

# Public Goods as a Compensation in Cartel Offenses

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# Overview

- Public interest can be often thought of as a public good
- → We can model it
- Question of cartelisation and public interest becomes a cost-benefit analysis
  - Costs of allowing a cartel to form vs. benefit of public good production
- **When is allowing such a cartel a good idea?**
  - Efficiency/Consumer welfare/Fairness

## Research Questions: Who Benefits?

- Consumers damaged by the price increase caused by the cartel formation and consumers benefiting the most from the public good provided can be very different groups
- What is the level of public good produced by the cartel that would compensate different consumers?
- How does it depend on the preferences and wealth of the affected consumers?
- Do firms have an incentive to form a cartel when providing this compensation?

# Public Interest and Public Goods

- Public goods
  - Non-excludable
  - Non-rivalrous
  - Street lights, natural beauty, clean air
- Overlap with "public interest"
- Often in cases of interest
  - Shrimp cartel, Closure of power plants

# Model Setup

- Two consumers with given wealth
- Can spend endowments on
  - Public good
  - Private good
  - Composite commodity
- Exogenous prices (for now)
- Different marginal utilities of goods' consumption

# Model Setup

- Find the consumers' utilities pre- and post- price increase of the private good
- Find the amount of public good that would compensate the consumers for the utility loss
- Investigate the determinants of the size of the compensation
- Compare the cartel provision of public goods with a Lindahl equilibrium

# A Simple Model

- Two consumers  $\{1, 2\}$
- Wealth endowments  $\{w_1, w_2\}$
- Heterogenous CES utilities:
  - Public good  $G$
  - Private good  $x$
  - Composite Commodity  $y$
- Set of prices  $\{p_G, p_x, 1\}$

## Consumer's Problem

$$\max_{G, x_i, y_i} \{a_i G^{1-\theta} + b_i x_i^{1-\theta} + c_i y_i^{1-\theta}\}$$

$$s.t. p_G G + p_x x_i + y_i \leq w_i + p_g G_{-i}$$

$$G_{-i} \leq G$$

- $G$  is the public good

$$G = g_i + g_{-i} + g_N + g_F$$

- Provided by consumers, nature, cartelised firms
- $x_i$  is the good produced by the (possibly cartelised) industry
- $y_i$  is a composite commodity representing the remainder of the economy
- $a_i, b_i, c_i$  determine marginal utilities



## Consumer's Purchases of the Public Good

- Consumer  $i$  purchases the public good iff

$$f_1(p_G, p_x, \frac{b_i}{a_i}, \frac{c_i}{a_i}, \theta)w_i > f_2(p_G, p_x, \frac{b_{-i}}{a_{-i}}, \frac{c_{-i}}{a_{-i}}, \theta)(w_{-i} + p_g G - c)$$

- High enough (relative) wealth
- High enough (relative) preference for the public good  $a_i$
- Low provision by nature (and/or the cartel)
- Otherwise nature (and cartel) are the only providers of  $G$

- Find the Nash equilibrium with the given price  $p_x$  (unique, Nett and Peter (1993))
- A price increase occurs  $p_x \rightarrow q_x$  ("cartel formation")
- The price increase is accompanied by some (firm) public good provision  $g_F$
- Compare the two Nash equilibria in terms of consumer utility, and find the  $g_F$  necessary to keep the consumer on the same utility level
- Prices of the public good and the composite commodity assumed constant

# Compensation in Equilibrium without Consumer Contributions

$$g_F^{NC1} = \left\{ \frac{w_1^{1-\theta}}{a_1} \times [f_3(p_x, q_x, b_1, c_1, \theta)] + g_N^{1-\theta} \right\}^{\frac{1}{1-\theta}} - g_N$$

- Is the necessary compensation to keep the consumer 1 on the same utility level as before the price increase
- Wealthy people who do not like the public good are harder to compensate
- Wealth distribution does matter for the necessary compensation if we do not want any consumer to suffer
- So does preference heterogeneity (worst case:  $\frac{a_1}{b_1}$  low and  $\frac{a_2}{b_2}$  high when consumer 1 is the wealthy one)
- This necessary compensation is always positive

## Compensation in Equilibrium with Consumer Contributions

$$g_F^{NC1} = \frac{(w_1 + w_2 + p_g g_N)}{p_g} \times [f_4(p_G, p_x, q_x, a_1, a_2, b_1, b_2, c_1, c_2, \theta)]$$

- Is the necessary compensation to keep the consumer 1 on the same utility level
- Preference heterogeneity plays a similar role
- Preferences of the other consumer now matter for the compensation
- Independent of wealth distribution (Warr (1983), Bernheim (1986), Itaya et al. (2002))
- $g_F^{NC1}$  can be negative if the other consumer likes the public good (relatively) a lot

# Lindahl Equilibrium

- Individuals pay for the public good according to their marginal benefit
  - Find out consumer's true valuation of the public good
  - Calculate individual prices so that everyone demands the same level of the public good
  - Charge individual prices for the amount of public good produced
- Pareto efficient
- Generally quite acceptable concept
- But: very hard to implement in practice
- Even though incentive compatible schemes do exist (Walker (1981))

# Lindahl equilibrium

$$p_{g1}g_P + p_x\left(\frac{b_1p_{g1}}{a_1p_x}\right)^\rho(g_P + g_N) + \left(\frac{c_1p_{g1}}{a_1}\right)^\rho(g_P + g_N) = w_1$$

$$p_{g2}g_P + p_x\left(\frac{b_2p_{g2}}{a_2p_x}\right)^\rho(g_P + g_N) + \left(\frac{c_2p_{g2}}{a_2}\right)^\rho(g_P + g_N) = w_2$$

$$p_{g1} + p_{g2} = p_g$$

- $\{p_{g1}, p_{g2}\}$  are the individual prices
- $g_P = g_1 = g_2$  is the level of public good paid for by the consumers
- Wealthy consumers face a higher individual price
- Consumers with stronger preference towards the public good face a higher individual price

# Summary

- With price increase  $p_x \rightarrow q_x$ , the cartelised firms need to produce more public good in order to keep all consumers on pre-cartel utility level if
  - Preference heterogeneity is high
  - Wealth distribution is unequal and consumer do not privately finance the public good
- The scheme is relatively more beneficial for the consumer who
  - Has lower wealth (on par with Lindahl Equilibrium)
  - Likes the public good relatively more (not on par with Lindahl Equilibrium)

# Firms and Cartel Formation

- So far only exogenous price increases  $p_x \rightarrow q_x$
- Market structures generate them
- Simplest scenario: a cartel in a previously perfectly competitive industry agrees on monopoly pricing
- The required compensation has to be lower than the increase in profits, otherwise the firms would not have an incentive to form the cartel in the first place
- Increase in the required compensation (e.g. with increase in wealth inequality) suggests that profitability of the potential cartel shrinks
  - But: change in profits
  - Case by case
- What makes cartels produce the public goods?
  - Government policy: not being able to form the cartel otherwise



## Concluding Remarks

- A Cartel to provide public goods as a compensation for the price increase can help offset the public good coordination problem
- Cartel as a tax?
- Alternative means can do at least just as good: tax the private good
- Necessary compensation can rise above any limit