



Module: Public Sector Economics

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Externalities and Property Rights

Externalities

- An externality occurs whenever an individual or firm undertakes an action that has an effect on another individual or firm for which the latter is not paid or does not pay

Externalities

- Positive externality – An action of an individual or firm which confers benefits on others but for which the latter does not pay
- Negative externality – An action of an individual or firm which confers costs on others but for which the latter is not paid

The Reciprocal Nature of Externalities

- Example 1 Chapter 3 - Polinsky
 - A factory is located beside a residential area
 - The smoke from the factory dirties the households' laundry
 - What should the policy reaction be?

The Reciprocal Nature of Externalities

- Example 1
 - Historically, the economic and legal view toward such a situation was simple & clear
 - **The factory's smoke was harming the residents' laundry therefore it ought to be restrained.**
 - Coase had a different view
 - His insight was that the above view completely overlooks the **reciprocal nature of the problem**

The Reciprocal Nature of Externalities

- Example 1
 - The factory's smoke **does** harm the residents' laundry but if we prevent it, we harm the factory
 - The central issue is who owns the **property right** to the quality of air in the area
 - The traditional view looked at the question in terms of causes and fairness
 - Coase looked at the question in terms of **efficiency**
 - The factory emits smoke, not for the purpose of harming the residents but in pursuit of its own livelihood
 - No matter what happens there will be harm to someone

The Reciprocal Nature of Externalities

- Example 1
 - Whether the harm caused to the residents by the smoke is greater than the harm caused to the factory if the smoke is prohibited is **strictly an empirical question**

The Reciprocal Nature of Externalities

- Example 1
 - A factory's chimney smoke causes damage to the laundry hung outdoors by five nearby residents
 - This smoke causes €75 worth of damage to each household ($5 \times €75 = €375$ in total)
 - The smoke damage can be eliminated by either of two ways
 - A smokescreen can be installed on the factory's chimney at a cost of €150, or
 - Each resident can purchase a dryer at a cost of €50 each (total $5 \times €50 = €250$)

The Reciprocal Nature of Externalities

- Example 1
 - The efficient solution is obviously to install a smokescreen. It eliminates total damages of €375 for a payment of €150 whereas purchasing five dryers would cost €250
 - But who pays?
 - This depends on who has the right to determine the quality of air
 - Do the residents have the right to clean air?
 - Or
 - Does the factory have the right to pollute?

The Reciprocal Nature of Externalities

- Example 1
 - If there is a “right to clean air”, then the factory has three choices
 1. Pollute and pay €375 in damages (€75 to each household)
 2. Install a smokescreen for €150
 3. Buy 5 dryers for the residents at €50 per dryer for a total outlay of €250
 - Clearly, the factory will install the smokescreen
 - This is the efficient solution
 - €375 worth of damages are eliminated at a cost of €150

The Reciprocal Nature of Externalities

- Example 1
 - If there is a “right to pollute” then the residents face three choices also
 1. Suffer collective damages of €375
 2. Buy a smokescreen for the factory at €150
 3. Buy a dryer each for a total outlay of €250
 - The residents will also chose to purchase the smokescreen
 - This is again the efficient solution
 - The important thing to notice here is that the efficient outcome will be achieved regardless of the assignment of the legal right

The Reciprocal Nature of Externalities

- Example 1
 - We can now state the “simple” version of the “Coase” Theorem or “Stigler’s version” of the “Coase” Theorem
 - “If there are zero transactions costs, the efficient outcome will occur regardless of the choice of legal rule”

The Reciprocal Nature of Externalities

- Example 1
 - An important element to note also, is that we have implicitly assumed that the residents could costlessly get together and negotiate with the factory
 - Is this true in reality?
 - In Coasean terms we have assumed “zero transaction costs”

The Reciprocal Nature of Externalities

- Example 1
 - Transaction costs generally include
 1. The cost of identifying the parties with whom one has to bargain
 2. The cost of getting together with them
 3. The costs of actually bargaining with them
 4. The costs of observing and enforcing any bargain reached

The Reciprocal Nature of Externalities

- Example 1
 - Note, the choice of legal rule does not affect the attainment of the efficient solution when there are zero transactions costs **BUT** it does affect the distribution of income
 - Depending on the legal rule either the factory or the residents pay for the smokescreen
 - **This is a very important point**

The Reciprocal Nature of Externalities

- Example 1
 - The assumption of zero transaction costs is unrealistic
 - What happens if transaction costs are positive?
 - To consider this, say, for example, it costs each resident €60 in transaction costs (e.g. travel, time, legal advice, etc.)

The Reciprocal Nature of Externalities

- Example 1
 - If the residents have a right to clean air, the factory again faces the choice of paying damages, buying a smokescreen or buying dryers
 - The factory again would buy the smokescreen – the efficient solution

The Reciprocal Nature of Externalities

- Example 1
 - But, if the factory has the right to pollute?
 - The household faces three choices
 1. Put up with the pollution at a cost of €75 in disutility for each household (€375 in total)
 2. Buy a dryer for €50 (a total outlay of €250)
 3. Buy a smokescreen for €150 and incur €60 each in transactions costs (Total of €150 + €60x5 = €450)
 - Each resident will purchase a dryer – an inefficient solution
 - Given the transactions costs described – the right to clean air is efficient, while the right to pollute is not

The Reciprocal Nature of Externalities

- Example 1
- The “Complex” Coase theorem:
 - “If there are positive transactions costs, the efficient outcome may not occur under every legal rule. In these circumstances, the preferred legal rule is the rule that minimises the effects of transaction costs”
 - **Or equivalently**
 - “Efficient laws and social institutions are the ones that place the burden of adjustment to externalities on those who can accomplish adjustment at least cost”

Coase v Pigou

- Example 1
 - The factory if it produces, imposes a cost of €375 on the householders
 - The factory loses €300, if it can't produce (householders' rights)
- The householders can buy dryers. The cost is €150. ($\text{€}30 \times 5$)
- Smokescreen unavailable (for now)
- Cost of negotiation is €140 ($5 \times \text{€}28$)

Coase v Pigou

- Example 1
- If the situation is conceived, as it was historically, as perpetrator-victim scenario, then the factory's smoke is causing pollution and therefore he ought to be taxed.
- The tax forces the factory to internalize the cost & bring about an optimal allocation of resources.
- Simply, the factory is the polluter and should be taxed. (Effectively householders' rights)

Coase v Pigou

- The factory should be taxed according to the amount of damage it is causing (householder's rights)
- The factory has the following options
 - Option 1 – continue production & pay tax. Net personal return is €300-€375=-€75 (net social return -€75)
 - Option 2 – Stop production immediately to avoid tax (householder's benefit from clean air, net social outcome is €375)
 - Option 3 - negotiate with householders to install dryers, net personal return is €300-€150-€140=€10 (net social return is €375+ €10=€385)
 - Option 3 is chosen (social return is €385)

Coase v Pigou

- If **no tax is levied**, the factory produces and the households have the following options. (factory's rights)
 - Option 1 – Residents suffer in silence (-€375). The factory produces (€300). Net social outcome is -€75
 - Option 2 - households install dryers (net social return is $\text{€}300 + \text{€}375 - \text{€}150 = \text{€}525$)
 - Option 2 is chosen (net social return is €525)
- *Coase shows that Pigouvian Tax may not be efficient*

Coase v Pigou

- Suppose now that smokescreens come on the market at a cost of €50.
- The government levies a tax on pollution equal to the damage (householders' rights)
- The factory faces a tax of €375 that can be avoided by installing a smokescreen for €50

Coase v Pigou

- Factory has the following options (householders' rights)
 - Option 1 – Produce & pay tax. Net personal return is $\text{€}300-\text{€}375=-\text{€}75$ (net social return $-\text{€}75$)
 - Option 2 – Stop production, avoid tax (householders hang out washing, net social return 375)
 - Option 3 - negotiate with householders to install dryers so net personal return is $300-140-150=10$
 - Option 4 – Install smokescreen at a cost of €50 (net personal return of €250; net social return of $\text{€}300-\text{€}50+\text{€}375=\text{€}625$)
 - Option 4 is chosen (social return €625)

Coase v Pigou

- If **no tax is levied**, the factory produces and the households have the following options. (factory's rights)
 - Option 1 – Suffer in silence (The factory produces, net social outcome is -€75)
 - Option 2 - households install dryers (net social return is $\text{€}300 + \text{€}375 - \text{€}150 = \text{€}525$)
 - Option 3 – households negotiate with factory to install smokescreen (net social return is $\text{€}375 - \text{€}50 - \text{€}140 + \text{€}300 = \text{€}485$)
 - Option 2 is chosen (net social return is €525)

Solutions to externalities

- Internalisation
- Negotiation
- Legal System
- Pigouvian Taxes/Subsidies
- Marketable Permits
- Regulation

The Reciprocal Nature of Externalities

- Example 2 Chapter 17 - Frank
 - A doctor and a confectioner have their premises next to one another.
 - The noise from the confectioner's machine disrupts the doctor while examining his patients
 - What should the policy reaction be?

The Reciprocal Nature of Externalities

- Example 2
 - Historically, the economic and legal view toward such a situation was simple & clear
 - **The confectioner's noise was harming the doctor therefore it ought to be restrained.**
 - Coase had a different view
 - His insight was that the above view completely overlooks the **reciprocal nature of the problem**

The Reciprocal Nature of Externalities

- Example 2
 - The confectioner's noise **does** harm the doctor but if we prevent it, we harm the confectioner
 - The central issue is who owns the **property right** to the level of noise in the building
 - The traditional view looked at the question in terms of causes and fairness
 - Coase looked at the question in terms of **efficiency**
 - The confectioner makes noise, not for the purpose of harming the doctor but in pursuit of his own livelihood
 - No matter what happens there will be harm to someone

The Reciprocal Nature of Externalities

- Example 2
 - Whether the harm caused to the doctor by the noise is greater than the harm caused to the confectioner if the noise is prohibited is **strictly an empirical question**

The Reciprocal Nature of Externalities

- Example 2 **Situation 1**
 - Benefit to confectioner of baking (makes noise) is 40
 - The doctor loses 60 if the confectioner makes noise
 - If the **confectioner** is made liable (**Doctor's rights**) for his noise he has two options
 - Option 1 – continue to bake and pay compensation, i.e. earn 40, pay compensation of 60 for a net return of -20
 - Option 2 – shut down, i.e. earn 0
 - Confectioner will choose option 2 & Doctor will practice
 - Benefit to society is 60

The Reciprocal Nature of Externalities

- Alternatively, if the confectioner is not liable for noise, he can continue to produce (value 40)
(confectioner's rights)
- What will the doctor do?
 - Option 1 - He can shutdown and earn 0 (social return 40)
 - Option 2 - He can pay the confectioner to shutdown. The doctor will produce 60 out of which he will pay the confectioner an amount P which will be greater than 40 but less than 60
 - Doctor chooses option 2
- Lets say the doctor pays the confectioner 50
- The confectioner gets 50, 10 more than if he stayed open and the doctor receives 10, 10 more than if he had to shutdown (social return 60)

The Reciprocal Nature of Externalities

The Reciprocal Nature of Externalities

- Example 2 **Situation 2**
- This is the same as the previous example except the confectioner now has access to soundproofing equipment at a cost of 20
- If the confectioner is liable for the noise (**doctor's rights**) the confectioner will install the soundproofing equipment and earn 20 ($40 - 20$)
- His alternatives are to shutdown (earn 0) or pay compensation for making noise ($40 - 60 = -20$)
- Social outcome: 20 (earned by confectioner) + 60 (earned by doctor) = 80

The Reciprocal Nature of Externalities

- If the confectioner is not liable for the noise (**confectioner's rights**) What happens?
- It will be in the doctor's interest to pay the confectioner to install the soundproofing
- His alternative is to shutdown (earn 0)
- The minimum payment (P) confectioner would be willing to accept is 20 (cost of installation) while the most the doctor would be willing to pay is 60 (the amount he would lose if it weren't installed)
- Social outcome: $60-P$ (net amount doctor gets) + $(20+P)$ (amount confectioner gets) = 80

The Reciprocal Nature of Externalities

- Again, we see that the assignment of legal rights does not effect the efficiency of the outcome but does effect the distribution
- **Simple Coase Theorem:** When parties affected by externalities can negotiate costlessly with one another, an efficient outcome results no matter how the property rights are defined

The Reciprocal Nature of Externalities

- Example 2 **Situation 3**
- We now assume that the doctor can move his examination room to the other side of the building where he won't be affected by the noise. The cost is 18
- The doctor can now eliminate the damage at the lowest cost
- If the confectioner is liable (**doctor's rights**) he will offer a payment to the doctor of at least 18 but not more than 20 (the cost of the confectioner installing his own soundproofing)
- Social payoff: Doctor $(60-18+P)$ + confectioner $(40-P) = 82$

The Reciprocal Nature of Externalities

- If the confectioner is not liable (confectioner's rights) the doctor will rearrange his office at his own expense (18)
- Social outcome: Doctor ($60-18=42$) + confectioner (40) = 82
- Again, efficient outcome reached but distribution different

The Reciprocal Nature of Externalities

- Example 2 **Situation 4**
- We now assume that the parties must face negotiation costs of 25
- If the confectioner is liable (**doctor's rights**) he has the following options
 - Option 1 – continue production and pay compensation $40-60=-20$ (doctor can't practice)
 - Option 2 – install soundproofing at cost of 20 so net return is $40-20 = 20$ (Social return is $20+60=80$)
 - Option 3 – negotiate with doctor to move office $40-25-18=-3$ (social return $-3 +60=57$)
 - Option 2 chosen – Social return is 80

The Reciprocal Nature of Externalities

- Example 2 **Situation 4**
- If the confectioner is not liable, the doctor has the following options
 - Option 1 – Stop practice (social return is $0+40=40$)
 - Option 2 – move office at a cost of 18 so his net return is 42 (social return is $42+40= 82$)
 - Option 3 – negotiate with confectioner to install soundproofing so net return is $60-25-20=15$ (social return is $15+40=55$)
 - Option 2 is chosen (social return is 82)

The Reciprocal Nature of Externalities

- Example 2 **Situation 4**
- We see in this example that the assignment of property rights does matter to efficiency and that liability should be left with the party that can accomplish adjustment at the least cost
- The “Complex” Coase theorem:
 - “If there are positive transactions costs, the efficient outcome may not occur under every legal rule. In these circumstances, the preferred legal rule is the rule that minimises the effects of transaction costs”
 - **Or equivalently**
 - “Efficient laws and social institutions are the ones that place the burden of adjustment to externalities on those who can accomplish adjustment at least cost”

Solutions to externalities

- Internalisation
- Negotiation
- Legal System
- Pigouvian Taxes/Subsidies
- Marketable Permits
- Regulation

Coase v Pigou

- Example 2 **Situation 5**
 - Benefit to confectioner of baking (makes noise) is 40
 - The doctor loses 60 if the confectioner makes noise
- The doctor can move his examination room to the other side of the building where he won't be affected by the noise. The cost is 18 (We assume for simplicity that the confectioner has no access to soundproofing)
- Cost of negotiation is 25

Coase v Pigou

- Example 2 **Situation 5**
- If the situation is conceived, as it was historically, as perpetrator-victim scenario, then the confectioner's noise is causing pollution and therefore he ought to be taxed.
- The tax forces the confectioner to internalize the cost and bring about an optimal allocation of resources.
- Simply, the confectioner is the polluter and should be taxed. (Effectively Doctor's rights)

Coase v Pigou

- The confectioner should be taxed according to the amount of damage he is causing (Doctor's rights)
- The confectioner has the following options
 - Option 1 – continue production and pay tax. Net personal return is $40-60=-20$ (net social return is -20)
 - Option 2 – Stop production immediately to avoid tax (Doctor can practice, net social outcome is 60)
 - Option 3 negotiate with doctor to rearrange office so net personal return is $40-25-18=-3$
 - Option 2 is chosen (social return is 60)

Coase v Pigou

- If there is no tax levied, the confectioner will continue production as normal. (Confectioner's Rights)
- The doctor has the following options
 - Option 1 – Stop production (Only confectioner produces, net social outcome is 40)
 - Option 2 - doctor rearranges his office (net return social is 60- $18+40=82$)
 - Option 2 is chosen (net social return is 82)
- ***Coase shows that Pigouvian Tax may not be efficient***

Coase v Pigou

- Suppose now that soundproofing for confectionery machines comes on the market at a cost of 10.
- If the government levies a tax on noise equal to the damage, the confectioner faces a tax of 60 that can be avoided by installing soundproofing for 10

Coase v Pigou

- The confectioner has the following options
 - Option 1 – continue production and pay tax. Net personal return is $40-60=-20$ (net social return is -20)
 - Option 2 – Stop production immediately to avoid tax (Doctor can practice, net social outcome is 60)
 - Option 3 - negotiate with doctor to rearrange office so net personal return is $40-25-18=-3$
 - Option 4 – Install soundproofing at a cost of 10 (net personal return of 30; net social return of $60+30=90$)
 - Option 4 is chosen (social return is 90)

Conclusion

- Policy should be determined on a strictly empirical basis
- The “Complex” Coase theorem:
 - “If there are positive transactions costs, the efficient outcome may not occur under every legal rule. In these circumstances, the preferred legal rule is the rule that minimises the effects of transaction costs”
 - Or
 - “Efficient laws and social institutions are the ones that place the burden of adjustment to externalities on those who can accomplish it at least cost”