

Horizontal mergers: Merger in the salmon market

Unilateral effects in Cournot markets with differentiated products

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This presentation represents a personal view and does not necessarily reflect the view of the Conseil de la concurrence.

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The framework

Market for salmon

- Quantity competition (Cournot competition)
- Scottish salmon and Norwegian salmon are differentiated

The unilateral effects in Cournot competition with one homogeneous good (no capacity constraint)

At the equilibrium, the mark-ups of the firms are linked to the concentration of the market.

- Concentration measure: $HHI = \sum_k s_k^2$, where s_k is the market share of firm k .
- Mark-up measure (Lerner Index): $L = \sum_k s_k \frac{p - c_k}{p}$



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The framework (continued)

The unilateral effects in Cournot competition with one good

Relationship between the Lerner Index and the HHI

$$L = -\frac{d \ln p}{d \ln q} \cdot HHI \quad (1)$$

- Equation (1) comes from the FOC of the program of the firms.
- With 1 good:

$$\frac{d \ln p}{d \ln q} = \frac{1}{\frac{d \ln q}{d \ln p}} = \frac{1}{\varepsilon}$$

with ε : elasticity of quantity to price



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The framework (continued)

The unilateral effects in Cournot competition with one good

$$L = -\frac{HHI}{\varepsilon}$$

Goal of the analysis: extension of the link between Lerner Index and HHI to several goods (no capacity constraints).

Main caveat

With M goods: $p_i = p_i(q_1, \dots, q_j, \dots, q_M)$

$$\frac{\partial \ln p_i}{\partial \ln q_j} \neq \frac{1}{\frac{\partial \ln q_j}{\partial \ln p_i}}$$

$\frac{\partial \ln p_i}{\partial \ln q_j}$: known as the 'flexibility' of the price p_i to quantity q_j

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The relationship between flexibilities and elasticities

To analyze the unilateral effects in Cournot competition, one has to deal with flexibilities.

- Let F be the matrix of flexibilities (generic term: $f_{ij} = \frac{\partial \ln p_i}{\partial \ln q_j}$)
- Let E be the matrix of elasticities (generic term: $\varepsilon_{ij} = \frac{\partial \ln q_i}{\partial \ln p_j}$)
- The relationship between flexibilities and elasticities is:

$$F = E^{-1}$$

p- and q-substitutes

If $\varepsilon_{ij} > 0$: goods i and j are p-substitutes

If $f_{ij} < 0$: goods i and j are q-substitutes

There is no general equivalence between p- and q- substitutes

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Generalization of the Lerner-HHI relationship

- M goods (i, j : index of good)
- Let S be :

$$S = \begin{pmatrix} s_1 & 0 & \dots & \dots & 0 \\ 0 & \ddots & \ddots & 0 & \vdots \\ \vdots & \ddots & s_i & \ddots & \vdots \\ \vdots & 0 & \ddots & \ddots & 0 \\ 0 & \dots & \dots & 0 & s_M \end{pmatrix}$$

- s_i : market share of good i . $s_i = \frac{p_i q_i}{\sum_j p_j q_j}$
- In the case of two goods (Scottish/Norwegian salmon):

$$S = \begin{pmatrix} s_S & 0 \\ 0 & s_N \end{pmatrix}$$



Generalization of the Lerner-HHI relationship (continued)

- Let H be :

$$H = \begin{pmatrix} \sum_k s_{k1}^2 & & \dots & & \\ & \ddots & & \sum_k s_{ki}s_{kj} & \\ \vdots & & \sum_k s_{ki}^2 & & \vdots \\ & \sum_k s_{ki}s_{kj} & & \ddots & \\ & & \dots & & \sum_k s_{kM}^2 \end{pmatrix}$$

with s_{ki} : market share of firm k on market i

- Diagonal terms of H : HHI of each market
- Lerner index : $L = \sum_i s_i \cdot \left(\sum_k \frac{p_i - c_{ki}}{p_i} \right)$



Generalization of the Lerner-HHI relationship (continued)

The unilateral effects in Cournot competition with one good
Relationship between the Lerner Index and the HHI

$$L = -\frac{d \ln p}{d \ln q} \cdot HHI$$

The unilateral effects in Cournot competition with M goods
Relationship between the Lerner Index and the HHI

$$L = -tr(S.F.H)$$



A further look at flexibilities

- Slutsky's equation for elasticities :

$$\varepsilon_{ij} = \mathbf{s}_j(\sigma_{ij} - \varepsilon_{iY})$$

σ_{ij} : elasticity of substitution between i and j

ε_{iY} : income elasticity of good i

- Slutsky's equation for flexibilities :

$$f_{ij} = \mathbf{s}_j(\omega_{ij} + \delta_i)$$

ω_{ij} : elasticity of complementarity between i and j

δ_i : scale flexibility of good i . δ_i describes how marginal valuation of good i changes with expansions in the consumption bundle.



The case with 2 goods (S and N) with homothetic preferences

$$L = (1 + \omega_{SN})\bar{H} - \omega_{SN}(s_S H_S + s_N H_N)$$

- \bar{H} : HHI computed on the whole market(S+N) (market share in value)
- H_S : HHI computed on Scottish salmon producers
- H_N : HHI computed on Norwegian salmon producers
- If Scottish and Norwegian salmons are perfect substitutes :
 $\omega_{SN} = 0$
- If Scottish and Norwegian salmons are independent : ω_{SN} close to -1.

Conclusion : the Lerner index in the new equilibrium is a weighted average of two polar cases (perfect substitutability and independence)

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Evaluation of the unilateral effects of the operation

Strategy of evaluation (3 steps) :

- **Polar case #1: S and N are perfect substitutes.**

Academic studies conclude that the elasticity of demand for salmon could be, at worst, close to -1. The maximal variation of the HHI is 540. The Conseil de la concurrence concluded that in the worst case scenario (elasticity of -1 and $\Delta HHI = 540$), the unilateral effects of the operation would be limited.

- **Polar case #2: S and N are independent.**

One has to consider the effects of the operation on each product. Unilateral effects on Scottish salmon might be high (high concentration before the operation and variation of the HHI greater than 1,000). (No data on costs to perform an estimation of the variation of the HHI.)



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Strategy of evaluation (continued) :

- Evaluation of the degree of substitutability

The Conseil de la concurrence had not sufficient data to proceed to a quantitative evaluation of the elasticity of complementarity. However, qualitative findings of significant imperfect substitutability between Scottish and Norwegian salmons.

Smokers

22.5% of the demand in volume.

Smokers cannot do without Scottish salmon: their strategy is to propose a complete diversified range of smoked salmons.

Conclusion

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The proposed remedies

- Sale of production capacities equivalent to 19,000 tonnes in Scotland.
- **Consequence** : Market share would be limited to 30% (equivalent to the level that Marine Harvest already had before the operation)
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