Toulouse School of Economics

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Comments on Gulli’s paper: Environmental policy under imperfect competition in vertical related energy markets

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Main result(s) of the paper

- **Environmental policy may increase rather than decrease pollution.**
  - **A model with a dominant firm and a fringe**
  - **Two technologies ($c_a<c_b$ but $r_a>r_b$); dominant firm has technology 'a'**
  - **Initial equilibrium: monopoly price on residual demand**
  - **After tax equilibrium: price = marginal cost of the fringe**

- **Argue that it is likely on electricity markets.**

The basic mechanism

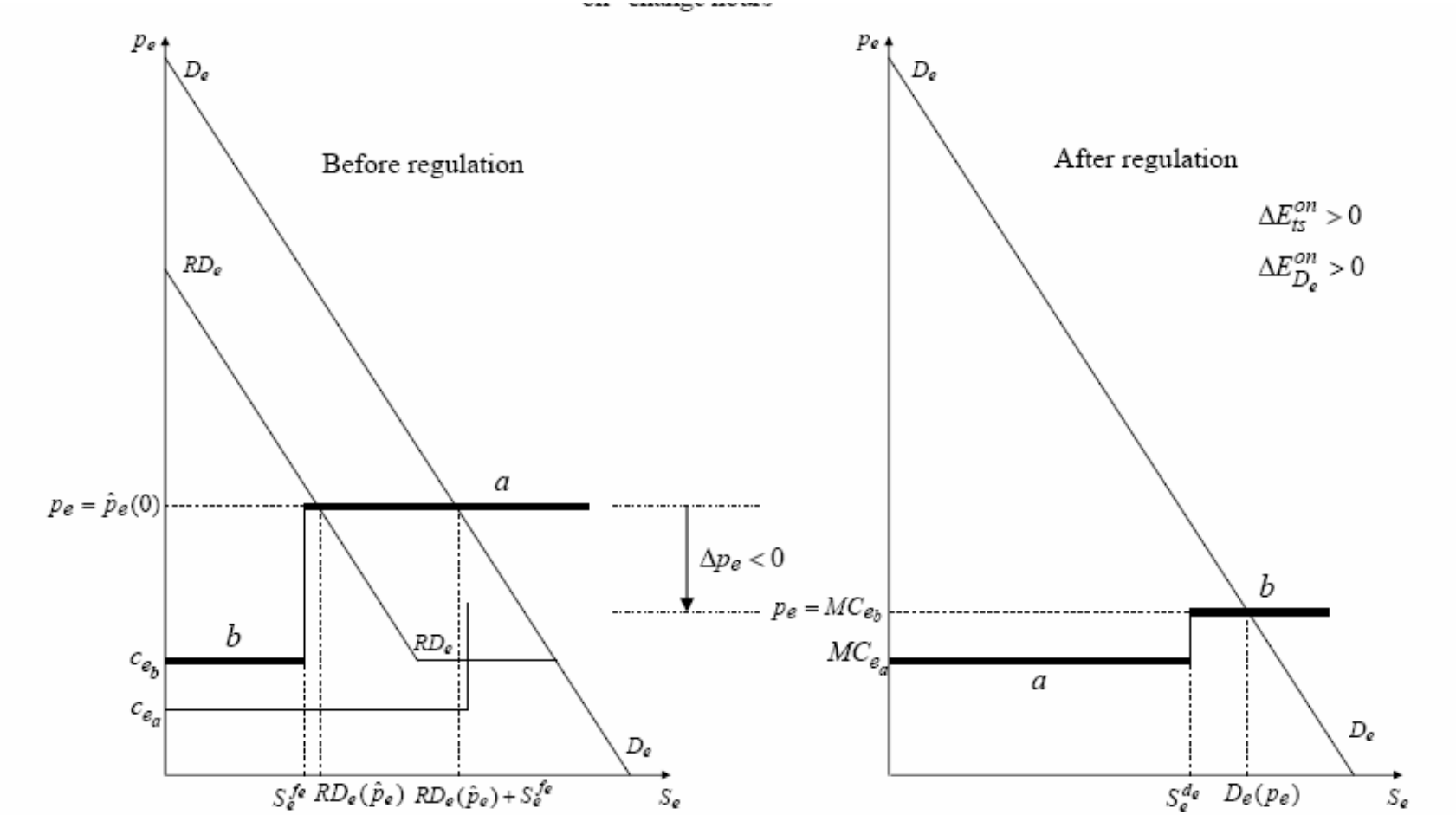

Figure 3. Change in emissions in the on-change hours (decreasing market power)

The basic mechanism

- Dominant firm c_a, fringe c_b
- Before regulation: $(p^0-c_a)*(D(p^0)-Q_f)>(c_b-c_a)*Q_d$
- Switch after regulation: $(p^1-c_a-\blacklozenge r_a)(D(p^1)-Q_f)<(c_b+\blacklozenge r_b-c_a-\blacklozenge r_a)*Q_d$
- **Necessary condition $(p-c_a)<(c_b-c_a)/(1-r_b/r_a)$**
- Given your assumptions on r_b and r_a : **$(p-c_a)<2(c_b-c_a)$**
- More emission means: $[D(p^0)-Q_f]r_a+r_bQ_f<r_aQ_d+[D(c_b+r_b)-Q_d]r_b$

Remarks about the main result

- Cf. Levin (1985). In a Cournot duopoly, if firms are sufficiently ‘different’, raising an emission tax can cause more pollution (aggregate output goes down but the most polluting firm increases its production). See also survey by Requate (2005).

- Welfare analysis
  - Monopoly case: optimal tax lower than marginal damage.
  - In your case, perhaps better in term of welfare to have the switch in production as electricity price will go down.

The whole model

- Ingredients
  - Different technologies with different level of pollution $c_a<c_b$ but $r_a>r_b$
  - No abatement technology
  - Input market (gas) non competitive (dominant firm + fringe)
  - Output market (electricity) non competitive (dominant firm + fringe)
  - Different ‘regimes’ of demand (on peak, off peak)
- Too many ingredients? Ad-Hoc assumptions.
- Difficult to exactly evaluate the role of the different ingredients (notations do not help…). Perhaps consider explaining first the basic mechanism and then add other ‘ingredients’.

Input Market (1)

- Pricing rule:
  - Dominant firm sets a price such that the buyer is indifferent between using gas or an alternative fuel in the long run
  - Equality between long run marginal costs including investment costs as well as the tax rate (or its equivalent if ETS)
  - Avoid entry of the competitor, a limit pricing rule

Input market (2)

- **Remarks / Questions:**
  - What do you consider exactly …. Seems to be a long term contract with firms producing electricity… but you solve it first ? TIMING??
  - No link with the downstream market (the demand is not considered)!!
  - Why a dominant firm model rather than an upstream monopoly?
  - What about the link between the market considered and the other gas markets (arbitrage)
  - What about the strategy of alternative fuel producer(s)?

Output market (1)

- Dominant firm and fringe
  - 2 technologies a (coal) and b (gas) $c_a<c_b$ but $r_a>r_b$
  - Marginal cost is $c_a+♦*r_a$
  - Fixed capacities, short run competition
  - **Exogenous maximum price. However does depend on ♦▭**
  - Demand varies along the day. However, only one case is central for the analysis
  - Dominant firm chooses between
    - Maximum price
    - Marginal cost of least efficient technology
  - From the equilibrium, compute the level of pollution. Key issue is obviously the quantity produced at equilibrium and the technology used.

Output Market (2)

- Questions / Remarks
  - **Maximum price is completely ad-hoc**. Why do you introduce it?
  - **Why the elasticity of demand does not play a role in the results ???**
  - You argue it is likely to have an increase in emissions. Given the data you provide and the basic mechanism described before, it does not seem it is likely (however, I do not have all the parameters to verify and in particular demand elasticity as well as cost parameters).