

Chapter 6

The Economics of Property Law: Fundamentals

The Control of Externalities

These notes consider various remedies for controlling externalities. The following model considers both short and long run efficiency in anticipation of the fact that some remedies that are efficient in the short run are not efficient in the long run. To be concrete, consider a railroad whose trains emit sparks that occasionally set fire to crops on farmland adjacent to the tracks. Let

n_T = number of trains run by the railroad;
 n_F = number of farms (or total acreage);
 x = expenditure on abatement by the railroad per train;
 y = expenditure on precaution by each farmer per acre (e.g., moving crops);
 $n_T n_F D(x, y)$ = total expected fire damage, where $D_x < 0$, $D_y < 0$, $D_{xx} > 0$, $D_{yy} > 0$;
 $b_T(n_T)$ = marginal benefit of trains, $b_T' < 0$;
 $b_F(n_F)$ = marginal benefit of farming, $b_F' < 0$.

Social welfare is given by

$$W = \int_0^{n_T} b_T(u) du + \int_0^{n_F} b_F(z) dz - [n_T n_F D(x, y) + n_T x + n_F y] \quad (6.1)$$

Efficiency conditions. Short run efficiency concerns the choices of care by the two parties, taking as given the number of trains and farmers. The following first order conditions describe the optimal values of x and y , respectively, given n_T and n_F :

$$n_F D_x + 1 = 0 \quad (6.2)$$

$$n_T D_y + 1 = 0. \quad (6.3)$$

Thus, parties should invest in precaution to the point where marginal benefits equal marginal costs.

In the long run, the number of trains and farm acreage are variable. The first order conditions defining the efficient n_T and n_F are

$$b_T - [n_F D + x] = 0 \quad (6.4)$$

$$b_F - [n_T D + y] = 0 \quad (6.5)$$

Thus, each activity should be increased until the marginal benefit equals the marginal cost. We now consider how well various remedies achieve efficiency in the short and long run.

Pigovian tax-subsidy approach. Under this approach, the government imposes a tax on, or pays a subsidy to, the party, “causing” the externality (in this case, the railroad). Consider first the short run. Under a tax on fire damage, the railroad will choose the efficient level of abatement provided that the marginal tax equals marginal damages, or $t'(x)=n_F D_x$; and farmers will choose the efficient level of precaution provided that they do not receive any of the tax revenue. Symmetrically, a subsidy to the railroad will induce efficient precaution by both parties provided that the marginal reduction in the subsidy equals the marginal damages, or $-s'(x)=n_F D_x$.

In the long run, the railroad will only choose the efficient number of trains if it fully internalizes the crop damage. This requires that it pay a tax per train equal to $t=n_F D(x,y)$. (Note that this tax satisfies the above marginal condition.) Clearly, any subsidy paid to the railroad will induce it to run an excessive number of trains. As for farming, efficient entry of farmers requires that they fully internalize their contribution to crop damage. This is satisfied as long as farmers do not expect to receive any compensation for their losses (including lump sum payments).

The property rule-liability rule approach. Ronald Coase (1960) argued that the Pigovian approach is not the only way to internalize externalities. An expanded set of remedies is revealed by considering the choice between property rules and liability rules. Under property rules, the parties to an externality reach the efficient outcome through bargaining, provided that transaction costs are low. Suppose, for example, that farmers’ right to be free from crop damage is protected by a property rule. Thus, they can block the railroad from running any trains by an injunction. However, the railroad can seek to purchase rights to impose crop damage from farmers. For each train that it runs, the railroad will invest in abatement up to the point where the last dollar spent just equals the marginal damages to farmers, after which it will prefer to compensate farmers for their residual damages. And, given efficient abatement per train, the railroad will run trains up to the point where the marginal amount it has to compensate farmers for running one more train equals the marginal benefit. The result is an efficient number of trains.

Efficient precaution by farmers can also be achieved by contracting. Continuing with the assumption that farmers have the right to be free from damage, this requires that the railroad pay farmers to invest in abatement up to the point where the last dollar spent equals the marginal savings in crop damages. Achieving the efficient amount of farming is more problematic. According to (6.5), long run efficiency requires that farmers enter up to the point where the marginal benefits of the last farm (or acre) equal its marginal contribution to crop damage plus cost of abatement. But since farmers are compensated for these costs under the current assignment of rights, there exists an incentive for too many to enter. In theory, Coasian bargaining can prevent this, but only if the railroad can identify all *potential* entrants into farming and then pay them their marginal benefits of entry to stay out. Clearly this poses a significant informational demand on the railroad.

(A similar problem would face farmers if the railroads initially had the right to run trains without incurring damage liability.) This discussion illustrates the limited usefulness of private contracting in internalizing most externalities, especially regarding long run efficiency.

Now suppose the farmer's right is protected by a liability rule. If liability is strict, the railroad must pay full compensation regardless of its level of abatement. In terms of short run efficiency, strict liability induces efficient abatement by the railroad, but because farmers are fully compensated, they have no incentive to invest in precaution. (The outcome is identical to the above tax scheme if the tax revenue is given to farmers.) In contrast, a negligence rule, which only holds the railroad liable if it failed to invest in efficient abatement, will induce both parties to invest efficiently. The railroad will choose the efficient level of abatement to avoid liability, and farmers will choose efficient precaution to minimize their losses.

Neither liability rule, however, will achieve long run efficiency for both railroads and farming. Under strict liability, too many farmers will enter because they do not consider the impact of their entry on total damages. Although the railroad does face full liability for each train it runs, equal to $n_F D(x,y)$, this amount is too large because of the excessive amount of farming. Thus, too few trains will run (though the number of trains is efficient given the number of farms.) The situation is reversed under negligence. The railroad will invest in optimal abatement, but it will run too many trains because it is not liable for the crop damage. In contrast, farmers will face the full amount of their damages, $n_T D(x,y)$, but too few farmers will enter because the number of trains is too large (though, again, the amount of farming is efficient given the number of trains). In general, liability rules cannot create long run incentives for both parties because of the constraint that what one party pays the other must receive. (The situation is identical to the choice of an activity level by injurers and victims in Chapter 2.)

Zoning, covenants, and common law control. Probably the most common legal response to land market externalities in the United States is zoning, a form of public regulation. The widespread use of zoning, however, does not necessarily make it the most efficient response to externalities. High administrative and enforcement costs often exceed the saved "nuisance costs," thereby making the system inefficient. This would not be a problem, however, if the penalty for violations were payment of an appropriate fine, which would allow landowners to circumvent inefficient regulations. In this sense, zoning regulations are best enforced by a liability rule. The fact that compliance with zoning ordinances is required, however (that is, they are enforced by a property rule), forecloses this route to efficiency.

A private alternative to zoning are land use covenants, or deed restrictions that impose limits on what landowners can do with their property. Such restrictions are usually put in place by developers when they first sub-divide a parcel of land in recognition of the fact that, once divided, individual owners will often undertake activities that impose externalities on one another. By attaching the restriction up front, the developer maximizes the aggregate value of the development (and hence his profit) by internalizing

the neighborhood externalities. Further, since the restrictions are attached to the deed rather than to the landowner (that is, they “run with the land”), they avoid the transaction costs that would be necessary if each new resident had to negotiate anew with all existing residents. In this sense, covenants represent an effective private alternative to zoning for small-scale developments. They are not effective, however, in controlling externalities in large-scale urban areas where development occurs in a piecemeal and decentralized fashion.

Trespass and nuisance laws also represent private (common law) alternatives to zoning. Trespass is effective in internalizing small-scale intrusions (for example, boundary disputes between neighbors), while nuisance law is best suited to control localized harms that affect a few individuals. However, nuisance law is inadequate to internalize harms that are dispersed across a large number of landowners because no single owner will have an adequate incentive to incur the cost of bringing suit, even though the aggregate harm may exceed the benefit. For these types of externalities, public regulation is usually the best remedy.