UNIVERSITÉ TOULOUSE 1 CAPITOLE

TSE
Toulouse School of Economics
École d'économie de Toulouse

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SESSION 1

MASTER 1

INTERNATIONAL ECONOMICS
(durée 1h30)

M. F. CALMETTE

Lundi 6 mai 2013 ~ 16h00 - 17h30

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Consider a model of two identical countries (i,j), and a polluting industry consisting of one firm in each country. Pollution is purely local. Assume one unit of polluting emission for each unit of output and let γ denote the marginal damage resulting from one unit of emission/production.

The firms' technologies are described by a same constant marginal cost affected by environmental regulation. For simplicity, assume that the marginal cost of production coincides with the environmental tax t on emissions.

In each country, there is an identical linear demand: $P = a - Q$ (with $a > \gamma$) where Q is the global consumed quantity in each country.

Markets are segmented and firms must pay a linear per-unit trade cost, S, if they export.

In a first stage, each country's regulator assesses a pollution tax, (t_i, t_j) on emissions in order to maximize social welfare which is the sum of consumers' surplus, profits plus tax revenues, net of the global environmental damage.

In a second stage, firms set their output in order to maximize their profit and compete non-cooperatively on both markets when trade costs and pollution taxes are low enough to allow trade (where q_{ii} (respectively q_{jj}) are the quantities produced by each firm in country i (respectively j) for the domestic market and q_{ij} (q_{ji}) are the quantities produced by each firm in country i (j) and exported in country j (i)).

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I- Autarky: assume that trade cost is so high that firms are not able to export

1) What are, in autarky, the taxes t_{iA}, t_{jA} set by governments . What are the quantities produced by firms, the price and profits? What are the characteristics of the taxes? Comment.
2) What are the necessary conditions on S and γ to obtain the autarky equilibrium?

II-Open market: assume now that trade cost decreases and firms are able to export

1) Given emission taxes t_i and t_j, firms maximize their profit separately on each segmented market. What are the Cournot reaction functions? Re-write the reaction functions in terms of the emission taxes.
2) Write the four conditions allowing competition between domestic and foreign firms on both markets. Represent these four conditions in a graphic in the space t_i, t_j, for $a=5$, $S=1$. Define the areas of autarky, of two-way-trade, of one-way-trade. Explain why we can assert that an environmental policy can be a *"strategic trade policy"*.
3) Given the equilibrium behavior of firms (using I.1)) write the reaction functions ($t_i = f(t_j)$ and $t_j = f(t_i)$) obtained from the non cooperative game between governments and deduce the symmetric Cournot-Nash equilibrium taxes with two-way trade.
4) Write the necessary conditions on S and γ to obtain the open market Cournot-Nash equilibrium.