Microeconomics

Lecture 9

Factors resulting in an ineffective market allocation

- **Externalities**
- **Public goods**
- **Asymmetric information**

Ways to correct market failures

- **Internalization of an externality**
- **Pigou tax**
- **Negotaitions (R.Coase theorem)**
- **Command-control instruments**

Example: Production Externalities

- **A steel mill produces jointly steel and pollution.**
- **The pollution adversely affects a nearby fishery.**
- **Both firms are price-takers.**
- **p_S is the market price of steel.**
- **p_F is the market price of fish.**

Production Externalities

- $c_S(s,x)$ is the steel firm's cost of producing s units of steel jointly with x units of pollution.
- If the steel firm does not face any of the external costs of its pollution production then its profit function is

$$\Pi_S(s,x) = p_S s - c_S(s,x)$$

and the firm's problem is to

Production Externalities

The first-order profit-maximization conditions are

$$p_S = \frac{\partial c_S(s,x)}{\partial s} \quad \text{and} \quad 0 = \frac{\partial c_S(s,x)}{\partial x}.$$

$$p_S = \frac{\partial c_S(s,x)}{\partial s}$$ **states that the steel firm should produce the output level of steel for which price = marginal production cost.**

Production Externalities

- **What is the marginal benefit to the steel firm from reducing pollution?**
- **Zero, since the firm does not face its external cost.**

$\frac{\partial c_s(s,x)}{\partial x}$ **is the rate at which the firm's internal production cost goes down as the pollution level rises, so**

$-\frac{\partial c_s(s,x)}{\partial x}$ **is the marginal cost to the firm of pollution reduction.**

Production Externalities

Hence the steel firm chooses the pollution level for which $-\frac{\partial c_s(s,x)}{\partial x} = 0.$

E.g. suppose $c_s(s,x) = s^2 + (x - 4)^2$ and $p_s = 12$. Then

$$\Pi_s(s,x) = 12s - s^2 - (x-4)^2$$

and the first-order profit-maximization conditions are

$12 = 2s$ and $0 = -2(x-4).$

Production Externalities

$p_S = 12 = 2s$, determines the profit-max. output level of steel; **s* = 6**.

$-2(x-4)$ is the marginal cost to the firm from pollution reduction. Since it gets no benefit from this it sets **x* = 4**.

The steel firm's maximum profit level is thus $\Pi_S(s^*, x^*) = 12s^* - s^{*2} - (x^* - 4)^2$

$= 12 \times 6 - 6^2 - (4-4)^2$

$= \$36.$

Production Externalities

- The cost to the fishery of catching f units of fish when the steel mill emits x units of pollution is $c_F(f,x)$. Given f, $c_F(f,x)$ increases with x; i.e. the steel firm inflicts a negative externality on the fishery.
- The fishery's profit function is

$$\Pi_F(f;x) = p_F f - c_F(f;x)$$

so the fishery's problem is to

Production Externalities

The first-order profit-maximization condition is $p_F = \frac{\partial c_F(f;x)}{\partial f}$.

Higher pollution raises the fishery's marginal production cost and lowers both its output level and its profit. This is the external cost of the pollution.

Merger and Internalization

- **Are these choices by the two firms efficient?**
- **Suppose the two firms merge to become one. What is the highest profit this new firm can achieve?**
- **Merger has caused both an improvement in efficiency and less pollution production. Why?**

Merger and Internalization

- **When the steel firm does not have to face the external costs of its pollution, it increases pollution until this marginal cost is zero;**

- **The merged firm's marginal pollution cost is larger because it faces the full cost of its own pollution through increased costs of production in the fishery, so less pollution is produced by the merged firm.**

Merger and Internalization

- **But why is the merged firm's pollution level efficient?**
- **The marginal external pollution cost is** MC_x^E
- **The steel firm's cost of reducing pollution is** $-MC^m(x)$
- **Efficiency requires**

$$MC_x^E = -MC^m(x)$$

Merger and Internalization

- **Causing the injurer of an externality to bear the full external cost or to enjoy the full external benefit is called internalizing the externality.**
- **Merger therefore internalizes an externality and induces economic efficiency.**
- **Remarks:**
  - **Internalization does not mean burdening the injurers with total external costs,**
  - **In the social optimum marginal external cost does not have to be equal to 0.**

Externalities and Property Rights

- **How else might internalization be caused so that efficiency can be achieved?**
- **Ronald Coase's insight (1960) is that most externality problems are due to an inadequate specification of property rights and, consequently, an absence of markets in which trade can be used to internalize external costs or benefits.**

Externalities and Property Rights

- **In our example about smoking, neither Agent A nor Agent B owns the air in their room.**
- **What happens if this property right is created and is assigned to one of them?**

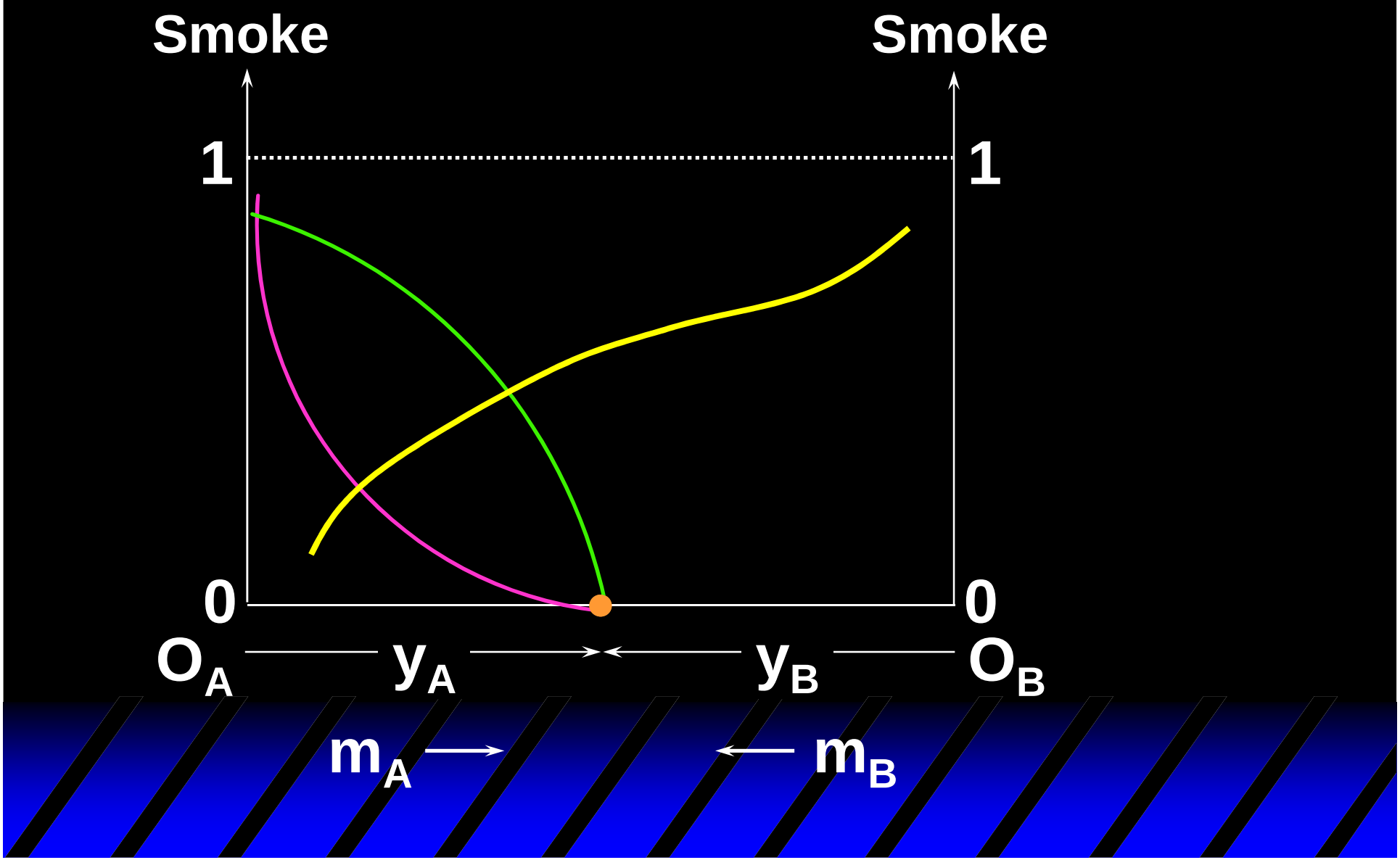
Externalities and Property Rights

- **Suppose Agent B is assigned ownership of the air in the room.**
- **Agent B can now sell “rights to smoke”.**
- **Will there be any smoking?**
- **If so, how much smoking and what will be the price for this amount of smoke?**

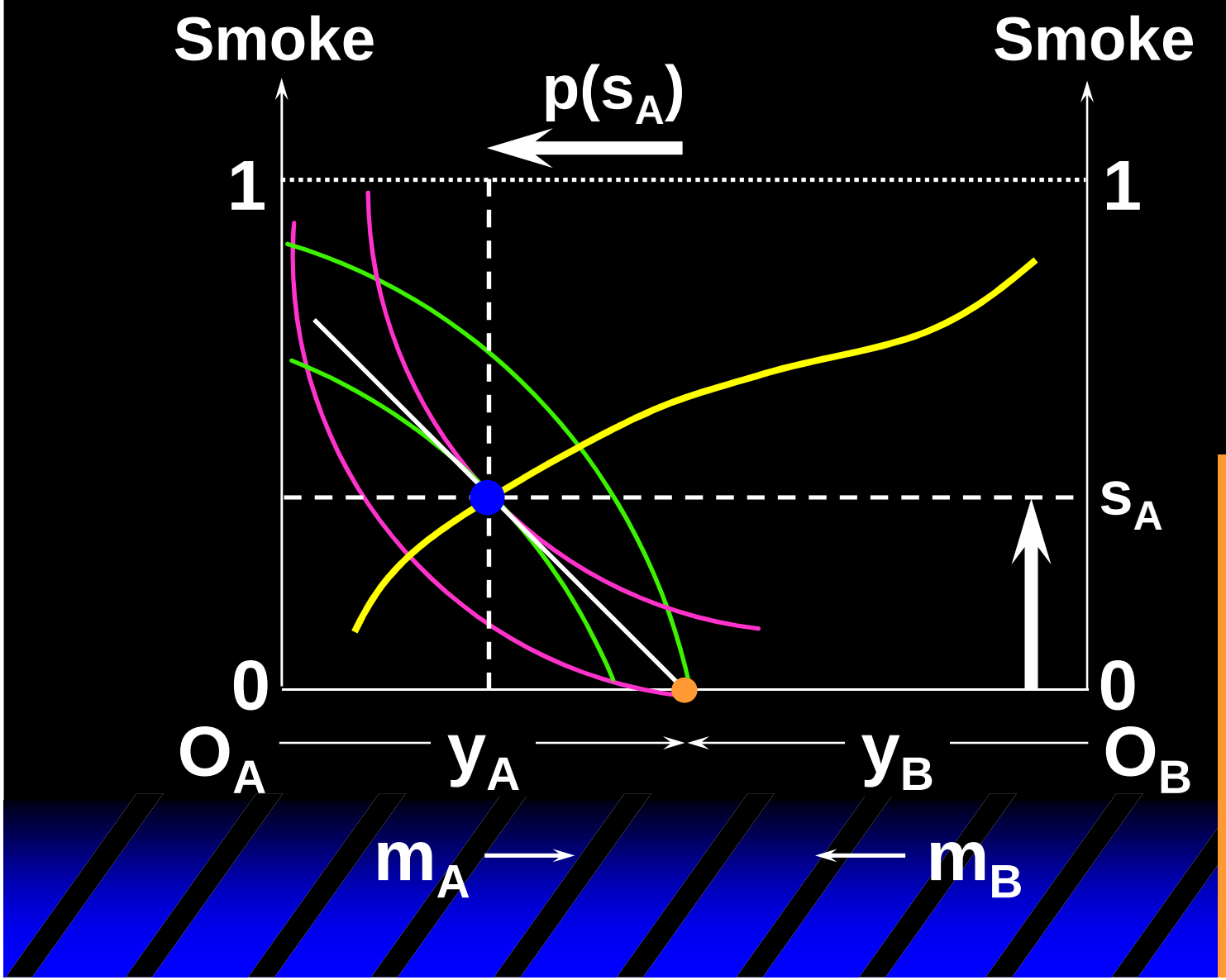
Externalities and Property Rights

- **Let $p(s_A)$ be the price paid by Agent A to Agent B in order to create a smoke intensity of s_A.**

Externalities and Property Rights



Externalities and Property Rights



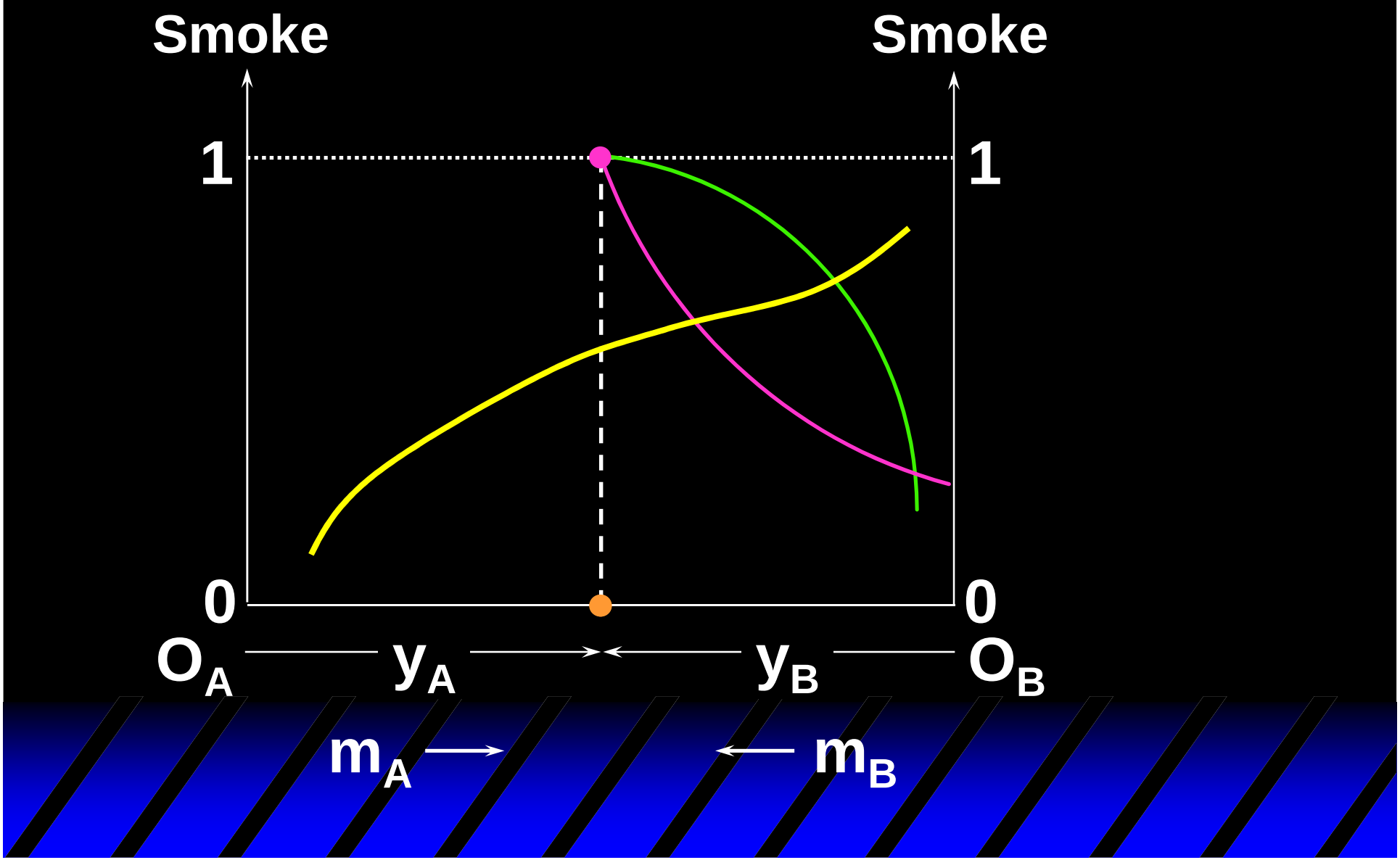
Both agents gain and there is a positive amount of smoking.

Establishing a market for trading rights to smoke causes an efficient allocation to be achieved.

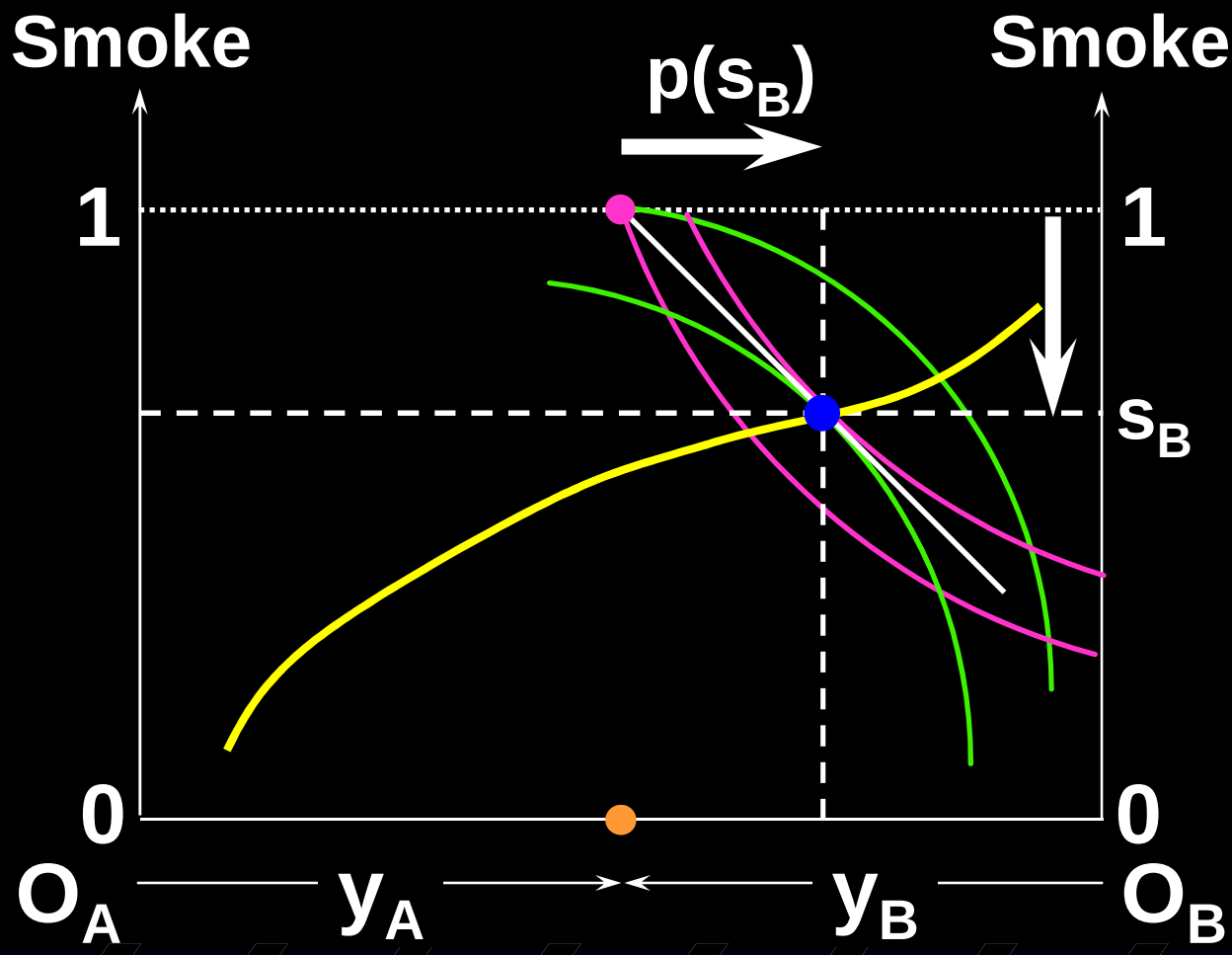
Externalities and Property Rights

- **Suppose instead that Agent A is assigned the ownership of the air in the room.**
- **Agent B can now pay Agent A to reduce the smoke intensity.**
- **How much smoking will there be?**
- **How much money will Agent B pay to Agent A?**

Externalities and Property Rights



Externalities and Property Rights

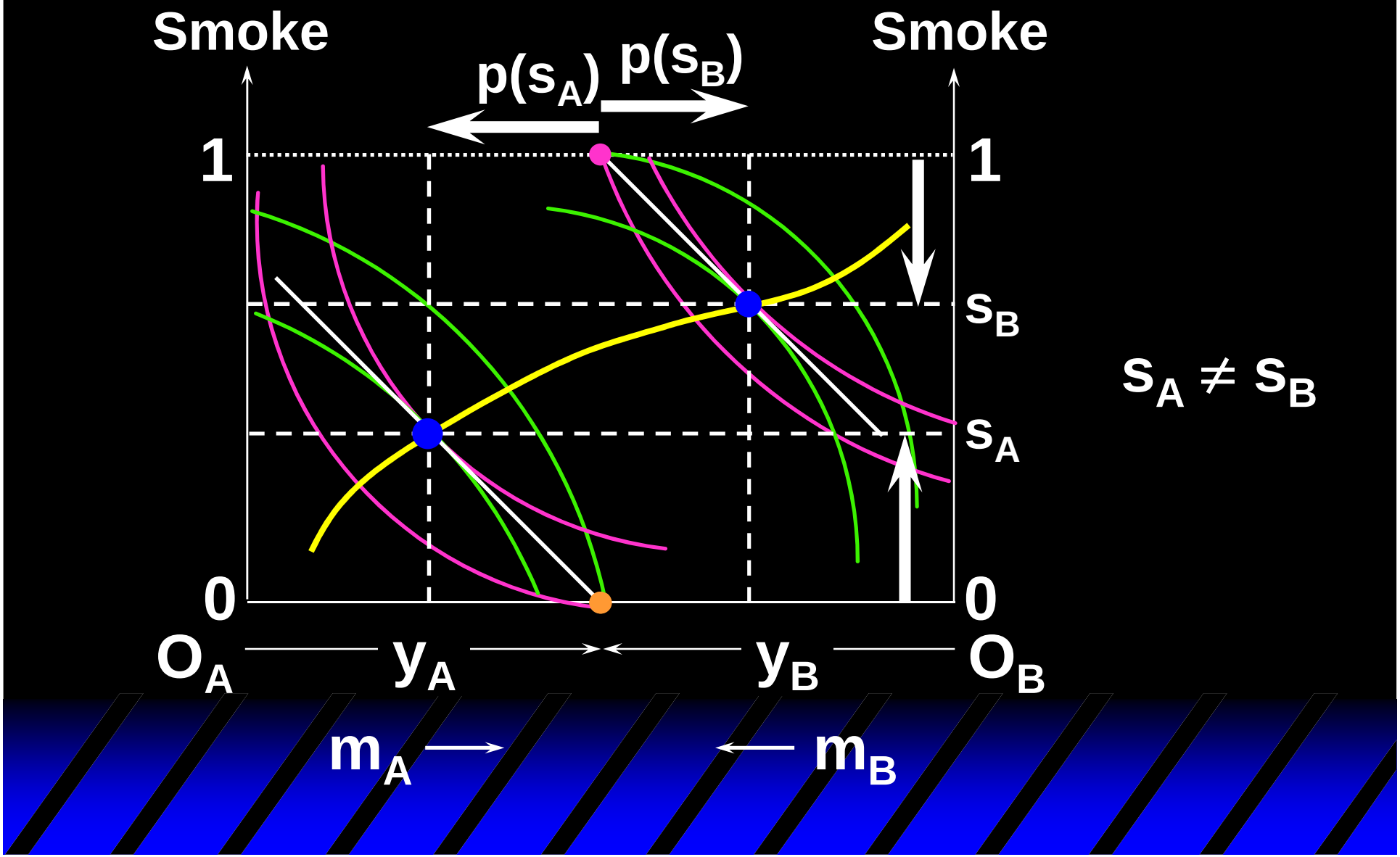


Both agents gain and there is a reduced amount of smoking.

Externalities and Property Rights

- **Notice that the**
  - **agent given the property right (asset) is better off than at her own most preferred allocation in the absence of the property right.**
  - **amount of smoking that occurs in equilibrium depends upon which agent is assigned the property right.**

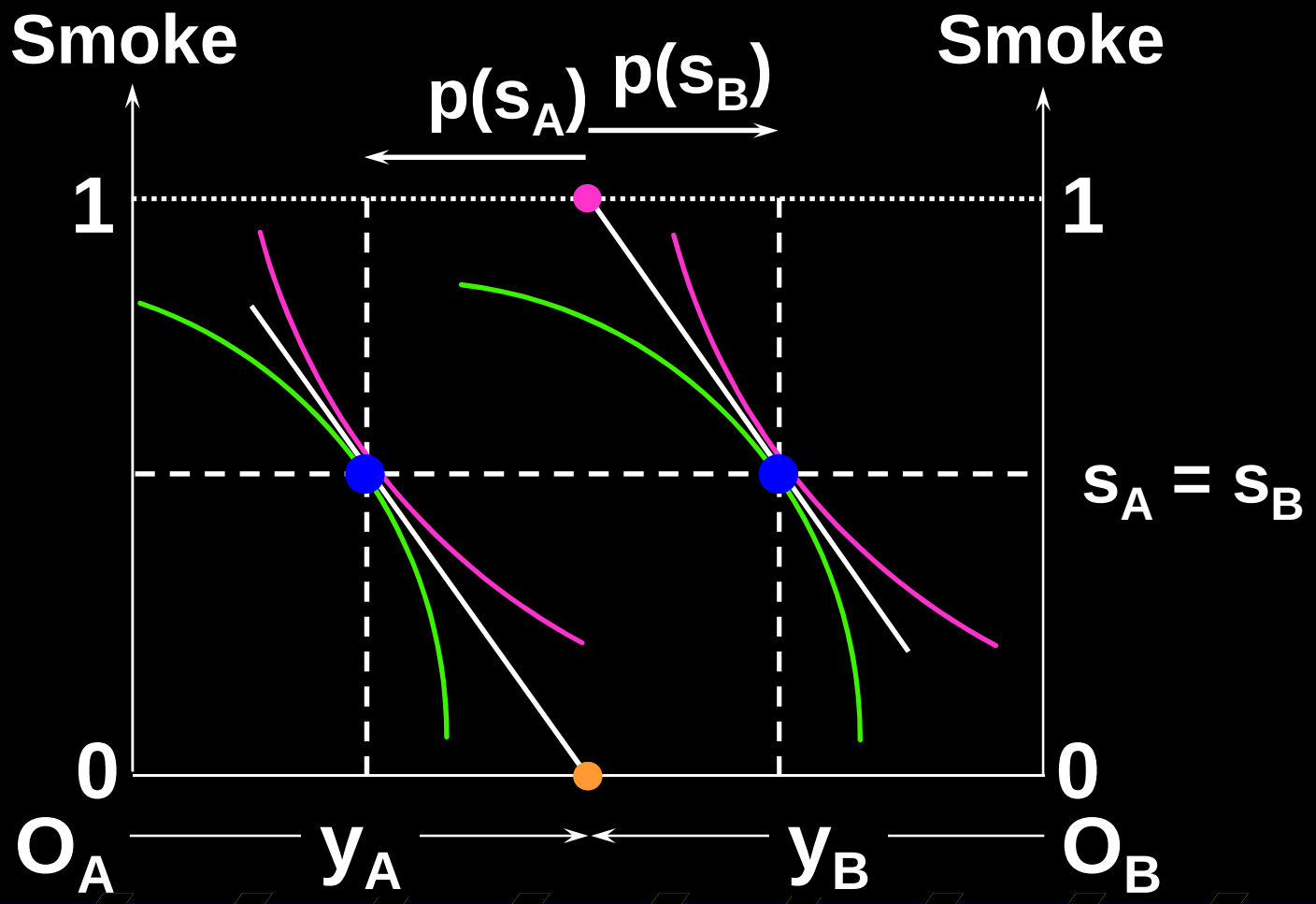
Externalities and Property Rights



Externalities and Property Rights

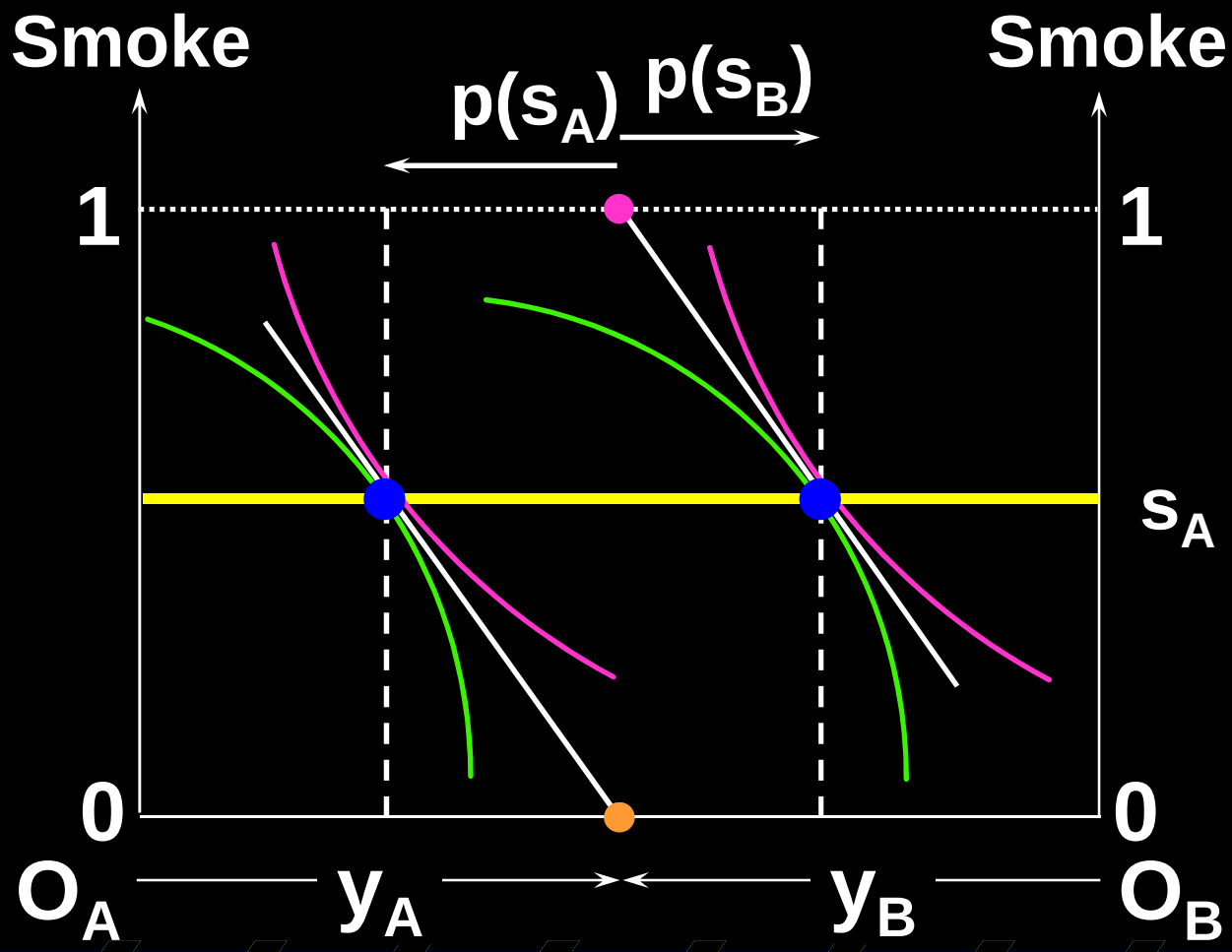
- **Is there a case in which the same amount of smoking occurs in equilibrium no matter which agent is assigned ownership of the air in the room?**

Externalities and Property Rights



For both agents, the MRS is constant as money changes, for given smoke intensity.

Externalities and Property Rights



So, for both agents, preferences must be quasilinear in money; U(m,s) = m + f(s).

Coase's Theorem

- **Coase's Theorem is: If all agents' preferences are quasilinear in money, then the efficient level of the externality generating commodity is produced no matter which agent is assigned the property right.**

Coase and Production Externalities

- **Coase argues that the externality exists because neither the steel firm nor the fishery owns the water being polluted.**
- **Suppose the property right to the water is created and assigned to one of the firms. Does this induce efficiency?**
- **If profit is quasi-linear in money, Coase's Theorem states that the same efficient allocation is achieved whichever of the firms was assigned the property right. (And the asset owner gets richer.)**

Network externalities

- many goods in contemporary economy have a network nature
  - utility depends on other elements of the network
  - in particular it depends (in a positive way) on the number of users
- examples: telecommunications, IT

Network externalities

- Positive externalities can be restricted to clients of a given firm
- Examples:
  - Microsoft aims to make it impossible to open Open Office files by MS Office and vice versa
  - High rates for inter-network connections
- Additionally, firms may increase switching costs (e.g. moving numbers between networks)

Re-monopolization in networks

- **Popularization of a given standard and its closing by a firm…**
- **… coupled with high switching costs…**
- **… severely restricts access to the market for other firms**

→ a monopoly might arise

Theoretical ways to correct an erroneous market allocation

Pigouvian Tax: Imposing a tax equal to the difference between the marginal social cost (MSC) and the marginal private cost (MPC) for the optimum (in the situation of an external cost) or granting a subsidy equal to the difference between the marginal social benefits (MSB) and marginal private benefits (MPB) for the optimum (in the situation of external benefits).

PT= MEC(Qs)=MSC(Qs) – MPC(Qp)

PS= MEB(Qs)=MSB(Qs) – MPB(Qp)