Competitive effects of state aid in oligopoly

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Abstract

Competitive effects of state aid are analysed in an oligopoly with differentiated goods. In period 1, firms invest in vertical product improvement. In period 2, they compete. State aid may then harm competitors even if it does not affect pricing directly. Since investments are strategic substitutes, aid that reduces the cost of capital will allow the recipient to increase investment at the cost of its rivals. It may then sell more at a higher price while the rivals sell less at a lower price. The recipient becomes dominant. Aid could be predatory if given in large amounts. Sequential investment has the same effect as state aid and so a period of protected existence may be considered state aid.

Keywords: State Aid, Oligopoly, Non-price effects.
JEL: H25, L1, L4

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1 Introduction

State aid is illegal in the European Union if it “distorts or threatens to distort competition by favouring certain undertakings” and if it affects trade between member states. Members of the EU must inform the European Commission of intentions to grant state aid in order that the aid may be evaluated. Firms that receive state aid that has not been exempted from the general prohibition by the European Commission may be requested to pay back the aid. This has happened recently, for example in the case of Olympic Airways.

On 11 December 2002, the European Commission decided that aid previously granted by Greece to Olympic Airways was illegal. The European Commission had authorised aid by Greece in 1994 and 1998 but Olympic Airways had misused the aid and had also received new illegal aid, giving it an unjustifiable competitive advantage. As a result, the European Commission asked the Greek authorities to recover the incompatible aid granted after 1998.

Previous literature has focused more on competition between member states to grant state aid. Collie (2000) examines the effect of state aid in an integrated market using a symmetric Cournot duopoly model where one firm is located in each member state. He shows that the prohibition of state aid may very well increase overall welfare thus providing a rationale for a general ban of state aid. In contrast with this model of symmetric oligopoly I focus on how state aid distorts competition, giving firms that receive state aid a competitive advantage. The resulting equilibrium is by nature asymmetric, unless state aid is entirely absent. In addition, while Collie (2000) assumes that the effect of state aid is to lower the receiving firm’s marginal costs, I show that there may be important non-price effects of state aid that seriously harm non-receivers. It could be argued that much of the state aid that is granted does not affect variable or marginal costs directly so that an immediate conclusion would be that competition is not affected. This is not correct if firms can or must undertake investments to increase demand.

1 Article 87(1) states that: “Save as otherwise provided in this Treaty, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, insofar as it affects trade between Member States, be incompatible with the common market.” Exemptions from this general provision may be granted if the aid serves 1) to assuage abnormally low standards of living or serious unemployment, 2) “to promote the execution of an important project of common European interest or to remedy a serious disturbance in the economy of a Member State;” 3) to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest; 4) to promote culture and heritage conservation where such aid does not affect trading conditions and competition in the Community to an extent that is contrary to the common interest.

2 Other recent cases include the decision to order Electricité de France (EdF) to repay a record €1.2 billion unlawfully received in tax breaks granted by the French government and to scrap state guarantees that give the company an unfair advantage in financial markets (December 17, 2003); and a decision to sue the French government for its failure to recover a large state loan from IT company Bull (October 2, 2003).

3 See Besley and Seabright (1999) for a survey of possible reasons for and effects of state aid.
The motivation for this study is the state aid received by firms that operate in industries where investments that enhance demand or industries where investments that reduce marginal costs are important. This could be industries such as airlines or television. For airlines, state aid in terms of financial advantages and slots allocations may increase the attractiveness of the recipient’s services, thus giving it a competitive advantage. For the TV industry, state aid in terms of financial packages and e.g. must-carry obligations can have competitive effects on the market for TV commercials that provide the major source of revenue for purely commercial channels.

The paper is organized as follows: In the next section I set up a basic model that captures the main features of competitive effects of state aid. I show that state aid has a negative impact on rivals even if it does not affect pricing directly through a lowering of the marginal costs. State aid leads the recipient to invest more and the rival to invest less in the quality of programming. The recipient firm’s price adjusted for the increase in quality is lower than when a level playing field obtains. Since the resulting equilibrium of the asymmetric oligopoly is rather complicated, I turn to numerical examples that illustrate the size of the loss under various assumptions of competition and state aid. I then turn to a number of extensions of the model and treat different industries in which the competitive effects of state aid have been important. The last section concludes.

2 A Model of the Competitive Effects of State Aid

Assume that firms engage in a two-stage game. First, at stage 1 the firms invest in product innovation or quality possibly spending state aid on this innovation. This investment shifts out the demand curve facing the investing firm. Second, at stage 2 the firms compete. First assume that they compete in prices à la Bertrand and then that they compete in quantities à la Cournot.

Competition for commercials is modelled by a simple extension of a standard model of oligopoly. In period 2, two firms, 1 and 2, engage competition with differentiated products facing the following inverse, derived demand curve:

\[ p_i = \alpha_i(I_i) - \beta_i q_i - \gamma_i q_j, \quad \alpha_i > 0, \frac{\partial \alpha_i}{\partial I_i} > 0, \beta_i > |\gamma_i| > 0, i, j = 1, 2; i \neq j \tag{1} \]

where \( p_i \) is the price set by firm i, \( q_i \) is the corresponding quantity sold, \( \alpha_i \) is the demand intercept and, if different from \( \alpha_j \), a measure of vertical product differentiation. If \( \alpha_j > \alpha_i \), then firm j is perceived as providing a better quality than firm i. The relation between the parameters \( \gamma \) and \( \beta \), on the other hand,

4The numerical calculations are found in an appendix that is available from the author upon request.
5The basic model is the same as the one used by Møllgaard & Lorentzen (2004). See also Hansen et al. (1996).
measures the degree of horizontal product differentiation, i.e. customer preferences for a given brand independently of quality levels. If $\gamma/\beta$ is close to unity, products are perceived as almost perfect substitutes and price competition is fierce; if $\gamma = 0$, products are independent in demand and the firms are essentially monopolists; if $\gamma < 0$, products are complements and the two firms are in fact not competitors but ‘complementors’.

The marginal cost of firm $i$ is $c_i$ and constant with respect to the quantity. How these costs may be related to state aid will become apparent below.

2.1 Modelling state aid

What is state aid? In the EU it is resources that – directly or indirectly is granted from state source and that provide the recipient with an economic advantage over others that it would not have enjoyed in their normal course of business.\(^6\) According to the European Commission, state aid comes in four broad categories:

A Direct transfers to firms, e.g. grants, interest subsidies, and tax reductions;
B Equity participation and debt conversion;
C Saved interest payments, e.g. as a result of tax deferrals; and
D Guarantees.

In order to determine whether a given item is state aid, the Commission applies the Market Economy Investor Principle (MEIP) that state aid is given when the terms of the funds are more favourable than those a private investor would request from a similar firm under normal market conditions.

Thus I model state aid as reducing the cost of capital to the firm. Simply assume that if a firm wants to invest an amount $I_i$ at stage 1, it would have to pay the market rate $r_1$. The interest payment due at stage 2 is then $r_1 I_i$. If firm 2 has access to state aid it will pay an interest rate, $r_2$, below the market rate: $r_2 \leq r_1$.

2.2 Bertrand competition

When the strategic variables of the second stage are prices, it may now be shown that, conditional on both firms being active, equilibrium profits are:

$$\pi_i = \frac{\beta}{\beta^2 - \gamma^2} \left[ \frac{(2\beta^2 - \gamma^2)(\alpha_i - c_i) - \beta\gamma(\alpha_j - c_j)}{4\beta^2 - \gamma^2} \right]^2 - r_i I_i$$

(2)

Observe that

$$\frac{d\pi_i}{d(\alpha_j - c_j)} = -\frac{2\beta^2\gamma}{\beta^2 - \gamma^2} \frac{(2\beta^2 - \gamma^2)(\alpha_i - c_i) - \beta\gamma(\alpha_j - c_j)}{4\beta^2 - \gamma^2} < 0$$

(3)

\(^6\)See http://europa.eu.int/comm/competition/citizen/citizen_stateaid_en.html
That is, anything that increases the rival’s product quality, \( \alpha_j \), or decreases the rival’s marginal cost, \( c_j \), will hurt the profits of the firm. State aid that reduces a rival’s marginal costs will thus directly hurt the firm. This is how the competitive effect of state aid is modelled in Collie (2000). However, it is rare that state aid takes a form that directly affects marginal costs. In the following, state aid is modelled as reducing the cost of capital (the interest rate) affecting competition through investments.

In period 1 firms must invest in vertical product quality (say, TV programmes that increase the value of a minute of advertising). The investment increases \( \alpha_i \) but this investment exhibits diminishing returns: \( \alpha'_i = d\alpha_i(I_i)/dI_i > 0, \alpha''_i = d^2\alpha_i(I_i)/dI_i^2 < 0 \). The firms now maximize profits, \( \pi_i(I_i) \), with respect to their own investment in that they have to borrow the amount of the investment in the first period to pay it back in the second at the interest rate \( r_i \). Alternatively, \( r_i \) represents the opportunity cost of the investment. The first order conditions are:

\[
2\beta(2\beta^2 - \gamma^2)\{(2\beta^2 - \gamma^2)(\alpha_i - c_i) - \beta\gamma(\alpha_j - c_j)\}\alpha''_i = (\beta^2 - \gamma^2)(4\beta^2 - \gamma^2)^2 r_i \tag{4}
\]

Since \( \alpha_i(I_i) \) is a concave, increasing function of \( I_i \), this shows that the investment will be decreasing with increasing interest rate, \( r_i \). To find a closed solution we assume that the demand intercepts measuring the vertical product differentiation (qualities as perceived by the customers) depend on the respective investments as follows:

\[
\alpha_i(I_i) = \alpha_0 + \sqrt[4]{I_i} \tag{5}
\]

so that \( \alpha'_i = 1/(2\sqrt[4]{I_i}) \) and \( \alpha''_i = -\frac{1}{4}I^{-3/2} \). We assume that \( \alpha_0 > c_i, i = 1, 2 \). In this case (4) leads to the following reaction functions

\[
I_i^B(I_j) = \left( \frac{-\beta(2\beta^2 - \gamma^2)(\alpha_0 - c_i) + \beta^2\gamma(2\beta^2 - \gamma^2)(\alpha_0 - \sqrt[4]{I_j} - c_j)}{\beta(2\beta^2 - \gamma^2) - (4\beta^2 - \gamma^2)^2(\beta^2 - \gamma^2) r_i} \right)^2 \tag{6}
\]

These reaction functions are down-sloping provided that the second order conditions hold:

\[
r_i > r^B \equiv \frac{\beta}{\beta^2 - \gamma^2} \left( \frac{2\beta^2 - \gamma^2}{4\beta^2 - \gamma^2} \right)^2, \quad i = 1, 2 \tag{7}
\]

That is, we need that the interest rate attains a minimum of \( r^B \). If the second order condition does not hold, then the firm(s) for which it is violated will either invest infinitely much or not at all and we will not find an equilibrium with both firms active.

\[\text{7 A mathematically equivalent formulation is that the investment is in process innovation lowering the marginal costs: } c_i(I_i) = c_i - \sqrt[4]{I_i}. \text{ The relevant term that enters profits will again be } (\alpha_0 + \sqrt[4]{I_i} - c_i). \text{ The ensuing analysis thus holds for investments in both product innovations (quality improvements) and process innovations (reductions of marginal costs).} \]
We find that equilibrium investments become a relatively complicated function of all the parameters of the model \((\alpha_0, \beta, \gamma, c_1, c_2, r_1 \text{ and } r_2)\):\(^8\)

\[I_{B*}^* = \left[ \frac{\{\beta(2\beta^2 - \gamma^2)\}^2}{\text{d}^2} \right] \]

Due to the complexity of the expressions, equilibrium profits are calculated using numeric methods after the section on Cournot competition.

2.3 Cournot competition

When the strategic variables of the second stage are quantities rather than prices, it may be shown that equilibrium profits are:

\[\Pi_i^C = \beta \left[ \frac{2\beta(\alpha_i(I_i) - c_i) - \gamma(\alpha_j(I_j) - c_j)}{4\beta^2 - \gamma^2} \right]^2 - r_i I_i \] (9)

Observe that

\[\frac{d\Pi_i^C}{d(\alpha_j - c_j)} = -\frac{2\beta\gamma}{4\beta^2 - \gamma^2} q_i^C < 0 \] (10)

where \(q_i^C\) is the Cournot equilibrium quantity of firm \(i\). I.e. as for Bertrand competition, anything that increases the rival’s product quality, \(\alpha_j\), or decreases the rival’s marginal cost, \(c_j\), will hurt the Cournot profits of the firm.

In the first stage, the firm now maximizes \(\Pi_i^C(I_i, I_j)\) with respect to \(I_i\). Solving the first order conditions leads to the following reaction functions:

\[I_i^C(I_j) = \left( -\frac{4\beta^2(\alpha_0 - c_i) - 2\beta^2\gamma(\alpha_0 + q_j I_j - c_j)}{4\beta^2 - (4\beta^2 - \gamma^2)\gamma^2 r_i} \right) \] (11)

This is a down-sloping function on the assumption that the second order condition is satisfied:

\[r_i > r_i^C \equiv \frac{1}{\beta} \left( \frac{2\beta^2}{4\beta^2 - \gamma^2} \right)^2 \] (12)

Comparing (7) with (12), it is easy to show that \(r_B > r_C\), so that the second order condition is more demanding for Bertrand than for Cournot competition. In other words, if the second order condition of the Bertrand case is satisfied then the second order condition for the Cournot case is also automatically satisfied.

The equilibrium investment for firm \(i\) is

\[I_i^{C*} = \left[ \text{subject to} \quad \frac{-4\beta^3(4\beta^3 - (4\beta^2 - \gamma^2)r_j - \beta\gamma^2)(\alpha_0 - c_i) - 2\beta^2\gamma(4\beta^2 - \gamma^2)r_j(\alpha_0 - c_j)}{(4\beta^3 - (4\beta^2 - \gamma^2)\gamma^2 r_1)(4\beta^3 - (4\beta^2 - \gamma^2)\gamma^2 r_2) - (2\beta^2\gamma)^2} \right] \] (13)

\(^8\text{For details, see the appendix that is available from the author upon request.}\)
3 Numerical examples

As an illustrative numerical example, consider the situation in which we fix the parameters at $\alpha_0 = 2, \beta = 10, \gamma = 7.5, c_1 = c_2 = 1$ and $r_1 = 0.10$, corresponding with a 10 per cent interest rate. In the Bertrand case, the intercept of firm 1 in equilibrium depends on the rate of interest paid by its rival as indicated in Figure 1:

If a level playing field obtains so that both firms pay a 10 per cent interest on their loan, they would both want to borrow $I_1 = I_2 = 0.0432$. If the rival receives state aid so that the interest rate is lower than the market rate (and possibly negative, if the "loan" does not have to be paid back in full), then that reduces the investment of the firm that does not receive state aid and increases the investment of the firm that receives state aid.

The numerical examples are summarized in Table 1. First consider the case of relatively little horizontal product differentiation ($\gamma = 7.5$, so that $\gamma/\beta$ is at .75) and Bertrand competition. If both firms face the same cost of capital ($r_1 = r_2 = 0.10$) then a level playing field obtains; prices, quantities, investments and profits will be identical. However, if firm 2 – the recipient – receives state aid corresponding to a drop in its cost of capital of only 1 percentage point, then the recipient will increase its investment by more than 40 per cent, while the non-receiving firm will decrease its investment by more than 20 per cent since investments are strategic substitutes. The increased investment will allow the recipient firm to increase both its quantity and its price compared with the level playing field. However, the quality-adjusted price, $p_2/\alpha_2(I_2)$, will be lower than in the situation without state aid. For this reason, the non-receiving firm will have to decrease its price and quantity, so it loses market share. The profit of the recipient increases by 14 percent while the non-receiving firm will suffer a loss of a similar size compared with the level playing field.
In fact, if the state aid reduces the recipient’s cost of capital corresponding to 3.5 percentage points (\(r_2 = 0.065\) down from 0.10), then the non-receiving firm’s profit is reduced to virtually zero. An even bigger reduction will result in a loss and the non-receiving firm may be forced out of the market. In this more extreme case, state aid would be predatory.

Table 1: Competitive effects of state aid.

<table>
<thead>
<tr>
<th>(\alpha_0 = 2, \beta = 10, \gamma = 7.5, c_1 = c_2 = 1, r_1 = 0.10)</th>
<th>Bertrand</th>
<th>Cournot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aid recipient’s (r):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prices (p_1)</td>
<td>1.2416</td>
<td>1.2233</td>
</tr>
<tr>
<td>(p_2)</td>
<td>1.2416</td>
<td>1.2638</td>
</tr>
<tr>
<td>Quantities (q_1)</td>
<td>0.0552</td>
<td>0.0510</td>
</tr>
<tr>
<td>(q_2)</td>
<td>0.0552</td>
<td>0.0603</td>
</tr>
<tr>
<td>Investments (I_1)</td>
<td>0.0432</td>
<td>0.0345</td>
</tr>
<tr>
<td>(I_2)</td>
<td>0.0432</td>
<td>0.0621</td>
</tr>
<tr>
<td>Profits (\pi_1)</td>
<td>0.0090</td>
<td>0.0079</td>
</tr>
<tr>
<td>(\pi_2)</td>
<td>0.0090</td>
<td>0.0103</td>
</tr>
</tbody>
</table>

The last two columns show that these effects prevail in Cournot competition, but that they are less pronounced compared with Bertrand. The recipient’s investment goes up while that of the rival goes down, see Figure 2. This allows the recipient to increase its quantity, gaining market share, while the competitor has to reduce it. Again, the recipient’s price will increase while that of the recipient will fall. The recipient’s profits increases at the expense of the rival.

The results hold even if the degree of substitutability is lower. The competitive effects are, as one would expect, smaller since the two firms compete less fiercely. However, as long as the two products are not independent in demand (\(\gamma = 0\)), these competitive effects will prevail.
4 Extensions

In this section I consider a few extensions of the model and its interpretation. First, I consider the case of sequential investment decisions. Then I discuss how the public service obligation should be defined and how much aid it should justify. Third, I discuss welfare effects of state aid and compare it with the welfare obtained in the level playing field. Fourth, I apply the model to various industries, interpreting the results of the model in the light of EU cases.

4.1 Sequential investment decisions

State aid may be granted in the subtle way that the recipient is allowed to start operations and thus invest before the other firm is allowed to start operations. This may be modelled by letting firm 2 set $I_2$ before firm 1 sets $I_1$ so that firm 2 has achieved a leader role in terms of investment. The results of this are summarized in Table 2.

<table>
<thead>
<tr>
<th>Effect on:</th>
<th>Bertrand</th>
<th>Cournot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$p_1$</td>
<td>1.2416</td>
<td>1.0953</td>
</tr>
<tr>
<td>$p_2$</td>
<td>1.2416</td>
<td>1.4538</td>
</tr>
<tr>
<td>Quantities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$q_1$</td>
<td>0.0552</td>
<td>0.0218</td>
</tr>
<tr>
<td>$q_2$</td>
<td>0.0552</td>
<td>0.1037</td>
</tr>
<tr>
<td>Investments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_1$</td>
<td>0.0432</td>
<td>0.0083</td>
</tr>
<tr>
<td>$I_2$</td>
<td>0.0432</td>
<td>0.4282</td>
</tr>
<tr>
<td>Profits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\pi_1$</td>
<td>0.0000</td>
<td>0.0012</td>
</tr>
<tr>
<td>$\pi_2$</td>
<td>0.0000</td>
<td>0.0042</td>
</tr>
</tbody>
</table>

Independently of whether competition is in prices or in quantities, firm 2 will exploit the first-mover advantage and invest much more than would otherwise be the case. Firm 1 will be hurt. For a common interest rate, so in the absence of state aid in the sense of lower cost of capital, allowing firm 2 a protected period of investment will have the same effect at direct state aid.

4.2 Public Service Obligation (PSO)

In its recent Altmarkt decision (Case C-280/00, Judgement of 24 July 2003), the European Court of Justice has attempted to clarify what amount of state aid a company that is subject to a PSO may be entitled to. The Court held that state aid in compensation of a PSO is legitimate provided that four conditions are satisfied, viz. that

1. the PSO is a real, clearly defined obligation;

2. the compensation scheme has been defined clearly in advance;

Table 2: Competitive effects of sequential investments.

\[ \alpha_0 = 2, \beta = 10, \gamma = 7.5, c_1 = c_2 = 1, r_1 = r_2 = 0.10 \]
3. the compensation scheme covers the cost of the PSO but taking into account both the revenues generated by the PSO and making allowance for a reasonable profit; and

4. the company is selected through a public procurement procedure or, failing this, the compensation is calculated on the basis of what would be required to make a well run firm take on this obligation.

Judging from state aid cases, one gets the impression that a PSO may be a fig leaf in relation to state aid. It is for this reason that it is important that the PSO is clearly defined not only in terms of legal terms but also in terms of the competitive effects.

The authority should use the Market Economy Investor Principle (MEIP) to evaluate how much compensation would be justified by the PSO. The PSO could be treated as something that reduces the value of the investment by firm 2. Assume that the effect is multiplicative, i.e. that when a PSO is imposed, an investment of $I_2$ will give rise to an addendum to the demand intercept of $\phi \sqrt{I_2}$ (or a similar reduction of the marginal costs), with $\phi < 1$. In this case, in order to avoid distorting competition, the level of state aid must be set to assure that $I_2 = I_2^*/\phi^2$. In the Bertrand case we may thus use the first-order condition for firm 2 (4) to ensure the right level of state aid:

$$r_2^B(\phi) = \frac{\phi^2 \beta (2\beta^2 - \gamma^2) (2\beta^2 - \gamma^2)(\alpha_2 + \sqrt{I_2^*/\gamma} - c_2) - \beta \gamma (\alpha_1 + \sqrt{I_1^*/\gamma} - c_1)}{(4\beta^2 - \gamma^2)^2}$$

where $I_2^{B*}$ is given by (8). Similarly in the case of Cournot,

$$r_2^C(\phi) = \frac{\phi^2 \beta^2 (2\beta^2 - \gamma^2)(\alpha_0 + \sqrt{I_2^*/\gamma} - c_2) - \gamma (\alpha_0 + \sqrt{I_1^*/\gamma} - c_1)}{(4\beta^2 - \gamma^2)^2}$$

A comparison of the two expressions reveals that firm two should receive more state aid in Cournot than in Bertrand in order to compensate for the PSO. Starting from the symmetric case in table 1, $r_2^C$ should be 10 per cent lower than $r_2^B$ for all values of $\phi$, i.e. independently of the size of the PSO. This is part of a more general proposition, that the state aid allowed to compensate a firm for its PSO should reflect the degree of competition, the degree of horizontal substitutability as well as other relevant market conditions.

### 4.3 Welfare effects

To be filled in.
4.4 Interpretation of the model in relation to different industries

4.4.1 TV Commercials

The market for TV commercials is scrutinized in the case of alleged state aid for Danish public broadcaster TV2.9 On 5 April 2000 the European Commission received a complaint from rival broadcaster TV Danmark alleging that the financing scheme of the period 1995-2002 should be regarded as illegal state aid. TV2 has a public service obligation (PSO) and the State of Denmark compensates it through a number of sources that commercial broadcasters could not obtain. These sources include licence-fee funds, transfers from public funds, exemption from corporate taxation, interest and installment-free establishment loans, state guarantees for operating loans, free transmission frequency and must-carry status.10

The European Commission has reached the tentative conclusion that

"without taking into account the public service obligation imposed upon TV2, the measures provide economic and financial advantages to TV2 that relieve TV2 from charges normally borne from its budget. The measures favour TV2 compared to its competitors not receiving the same funds, thereby distorting competition. All the measures, except the must-carry status, are granted through State resources. Furthermore, the measures affect trade between Member States, as they put TV2 in a more favourable condition compared to other undertakings, which are competing in intra Community trade." (European Commission, 2003, 2)

The European Commission cannot rule out that the State of Denmark overcompensates TV2 even if its PSO is taken into account. For this reason it has opened an investigation that may lead to the recovery of unlawful state aid from TV2.

The model above may be interpreted as a model of the market for TV advertising. Absent state, thus ignoring the effect of direct subscription, the main source of income for the competing TV channels arises from advertising. The product sold in this market is the number of viewers of commercials, see Bowman (1977). The underlying assumption is that better programming attracts more viewers and that a better coverage of all potential viewers also increases

9 For details on the case consult European Commission (2003a) that gives a summary of the case in English.
10 This means that TV2 is entitled to mandatory carriage rights on cable systems. The right of an EU member state to impose this obligation follows from Art. 31 in the Universal Service Directive (2002/22/EC) that also states that such "obligations shall only be imposed where they are necessary to meet clearly defined general interest objectives and shall be proportionate and transparent." In addition, the Member State "may determine appropriate remuneration, if any, ... while ensuring that ... there is no discrimination in the treatment of undertakings providing electronic communications networks."
the number of actual viewers. To advertisers, the value of advertising is increasing in the number of viewers, so TV channels may invest in better programming or improved coverage to attract more advertising. α2 may be interpreted as the reach of TV2 to TV viewers. Once the channels have invested, they compete in prices. There is horizontal product differentiation in the pricing game between TV channels, for example because viewers like variety.

In terms of the TV2/TV Danmark competition the model may explain not only why TV2 has a larger market share than TV Danmark, but also why the programming is of inferior quality: State aid allows TV2 to invest more in programming in order to attract more commercials. This forces TV Danmark to reduce investments in programming compared with the level playing field. TV Danmark thus becomes less attractive to advertisers.

Consistent with the predictions of the model, state-aid recipient TV2 has higher prices than its non-recipient competitors but is able to maintain a market share of more than fifty percent of the relevant market for TV commercials; see Competition Council, 2000. According to the media bureaus who intermediate TV commercials, TV2 has the highest price but it would not be possible to achieve a high reach without using TV2. The price of TV Danmark is 30-40 percent below that of TV2 according to their own estimates. TV2’s market share was on average 67 per cent during the five-year period 1995-1999, while the two main competitors’ shares were around 23 per cent (TV3) and 10 per cent (TV Danmark).12

The TV2 case involves a judgement as to what amount of state aid that may be justified by the PSO. This essentially requires an evaluation the extent to which the programming undertaken by TV2 corresponds with that of a private investor and a monetarisation of the non-pecuniary state aid (free transmission frequency and must-carry status).

4.4.2 Airlines

On 12 October 2000, HACA, the Hellenic Air Carrier Association, filed a complaint against with the European Commission against the Greek State for continued state aid for Olympic Airways SA. HACA organizes eight competitors to OA. The complaint included charges that OA received preferential treatment under Greek law in both financial and bureaucratic terms, see EU . Earlier, in its 1998 decision, the European Commission had concluded that it amounted to state aid when it “appeared that OA was not paying landing and parking fees...”, when “... Greece delayed unduly the abolition of OA’s exclusive right to operate domestic flights within continental Greece” and to countries outside the EEA and when “various provisions of Greek Law ... exempted OA generally from taxation inasmuch this was linked to the reorganisation of the structure of

11 See Nilssen and Sørgard (2001) for a richer model of the TV industry that takes into account the fact that viewers dislike advertising. My model is a closed-form version that assumes that improved programming attracts more viewers than the resulting advertising discourages.

12 See Competition Council (2000) at par. 105 and par. 24.
OA’s balance sheet.” (see par. 13 of the decision). The Commission also considers that ailing carriers are considered differently: OA has received preferential treatment in that bankruptcy and corporate legislation has been applied much more leniently than with regards to its rivals. Some of these elements of state aid involve a direct lowering of the marginal costs (landing and parking fees) while others reduce the cost of capital (including the more lenient approach to bankruptcy rules).

In the comments to the facts laid out by the Commission, Greece notes: "As for OA’s competitors, Greece fails to see why their financial difficulties should be attributed to the Greek State, as for instance in the case of Axon, it ceased operation solely on business grounds." (Par. 90) The model above shows that the competitive effects of state aid may indeed drive a non-receiving competitor out of business.

4.4.3 Trains

(Alstom – to be written)

4.4.4 Postal services

(Deutsche Post/UPS – to be written)

5 Conclusion

Economic models of state aid often assume that state aid reduces the recipient’s marginal costs. The competitive effects then arise because of a direct advantage from the state aid. Much state aid is, however, not given in a form that is in any way related to the marginal costs. Rather, it has the effect of lowering the recipient’s cost of capital. This may indeed be very harmful if demand-enhancing investments are important.

The main point of the paper is that state aid in this case will allow the recipient to gain market share and become dominant while charging higher prices and selling larger quantities compared with the level playing field. This is because the receiver’s quality-adjusted prices will be lower than without state aid. Non-receiving firms will be hurt. They are forced to reduce price, quantity and investment, effectively accepting the dominant firm’s leadership or dominance in terms of quality-adjusted prices. They suffer a loss of profits compared with the level playing field.

If the aid is sufficiently large, if the demand-enhancing investments in product quality are sufficiently important and/or if investments in cost-reducing process innovation are significant, then the non-receiving firm may be forced to leave the market. In this extreme case, state aid would be predatory.
References


