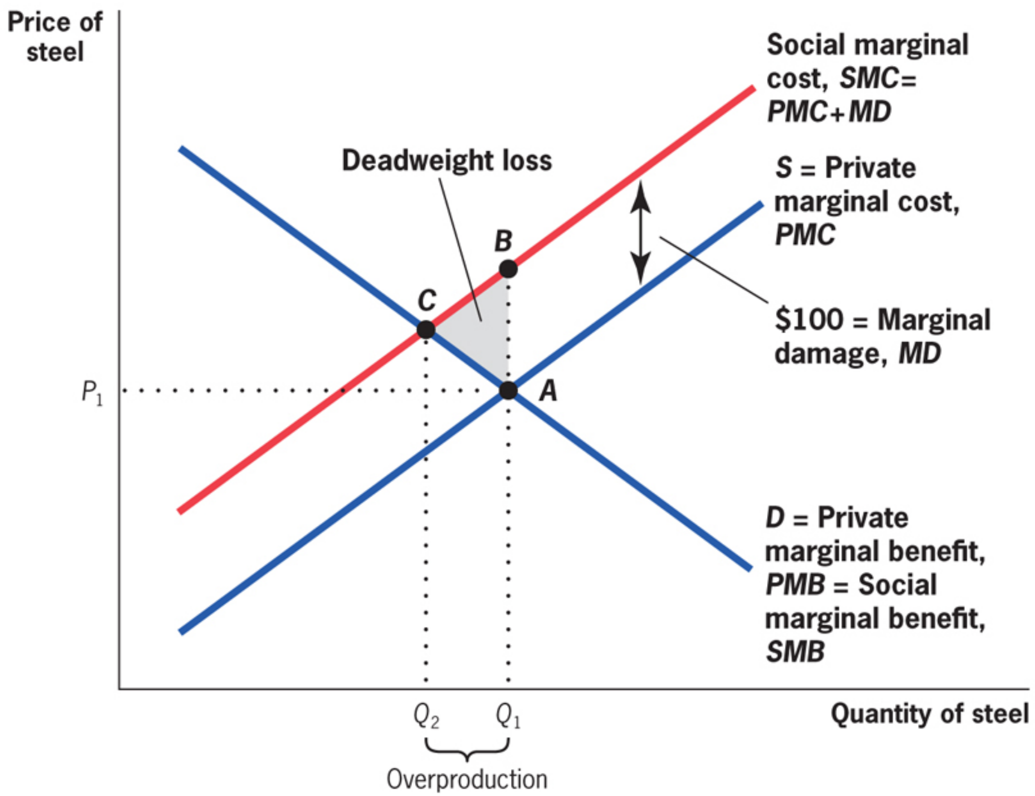
■ FIGURE 5-2



Market Failure Due to Negative Production Externalities in the Steel Market • A negative production externality of $100 per unit of steel produced (marginal damage, MD) leads to a social marginal cost that is above the private marginal cost and a social optimum quantity (Q_2) that is lower than the competitive market equilibrium quantity (Q_1). There is overproduction of $Q_1 - Q_2$, with an associated deadweight loss of area BCA.

Figure 5-2 Market Failure Due to Negative Production Externalities in the Steel Market
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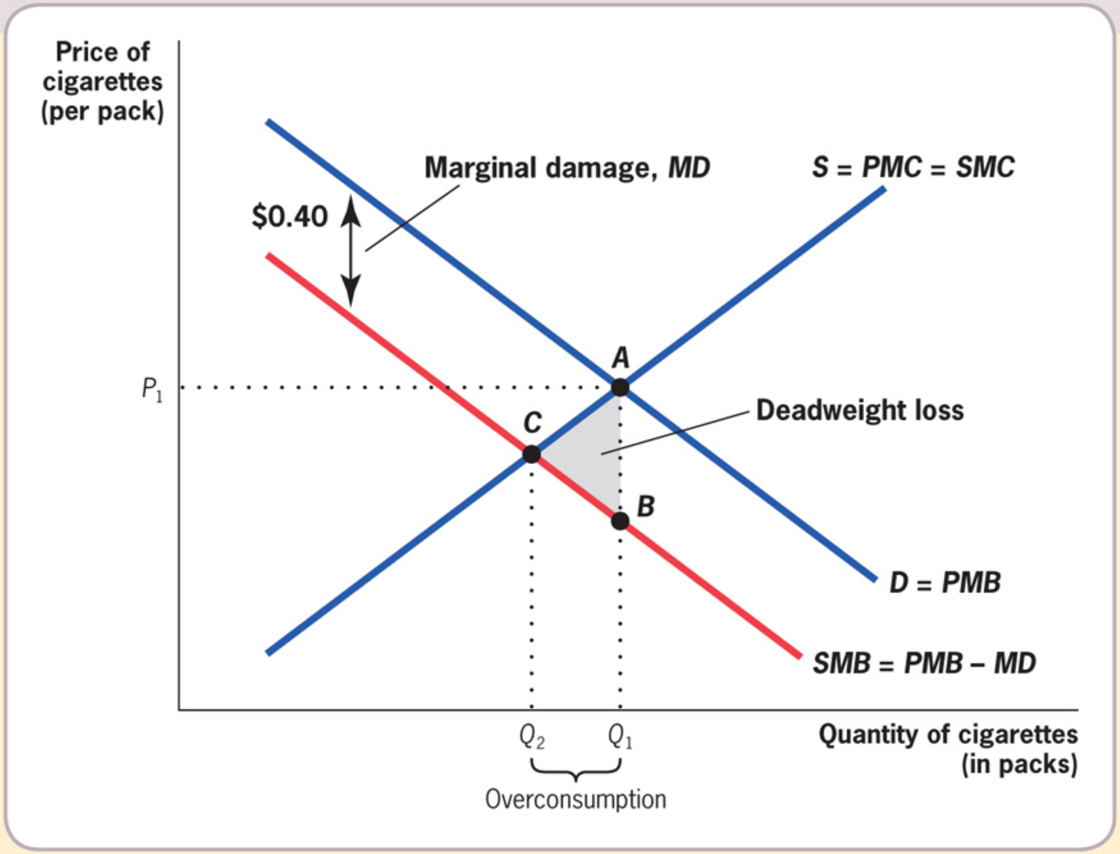
■ FIGURE 5-3



Market Failure Due to Negative Consumption Externalities in the Cigarette Market • A negative consumption externality of 40¢ per pack of cigarettes consumed leads to a social marginal benefit that is below the private marginal benefit and a social optimum quantity (Q_2) that is lower than the competitive market equilibrium quantity (Q_1). There is overconsumption $Q_1 - Q_2$, with an associated deadweight loss of area ACB.

Figure 5-3 Market Failure Due to Negative Consumption Externalities in the Cigarette Market
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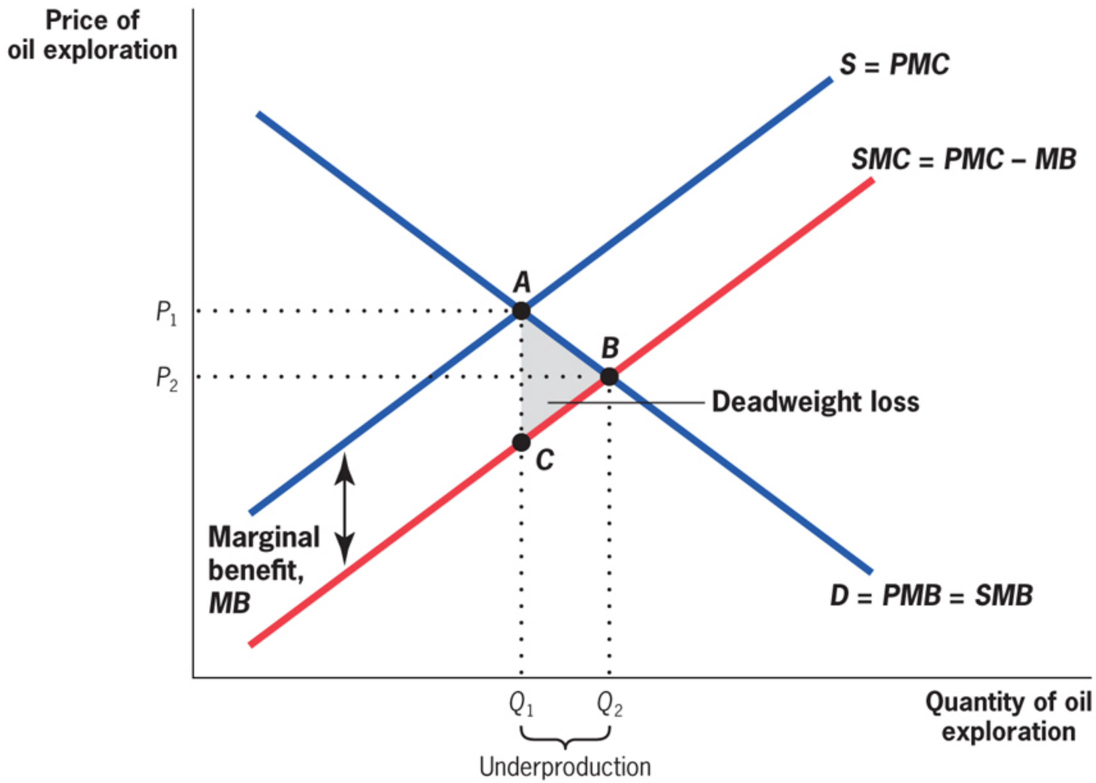
■ FIGURE 5-4



Market Failure Due to Positive Production Externality in the Oil Exploration Market • Expenditures on oil exploration by any company have a positive externality because they offer more profitable opportunities for other companies. This leads to a social marginal cost that is below the private marginal cost, and a social optimum quantity (Q_2) that is greater than the competitive market equilibrium quantity (Q_1). There is underproduction of $Q_2 - Q_1$, with an associated deadweight loss of area ABC.

Figure 5-4 Market Failure Due to Positive Production Externality in the Oil Exploration Market
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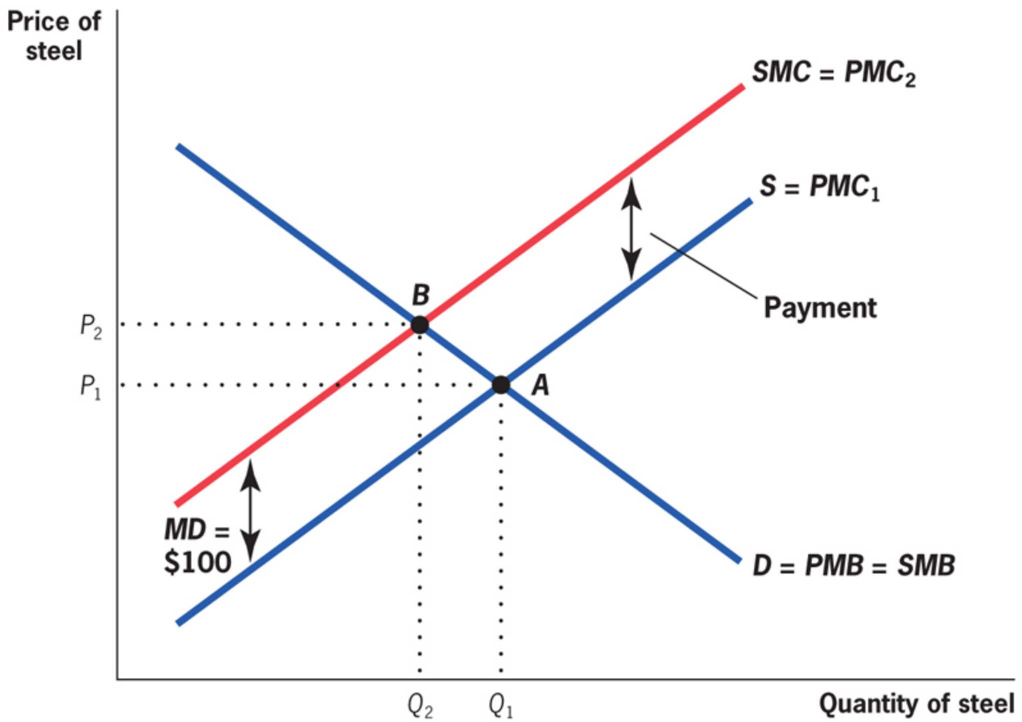
■ FIGURE 5-5



A Coasian Solution to Negative Production Externalities in the Steel Market • If the fishermen charge the steel plant \$100 per unit of steel produced, this increases the plant's private marginal cost curve from PMC_1 to PMC_2, which coincides with the *SMC* curve. The quantity produced falls from Q_1 to Q_2, the socially optimal level of production. The charge internalizes the externality and removes the inefficiency of the negative externality.

Figure 5-5 A Coasian Solution to Negative Production Externalities in the Steel Market
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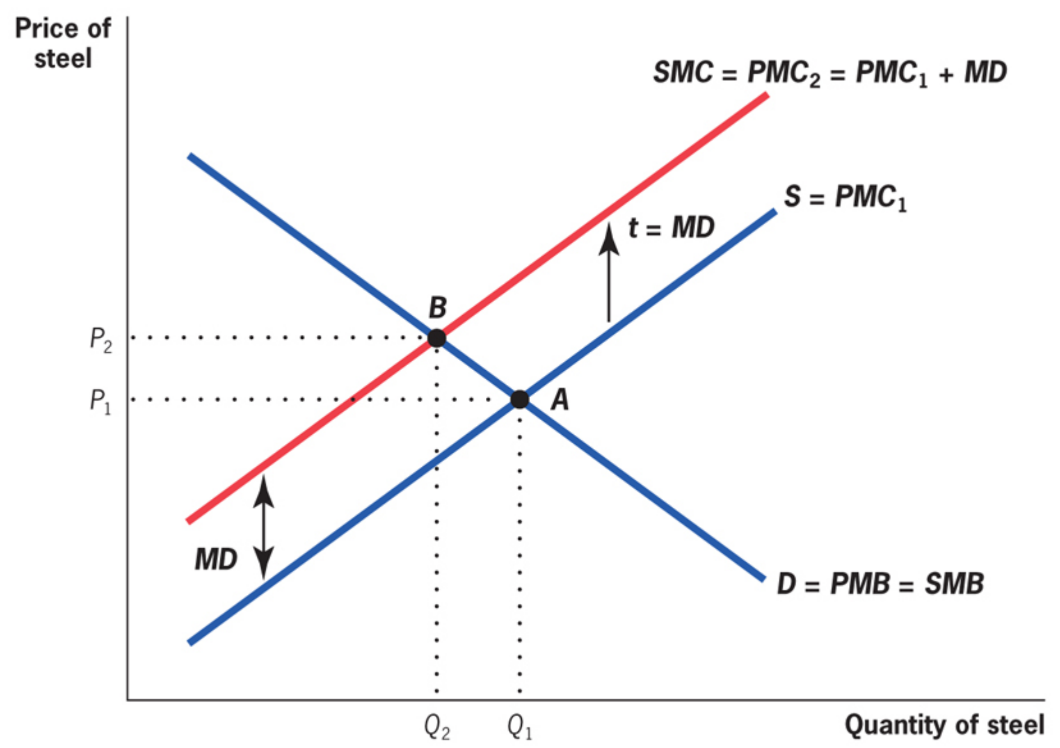
■ FIGURE 5-6



Taxation as a Solution to Negative Production Externalities in the Steel Market • A tax of $100 per unit (equal to the marginal damage of pollution) increases the firm's private marginal cost curve from PMC_1 to PMC_2, which coincides with the *SMC* curve. The quantity produced falls from Q_1 to Q_2, the socially optimal level of production. Just as with the Coasian payment, this tax internalizes the externality and removes the inefficiency of the negative externality.

Figure 5-6 Taxation as a Solution to Negative Production Externalities in the Steel Market
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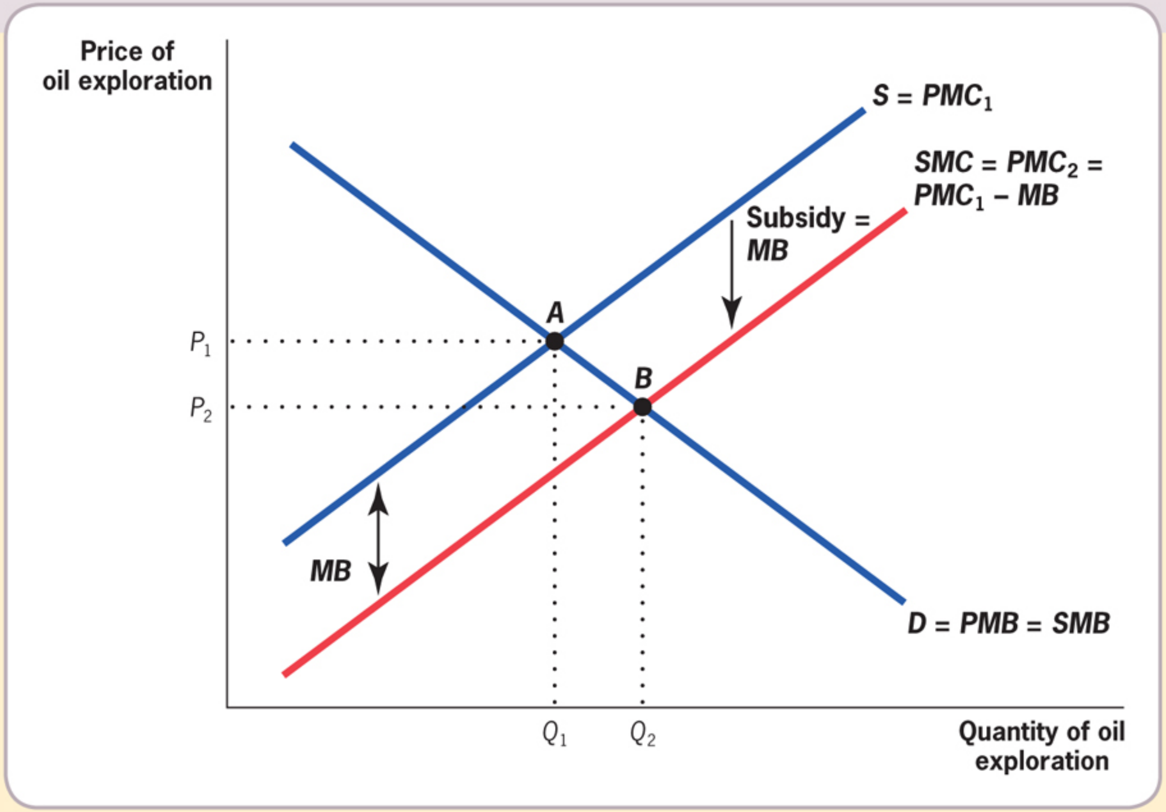
■ FIGURE 5-7



Subsidies as a Solution to Positive Production Externalities in the Market for Oil Exploration • A subsidy that is equal to the marginal benefit from oil exploration reduces the oil producer's marginal cost curve from PMC_1 to PMC_2, which coincides with the *SMC* curve. The quantity produced rises from Q_1 to Q_2, the socially optimal level of production.

Figure 5-7 Subsidies as a Solution to Positive Production Externalities in the Market for Oil Exploration
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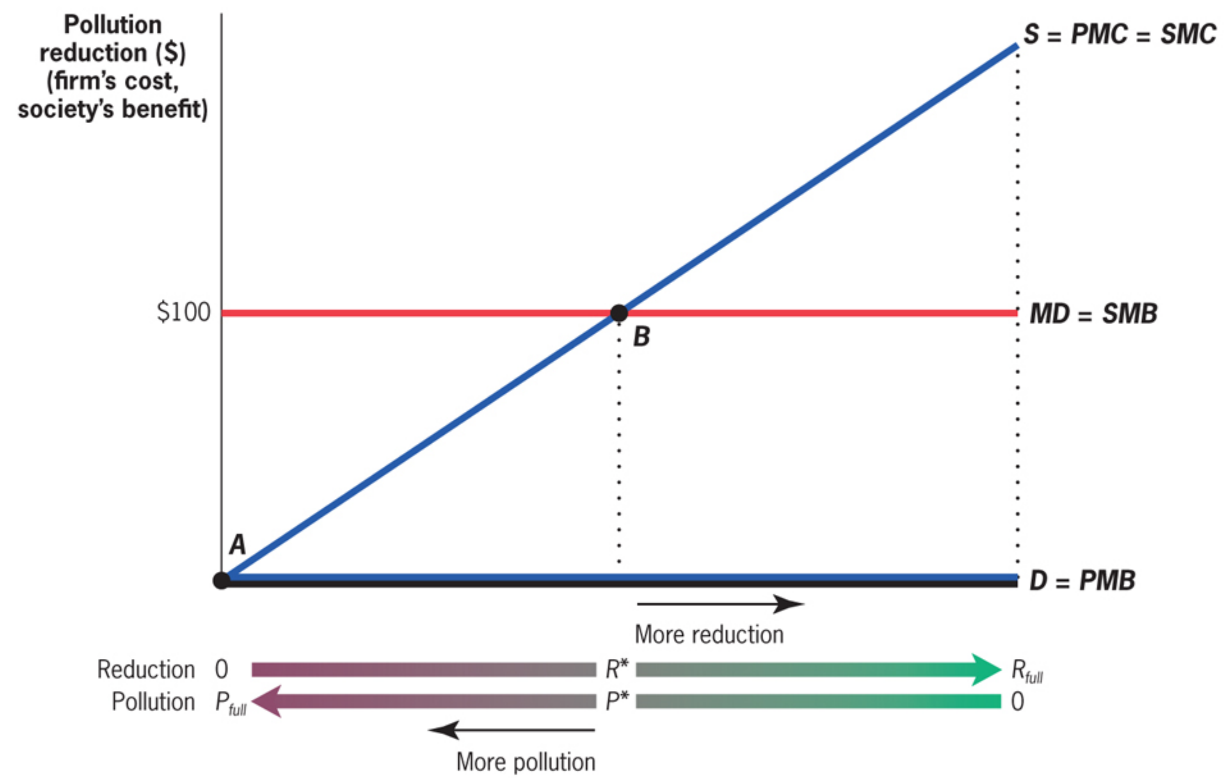
■ FIGURE 5-8



The Market for Pollution Reduction • The marginal cost of pollution reduction (*PMC* = *SMC*) is a rising function, while the marginal benefit of pollution reduction (*SMB*) is (by assumption) a flat marginal damage curve. Moving from left to right, the amount of pollution reduction increases, while the amount of pollution falls. The optimal level of pollution reduction is R^*, the point at which these curves intersect. Since pollution is the complement of reduction, the optimal amount of pollution is P^*.

Figure 5-8 The Market for Pollution Reduction
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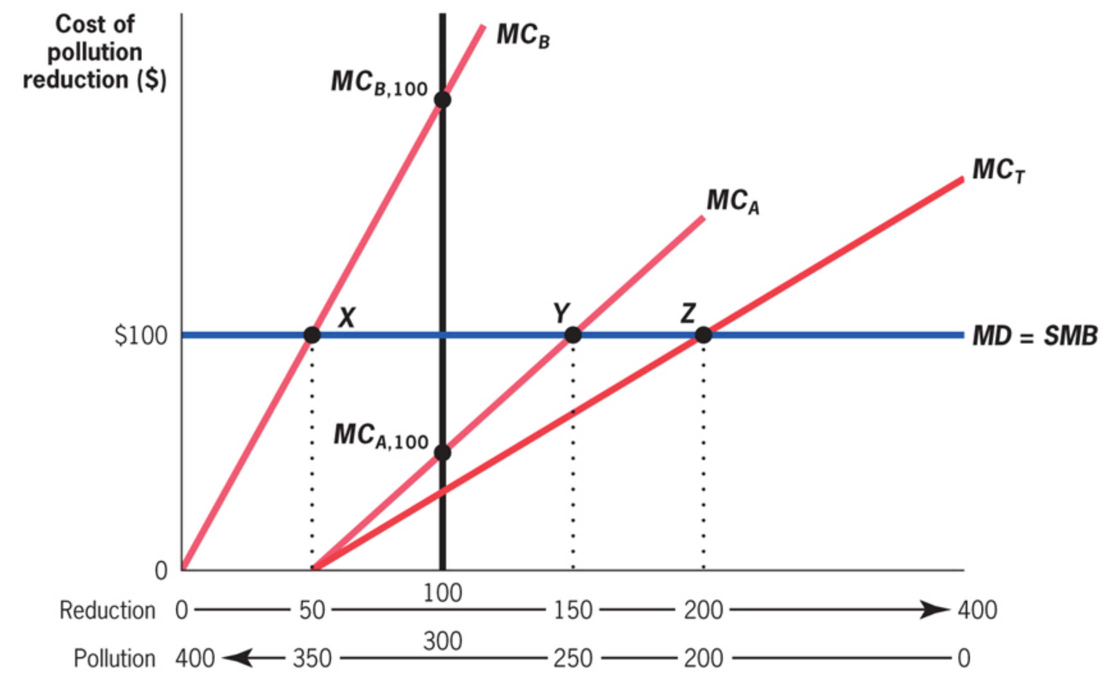
■ FIGURE 5-9



Pollution Reduction with Multiple Firms • Plant A has a lower marginal cost of pollution reduction at each level of reduction than does plant B. The optimal level of reduction for the market is the point at which the sum of marginal costs equals marginal damage (at point *Z*, with a reduction of 200 units). An equal reduction of 100 units for each plant is inefficient since the marginal cost to plant *B* (*MCB*) is so much higher than the marginal cost to plant *A* (*MCA*). The optimal division of this reduction is where each plant's marginal cost is equal to the social marginal benefit (which is equal to marginal damage). This occurs when plant *A* reduces by 150 units and plant *B* reduces by 50 units, at a marginal cost to each of $100.

Figure 5-9 Pollution Reduction with Multiple Firms
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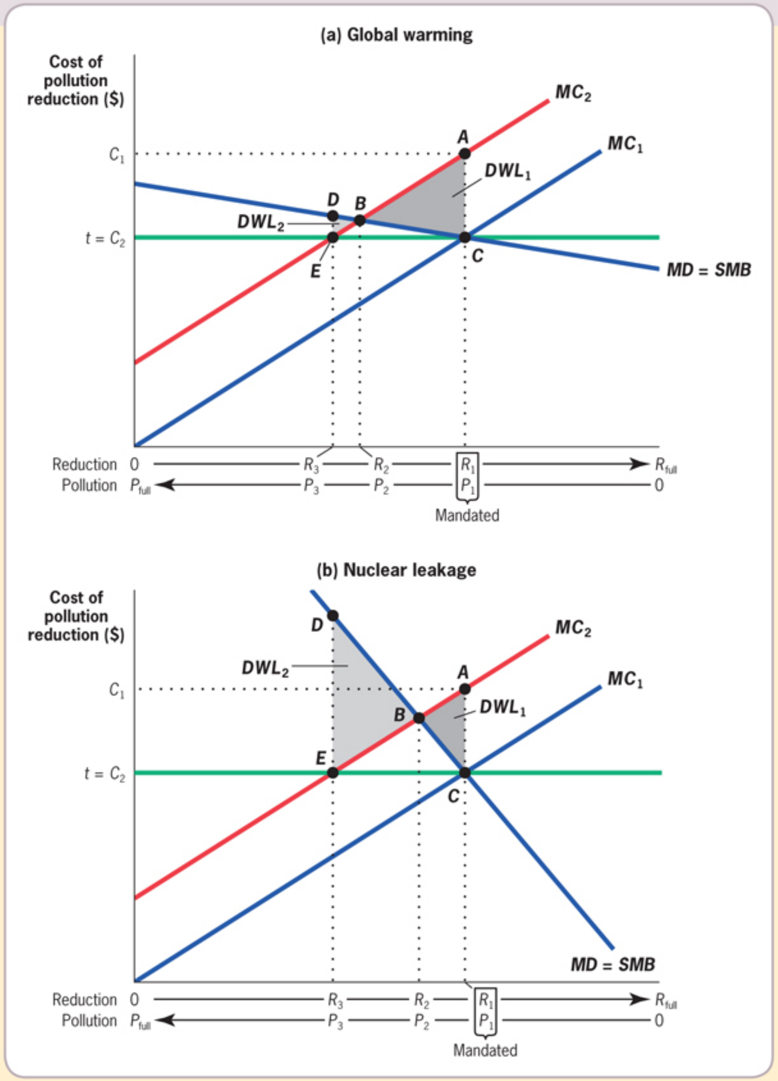
■ FIGURE 5-10



Market for Pollution Reduction with Uncertain Costs • In the case of global warming [panel (a)], the marginal damage is fairly constant over large ranges of emissions (and thus emission reductions). If costs are uncertain, then taxation at level $t = C_2$ leads to a much lower deadweight loss (*DBE*) than does regulation of R_1 (*ABC*). In the case of nuclear leakage [panel (b)], the marginal damage is very steep. If costs are uncertain, then taxation leads to a much larger deadweight loss (*DBE*) than does regulation (*ABC*).

Figure 5-10 Market for Pollution Reduction with Uncertain Costs
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