an efficient allo-

cation of resources reduces to arithmetic. Setting aside the second problem, we turn to the first and, in particular to the necessity for protecting the right to use economically valuable resources if we are to obtain accurate information about benefits.

It is well known that prices can serve as guideposts to where resources are wanted most, and in addition, that exchangeability of goods at these prices can provide incentives for people to follow these guideposts. However, analytical concentration on the price mechanism has kept us from closely examining what it is that is being traded. The value of what is being traded depends crucially on the rights of action over the physical commodity and on how economically these rights are enforced. The enforcement of the accompanying property rights has an important impact on the ability of prices to measure benefits. An emphasis on this aspect or view of the problem, in conjunction with our emphasis on exchange cost, will allow us to unify our treatment of what is now largely a collection of special cases in which our measures of benefits diverge from actual benefits. The petroleum and fishery "pool" problems are good examples of problems created by treating economic goods as free goods. The general conclusion reached by the analysis of pool problems is that a resource, be it petroleum, fish, or game, is too rapidly worked. This conclusion is correct and if we think in terms of producible inventories, the absence of property right enforcement also can be shown to result in too little production of the good, or in too small an increment to the pool or inventory of the good. This is because the prices, which reflect private benefits, fail to measure the whole of the social benefit derived from the good. As a special case of this general proposition, if we assume that it costs nothing to police property rights, it follows that there exists a direct relationship between the degree to which private benefits approach social benefits and the degree to which the conveyed property rights are enforced. This relationship can be illustrated with two examples.

Given any definition of the rights that accompany ownership in an automobile, the price mechanism will ration the existing stock of automobiles. But the total private value of this stock will depend on the degree to which auto theft is reduced by our laws and police. If we pass a law *prohibiting* the arrest and prosecution of auto thieves, and also prohibiting the use of private protection devices, the bids that persons subsequently offer for the purchase of automobiles will fall below the social value of automobiles. The lower bids will result from the reduction in control that a purchaser can expect to exercise over the use of a purchased auto and, in addition, from his ability to "borrow" at no charge those autos which are purchased by others. The bids submitted after the passage of such a law will underestimate the social value of autos, for we can assume for our purposes that the usefulness of an auto remains the same whether it is used by the purchaser or by the legal thief.

This is true even though the existing stock of autos is efficiently distributed among owners. The total value of autos will fall below social value and the subsequent increase in the stock of autos will be less than it should.

The lowering of bids that results from our law is similar to the lowering of bids that will take place when high police cost reduces the degree of private control that it is economical to guarantee owners. The provision of national defense provides us with a classic example of the impact of high police cost. Voluntarily submitted bids for defense will be lower than the social value of defense because the bidder can count on being able to enjoy (some of) the defense bought and also enjoyed by his fellow citizen. The effect on bidding is similar to that which takes place in our example of legalized auto theft except that the reason for lack of control is not merely the absence of an appropriate law but, rather, it is the high cost of defending a purchaser from a foreign aggressor while at the same time preventing his neighbors from enjoying protection. The cost of excluding those who have not contracted for benefits from the enjoyment of some of these benefits is so high that a general attitude of letting others bear the cost of defense can be expected. Consequently, voluntarily submitted bids will underestimate the social value of defense.

If a low cost method is available and is used to prevent those who do not contract for defense from benefiting from the defense bought by others, the market would reveal accurate information about the social value of defense. Such information would be extremely useful if the market or the planner is to allocate resources efficiently.

The institution of private property, which attempts to exclude nonpurchasers from the use of that which others have purchased, should, therefore, not be looked upon as either accidental or undesirable. On the contrary, its existence is probably due in part to its great practicality in revealing the social values upon which to base solutions to scarcity problems. This is precisely why we do not worry that bids for, say, candy will fail to reveal the social value of candy. The price of candy is accurate in its measure of social value because reflected in it is the ability of each purchaser to control the use of his purchase, whether that use be for resale or for charity, for his children, or for his own consumption. This valuation function is related to but distinct from the incentives to work provided by a property system, for even in a society where work is viewed as a pleasurable activity, and, hence, where incentives to work are not needed, it would still be necessary to properly value the varieties of alternative output that can be produced.

We have already observed that the value of what is being traded depends upon the allowed rights of action over the physical good and upon the degree to which these rights are enforced. This statement at once raises the question of which rights and which degrees of enforcement are efficient. If changing the

mix of property rights that accompany ownership increases the value of property, such a change will be desirable from the viewpoint of wealth maximizing. For example, if the problem is whether to allow automobile owners to increase the speed at which they travel on side streets, one could assess whether there would result an increase in the total value of affected property. Would people be willing to pay higher prices for automobiles? It is by no means clear that they would, for some prospective owners may fear high speed more than they value it. And, if there would result an increase in the price of automobiles, would it be large enough to offset any increase in the cost of insuring life, limb, and home (i.e., the resulting decline in the value of other property)? If a net increase in the total value of property follows a change in the mix of rights, the change should be allowed if we seek to maximize wealth. Not to allow the change would be to refuse to generate a surplus of value sufficient to compensate those harmed by the change. The process of calculating the net change in value will, of course, involve the taking into account of side effects and this is a problem that we have already discussed. The enforcement of rights can be viewed in the same way. Indeed, we can insist that a proper definition of a right of action include the degree to which the owner or the community is allowed to enforce the right. Enforcement thus becomes the specification of additional rights and can be included in the above analytical framework. The conclusion we have reached depends, of course, upon the existence of competitive entry in the exercise of particular rights. It is therefore necessary to exclude rights which confer monopoly by restricting entry and to insist that all owners have the same rights of action. There are some difficult problems which we do not take up here. For example, since everyone has the right to take out a patent or a copyright on "newly created" goods or ideas, does the granting of this right involve the granting of monopoly power?

It is, of course, necessary to economize on police cost, so that we will not always want to guarantee full control to the purchaser; more will be said below about this aspect of the problem. But, this aspect aside, it is essential to note that the valuation power of the institution of property is most effective when it is most *private*. It is ironic, therefore, that one of the strongest intellectual arguments for expanding the role of government has been based on the alleged necessity for eliminating exclusivity and for allowing free access to the use of certain types of resources. These resources have been given the name "public goods" and they are characterized by their alleged ability to confer benefits on additional persons without thereby reducing the benefits conferred on others. The provision of national defense is a well known example.

*The Public Goods Problem.* The relevance of what we have been discussing for public goods is that if the cost of policing the benefits derived

from the use of these goods is low, there is an excellent reason for excluding those who do not pay from using these goods. By such exclusion we, or the market, can estimate accurately the value of diverting resources from other uses to the production of the public good. Thus, even though extending the use of an existing bridge to additional persons adds nothing to the direct cost of operating the bridge, there is good reason for charging persons for the right to cross the bridge. Excluding those who do not pay for the use of the bridge allows us to know whether a new bridge is likely to generate more benefit than it is likely to cost.<sup>4</sup> Why should we desire information about a new bridge if the direct marginal cost of using the existing bridge is zero? Firstly, the bridge may depreciate with time rather than with traffic, so that the question of replacement remains relevant even though the marginal cost of use is zero. Secondly, there is a private marginal benefit to users of the bridge, at least in lessening their driving costs, and this benefit can be measured by pricing the use of the bridge. Such information would allow us to ascertain whether it is economic to have a new bridge closer to some persons than is the present bridge.

For some goods, air for example, the supply is so plentiful that diversion from some uses is not required to increase the intensity with which they are used elsewhere. Only where scarcity is absent is it *a priori* reasonable to charge a zero price. Superabundance is the only true *a priori* case for a zero-priced public good. All other goods are such that their provision forces us into resource allocation problems. To solve these problems efficiently, we need information which is obtained by excluding nonpurchasers, *provided that the additional information is worth more than the exchange and police costs necessitated*. In cases where the costs are greater, a zero price can be reconciled with efficiency requirements. If we must distinguish among goods, we had best do away with the "public goods" *vs.* private goods dichotomy and instead classify goods according to whether they are truly free or economic and classify economic goods according to whether marketing costs are too high relative to the benefits of using markets and to the costs of substitute non-market allocation devices.

*Alternative Devices.* The use of taxation for the provision of scarce goods must be defended on grounds other than the usual rationale of their being public goods. As we have seen, insofar as efficiency is concerned, the fact that side benefits can be derived by nonpurchasers from the acquisition by others of these goods is inconclusive. If the planner's or the market's calculation of benefits can be improved by a small expenditure to protect or to confer

<sup>4</sup> See Coase, The Marginal Cost Controversy, 13 *Economica* 169-82 (1946), for an early application of this point in reference to the use of multipart pricing in natural monopoly situations. See also Minasian, Television Pricing and the Theory of Public Goods, 7 *J. Law & Econ.* 71 (1964).

property rights, the use of price rationing to measure these benefits may be justified. The problem can be viewed as that of determining the degree to which it is desirable to purchase valuation information through the competitive pricing process. A purchase of valuation information reduces the utilization of a public good below the levels that seem to be warranted by the direct cost of extending utilization. If the direct cost of, say, increasing the volume of traffic carried by an existing bridge is zero, it may nonetheless be *undesirable* to charge a zero price because of the indirect costs implied by zero-pricing. These indirect costs are of two kinds.

Firstly, and obviously, valuation information about the bridge is sacrificed. (Is not valuation information one of the most important public goods?) Secondly, the alternative methods of financing the building of bridges may also lead to inefficiency, especially by degrading valuation information elsewhere. This is most easily seen by supposing that an excise tax is levied on other goods to finance bridges. Such a tax will lead to inefficiently small rates of production of these other goods (assuming competitive markets). Alternatively, the levying of an income tax will inefficiently reduce the quantities of income generating activities undertaken by those taxed. A tax on property values, even one on rent, would tend to discourage the seeking out of more valuable uses of property. A head tax would have the least effect because it is not concentrated on particular activities. Even a head tax, one could argue, would alter a person's choice of community, and moreover, a resident who refused to pay the tax might be excluded from use of the bridge. Taxes exclude just as do prices, so that on grounds of exclusion there is not much principle to guide us. Given these indirect costs of alternative methods of financing the provision of public goods, the desirability of zero-pricing is not at all clear, especially if the cost of policing is low.

For some goods, however, it must be recognized that police cost may seem too high to allow the market to generate accurate information on social benefits economically. In these cases taxation *may* be the most practical method of finance and zoning the most practical way of establishing rights, just as subsidies, excise taxes, and government nonprice rationing may be the most practical way of coping with high exchange costs. But it must be remembered that all these devices are "exclusionary" and have costs of their own. At best, they would be second best alternatives to a market in which police and exchange costs are small and in which there is no bias in arithmetic mistakes as between civil servants and others, for these devices are not as likely to turn up correct estimates of the social values of alternative goods.

In a world in which exchange and police cost and the cost of providing alternative political devices are all zero, reliance on the political mechanism of a smoothly run democracy will result in less efficiency than will reliance on the market. Aside from problems of monopoly in government or

of errors in calculation, in a one-man, one-vote democracy, where votes are not for sale, the polling place will generate information that is based on majoritarian principles rather than on maximum benefit principles. Thus, suppose some citizens prefer a stronger national defense but that a majority prefer a weaker defense. Left to a vote, the weaker defense will be our chosen policy even though the minority is willing to pay more than the additional cost required to bring defense up to the level they desire (and so, if possible, they may hire private police services). An error in the opposite direction is also possible. The majority of voters may approve of a large space effort even though they would not be able to bid high enough to acquire these resources for space in the absence of forced tax contributions. (Here, however, the minority cannot privately adjust.)

Although taxation is sometimes the most practical way of dealing with the provision of high police costs goods, there are other methods which are likely to arise in the market and which will lower the required police cost. As we have seen, extending the firm and the practice of sale-in-combination may overcome many instances of high exchange cost. These devices can also be used to reduce high police cost.

In the famous railway example, sparks from passing trains destroy some crops. The damage caused was believed to be adequate grounds for the government to take action through one or more of the political devices we have already mentioned. Direct contracting between the farmers and the railroad might take account of this side effect were it not that a bargain struck between a farmer and the railway would automatically confer benefits on all surrounding farmers by reducing spark fall-out on their land. Police costs are too high to allow benefits to be conferred on the contracting farmer without at the same time conferring them on non-contracting farmers. Therefore, it is believed that each farmer will wait for someone else to buy a reduction in spark output. (This conclusion requires two preliminary assumptions. The exchange cost of farmers getting together to submit a joint bid must be high relative to the benefits they will receive so that it is blocked by the expense it entails, and the exchange cost of their getting together to submit a joint bid must be higher than the cost of their organizing politically to lobby for antispark legislation.)

However, once the spatial aspects of the problem are admitted, we must again consider the phenomenon of differential land rent. Presumably, land rents on property adjacent to railways have been suitably depressed to allow farmers to compete with those not affected by sparks. The landowners, who find it in their interest to reduce the railroad's output of sparks, also find themselves not willing to enter into contracts through which other landowners will benefit. To some extent each would wait for the other to transact with the railway for a reduction in spark output. However, the analysis is not yet

finished. The railway may realize a profit by purchasing the surrounding land at its depressed price. The purchase of a parcel of land does not confer benefits on neighbors to the same degree as would a purchase of spark curtailment so that this action would not hamper the concluding of similar contracts with other landowners as much as would the sale of a reduction in sparks. After the railroad purchases title to enough land to make it worthwhile, it could take into account the effect of its output of sparks on land values and profitably bring about an adjustment of this output to the socially optimal amount—that which maximizes the joint value of railroading and landowning. The land must, of course, be rented or resold with a contractual agreement requiring a continuance of reduced spark output. The low police cost associated with the purchase of land is substituted for the very high police cost that would be required to eliminate sparks on some land but not on other nearby land. The necessity for purchasing a reduction in spark output is obviated by substituting a purchase of land.

The extension of the firm together with the combination-sale devices that are associated with differential land rent are extremely important alternatives to government action. These devices can extend considerably the usefulness of markets for revealing and measuring the value of many side effects. The sale of land may entail much less exchange and policing cost than the direct exchange of whatever is producing the side effect. The smoke emitted from a nearby factory would, in principle, be subject to solution in the same manner. Now, of course, in many of these cases we do not observe such solutions taking place because exchange and police costs are not reduced sufficiently and because they may require too much underspecialization cost. Governmental devices, say, zoning laws, may help take account of such benefits, however inaccurately, at a lower cost (in which we should include those costs imposed by the rigidities of zoning laws). It may be, however, that both governmental and market solutions are too costly and that the most efficient alternative is not to attempt to take account of some side effects.<sup>5</sup>

<sup>5</sup> The ability of combination sales to take account of side benefits depends on how closely the value of the tied-in good reflects the value of the public good. There is a direct and exact correspondence between the value of land and the (negative to farmers) value of spark output. A less exact correspondence between the values of the tied goods, while not a perfect device, can nonetheless be useful for taking account of the value of public goods.

Even the stubborn classic case of providing for the national defense is amenable to some usable tie-in arrangements. The provision of defense again presents us with a situation in which it is in the interest of a beneficiary to let others buy defense since he will benefit from their purchases. Suppose, however, that instead of financing defense with taxes, the government resorts to the sale of insurance to citizens which covers their lives and property in the event of loss arising from war. The tied goods, insurance and defense, are substitutes, but they do not fully correspond in value fluctuations. For a stated premium per thousand dollars of insurance and a stated maximum, citizens would buy more insurance the more likely they thought war and the less able they thought our

There are other indirect devices for internalizing via combination sales. The activities of labeling, branding, and advertising allow for internalization of side effects by tying in the sale of information with other goods. Suppose persons would like their tuna boiled longer before canning. Each canner would find it in his interest to prepare the tuna more carefully except that, in a world without labels, all competitors would enjoy at no cost some of the benefits of the resulting increase in demand. Some, therefore, wait for competitors to act. Underinvestment in tuna boiling (or overinvestment in boiling tuna at home) takes place and government regulations governing canning procedures are instituted.

Suppose we allow each canner to state on the label both his name and the minimum boiling time. The name is required to establish responsibility and thereby to reduce policing cost, which is another way of saying that the cost of exercising the rights acquired by purchasers by reason of the purchase contract is reduced for the buyer. The sale of knowledge jointly with that of tuna allows the value of longer boiling to be taken into account by producers and buyers. Structural market imperfections of the monopolistic competition variety can be ruled out if both longer boiled and less boiled tuna have numerous producers. The demand for each producer's tuna will then be the going market price of the particular quality he produces.<sup>6</sup>

Still other institutional arrangements have been devised to combine extensions of the firm with the sale-in-combination device. Department stores and shopping plazas are organizational devices for overcoming high police cost. The owner of the department store or shopping plaza can provide a general environment that is conducive for shopping, such as pleasant plantings, escalators, and other customer services that merchants who owned their own land might hesitate to pay for, hoping instead that neighboring landowners would incur the necessary expenses from which all would benefit. The enclosing of the land into a single ownership entity which often undertakes to

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defense. Those having more at stake would buy more insurance. The premiums could then be used to finance the defense establishment. The side effect is not fully captured, however, because your purchase of insurance, although it fully internalizes your losses in the event of war, also decreases the likelihood of war, and, hence, reduces the amount of insurance others would volunteer to buy. This smaller remaining public aspect of the good could be accounted for by offering the insurance for premiums that are believed to be subsidized.

War, as well as other events, can topple governments, so that to make the insurance credible, the government might need to offer citizens the option of cancelling their insurance and receiving all or some of the premiums they have paid. This cancellation option need be effective only up to the date before a war starts. The insurance device is not without dangers. By raising the maximum purchasable insurance (and lowering premiums), the government could induce a more aggressive attitude among the citizens than is warranted by actuarial fair insurance.

<sup>6</sup> It is not really necessary for efficiency to obtain to require that producers take the product price as given and beyond their control. See Demsetz, *op. cit. supra* note 3.

provide services usually provided by government from tax revenues, such as streets, sidewalks, refuse collection, and even police protection, allows the owner to exclude those who refuse to pay rentals which cover the cost of these services. The competition of various plazas and department stores will provide ample opportunity for merchants to select the services that they wish to buy without fearing or counting on free-loading. Apartment buildings can also be viewed in the same light, and especially the modern apartment building which combines office and recreational space with living space. The development of these institutional arrangements provides an interesting challenge to political institutions for the provision of many of the services generally presumed to be within the scope of the polling place.

The preceding discussion has taken as given the state of technical arts. The levels of exchange and police costs that are required for effective marketing and the costs of government substitute services depend on how well we master the technology of operating markets and governments. Attention is sometimes called to the fact that emerging technical developments will make the use of markets or governments more economic than they now are. There are surely many instances where this is true. However, our analysis suggests that technological developments can operate in the opposite direction. At the same time that technology is reducing the cost of using these alternative institutional arrangements for economizing, it is also reducing the cost of constructing parking spaces, of developing fire resistant corn, and of mass producing automobiles. Whether or not it pays to increase the extent to which we exchange via markets, protect private property rights, or use alternative government devices depends on how much we will thereby reduce production cost and crop damage. Markets or their government alternatives should come into greater prominence only if technical developments lower the costs of these institutional arrangements more than they reduce the costs of producing parking spaces and cars and the cost of crop damage.

Essentially, we have argued in this paper that there exist no qualitative differences between side effects and what we may call "primary" effects. The only differences are those that are implicitly based on quantitative differences in exchange and police cost. Suppose a factory invents a new more efficient furnace which can burn a cheaper grade of coal than can existing furnaces. The burning of cheap coal, we will assume, dirties homes in the neighborhood. We label this effect as side or neighborhood or external, but its real economic implication is to reduce the wealth of nearby homeowners. If this same factory, by virtue of its new furnace, successfully forces a nearby competing firm out of business, and if the resulting decline in demand for housing reduces the wealth of neighborhood homeowners, we do not become concerned. Why the difference in our attitudes toward these two situations which have the same effect on homeowners?

The decline in wealth which results from the fall in demand for housing is more than offset by an increase in wealth elsewhere. This increase accrues primarily to other homeowners and to persons purchasing the lower priced product produced by the factory. We accept the reallocation, I conjecture, because we feel that the existence of a smoothly operating market will insure that wealth is maximized. In the smoke case, exchange and police costs are high relative to the benefits of marketing smoke and, therefore, we do not have an existing market to rely on for the reallocation, although a potential one always stands ready. If the costs of exchanging and policing smoke contracts were zero (and if the cost of exchanging houses were zero) there would be no reason for distinguishing between the two cases insofar as "remedial" action is concerned. We have already argued that the most efficient arrangement may, in fact, require that nothing be done to prohibit smoke and we will not go into these matters again. Our present purpose is merely to emphasize that there is nothing special or qualitatively different about any of these effects, including the effects which stem from what we ineptly call public goods, and that any special treatment accorded to them cannot be justified merely by observing their presence.