Strategies of an incumbent in a context of Gas Release

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Preliminary version

Abstract

European regulators are free to choose their own regulatory process. The only constraint is that they have to respect the overall rules edited by European Commission's directives. Some of these regulators want to accelerate the development of competition in their own market. In order to reach this objective, they use an asymmetric regulation at the expense of their main national operator (incumbent). This kind of regulation could be implemented in two ways on European gas markets: gas release programmes or market share constraints. Expected results of the liberalization (positive effect of competition with an incentive to efficiency and decreasing prices) don't naturally appear. One explanation is that natural gas markets have characteristics, as all network industries, which allow operators to adopt non-competitive behaviors.

The model proposed in this paper is based upon Cournot approach. The paper's aim is to analyze the behavior of an incumbent both when the regulation is asymmetric (gas release) and when it has to renegotiate its supplies. The case studied is the following. The incumbent negotiates its supply contracts. The regulator wants to increase competition after the observation of the opening rate of its national market. To facilitate the entry of competitors it imposes a gas release program to the incumbent. The latter must release part of its long-term contracts. In doing so, it becomes the supplier of the competitor. Then, they compete "à la Cournot" in a perfect and complete information game. They know that each one of them can be constrained by the amount of the gas released. Two effects, function of the part of released gas and of the overall quantities negotiated by the incumbent, are underlined. Surprisingly, there are some cases where the incumbent still has incentives to behave and renegotiate its long-term contracts "for the best", regardless of the duration of the asymmetric regulation. There are also some cases where the asymmetric regulation induces a raising rivals' cost strategy for the incumbent, i.e. it has no longer incentives to minimize its supply costs.

Keywords: gas release, strategic behavior, oligopoly markets, regulation, efficiency

JEL-codes : L13, L29, L59, L95

1 Introduction

In some european countries, regulators have decided to impose Gas Release (GR) programmes to their incumbents. This type of asymmetric regulation has not been include in the first or second directive. Each authority of regulation is free to choose this type of mesure. The Gas Release is the obligation for the incumbent to release quantities of gas, contracted by long term relations, to an other operator. It becomes the provider of its competitor who has an easy access to the ressource. These GR programmes have been implemented in the 90's in Great Britain, and more recently in Spain, Italy, Germany, Austria and France. Two raisons can justify the adoption of this regulation. The first one is to facilitate the penetration of competitors in the market, giving to them the commodity (gas) without some any obligations (like security of supply). The second one is to compensate the negative effect of a merger between several operators that implied a too concentrated market. The processus of released quantity selection is fixed ambigously and represents in general 3 to 5% of the market consumption. These quantites are too small for some operators, sufficient to improve competition for others. After saying this, it will be necessary to remember the first aim of this mesure : to transform an inactive operator in the market to an active one. It is not an alternative of supply in the medium or long term. These programmes are always temporary, which can justify this idea and obliges the competitor to have others supplies if it wants to stay active. The competitor become the owner of the gas until the period of retrocession finished. Since this date, the incumbent don't have to sell quantities to its competitor. This one must have negociated others supplies to stay active in the market. Pricing is more transparent : it will be a price equals to weighted average costs of gas (WACOG) or an auction mecanism with a minimum starting price (that can be the WACOG). Positive results of these regulation are not obvious and can find other explanations. Increasing gas consumption or several producers on the retail market can explain the entry of others operators and the decrease in price. In addition, discriminatory and non-transparent TPA (Third Party Access) and opacity in selective process have limited expected waitings and rised negative feelings.

The authority of regulation is free to choose a gas release program to increase competition in its own market. In order to facilitate the entry of competitor, a regulator can be willing to facilitate the access to the gas resource. These regulations modify the relationship between the competitor and the incumbent. The later one becomes the supplier of the first one. Each operator must change its behaviour to adapt itself to the new competitive environment. The gas release is an obligation to the incumbent; it cannot use a forclusive strategy. Though the price of gas release is often cost representative, it can adopt a type of raising rivals' costs strategy. The competitor will be less competitive if it has access to a costly resource. Long term contracts have in their contractual clauses possibilities of renegociations. These possibilities depends on market evolutions and take into account the lack of full information when contract signed between the two parties (suppliers and distributors). In the monopolistic situation, the incumbent negociated "for the best" its contracts because it was the only one to benefit them. In the new competitive context, incentives to renogociate "for the best" its contracts knowing that it has to release part of them to its competitor is not obvious. The incumbent can accept supplier conditions, higher costs, to increase the price of gas release. We will analyse this behaviour when the price of gas release is based on costs or is an increasing function of them.

In this imperfect competitive context (oligopoly market), the incumbent can adopt a strategy of raising its own costs to increase the GR price and to make more profits (this strategy is a kind of raising rivals' costs strategy). In a first step, we will justify our choice of Cournot model to represent our problem. We will continue by model asumptions and optimal behaviour for the regulator, one firm maximising the welfare under a positive profit constraint. This regulationis not an alternative to the regulator because of european commission concerns and will be our benchmark to make limitations to incumbent' s supply conditions. Following, we will solve the model, finding different equilibria of the game, and will study incentives that may appear for an incumbent to increase its own costs to influence the GR price. We will conclude underlining appeared incentives to raise its costs to find itself in a better situation.

2 The model

2.1 Model presentation

2.1.1 Choice of Cournot oligopoly model

A competitor of the incumbent is in the market but it is inactive because of difficult gas access to be competitive. The regulator wants it to become on active operator. It decides to apply a GR programme. The regulator fixes the GR price and released quantities. We don't study here the fixation mode, we just suppose that the price is cost reflective. The two operators, the incumbent and its competitor, choose strategies. Strategies are here quantities they are able to sell on the market at the market price (Cournot oligopoly), taking into account available capacities (supplies) to each one. This problem can be approached by a capacity contraint Bertrand oligopoly. But, the choice of Counot oligopoly can be justified, on a theoric or empiric vision. In theoric vision, Kreps and Scheinkman (1983) results can be used. In the gas market, firms are dependant on gas supplies constraints, equal to capacity constraints. The competitor is constrained by the quantities of gas it can buy to the incumbent. The incumbent is constrained by the quantities it can sell on the market after the GR programme. The two operators are constrained by the quantities they can sell on the market, quantities less than the total of the incumbent supplies. Kreps and Sheinkman (1983) showed that, in a two stage game, if firms choosed capacities at the first step and prices at the second one, the only equilibrium of this two stage game is to choose Cournot quantities at the first step and Counot market price at the second one. Davidson and Deneckere (1986) showed that this result is only the right one if the rationing rule is the efficient one. If the rationing rule is the proportional one, several more competitive equlibria can appear. Tirole (1993b, p30) writes that if the demand function is concave and if the rationing rule is the efficient one, Kreps and Sheinkman have showed that the result of the two stage game is the same as the result of the one stage Cournot game. Wolfstetter (1999, p125), when he is talking about the Kreps and Sheinckman model, is writing "The surprising result will be that the equilibrium outcome of the game is as if duopolists played a Cournot-market game. Hence, Cournot competition may be a good predictor of oligopolistic behaviour even if firms set prices without the help of a fictitious auctioneer". Haskel and Maskin (1984) justify a Cournot model when operators could be constrained. Firms, knowing that they are constrained, are going to put on the market maximal quantities they can (to have a greater market share) and let the price be determined otherwise. Now, in empiric vision, the gas market is concentrated. In the upstream market, a few producers are present and may adopt a market power, despite the netback value and the indexation. In the downstream market, mergers and acquisitions limit the number of suppliers on the european gas market (Bazart [2003], Rutledge and Wright [2003]). Breton and Zaccour (2001) justify a Cournot model to represent the gas market because of the long term contracts Take or Pay in the supply market. Although operators must take or pay the gas withdrawaled or not, they are going to try to sell all the quantites they have bought. The last justification is in the GR programme itself. If all firms may propose quantities they wanted, there will be a sufficient access to the ressource and GR programme will be not needed. Customers do not change suppliers if it cannot give to them the desired quantities, despite tariff conditions more attractives.

2.1.2 Model asumptions

Two operators, an incumbent and a competitor, choose their quantities (capacities) and give a price in a two stage game. The rationing rule is the efficient one. It is easy to see that the two firms have information about the value of the gas for their customers (in function to their caracteristics and their business activity) and can serve first those having the greater value. We can use the result of Kreps and Scheinkman (1983) to solve this game. The result of our game is the same as the one stage Cournot game.

We suppose the incumbent has a long term contract gas portfolio $K_o \in]0,1]$ which was negociated before. This quantity K_o has been negociated at the unit cost $u \in]0,1]$. The regulator decides to apply a gas release programme which has a permanent duration. The incumbent must release a proportion $\alpha \in \left]0,1\right]$ of its portfolio K_o to the competitor at a price $r \in \left]0, \frac{1}{2}\right[$. The regulator determines the (α, r) values. The price r is cost reflective (depends on the level of u). We can suppose a fixed released quantity like a proportion α but it does not change our results. Variables K_o, u, α and r are exogeneous. The demand function of the market is a linear one, $P(q) = 1 - q$ with $q = q_o + q_e$, where q_o and q_e are quantities proposed by the incumbent and the competitor. We will indice by "o" variables of the incumbent and by "e" those of the competitor. We suppose that transport and distribution costs, which were applied on the two operators, are normalised to 0. To finish, we assume that the competitor has not other supply possibility than the GR. This operator is obligated to sell what it is buying.

2.1.3 The two stages of the game

In the first stage, operators simultaneously choose their quantities q_e and q_o. They are constraint by the GR (the competitor cannot sell more than it can buy to the incumbent) and the market constraint (the two operators cannot sell more than the incumbent's supply K_o). In the second stage, they ask a price and they compete on the market. To solve this game, we use the result of Kreps and Scheinkman (1983). We know that the result is the same as the one stage Counot game. They will choose the Cournot quantities and ask the Cournot price. They can choose simultaneously their quantities, the price is determined by the market. In the following, we will consider the Cournot game and strategies will be quantities each operator will be able to sell on the market.

2.2 An optimal solution for the regulator : welfare maximisation (benchmark)

In this situation, one firm maximizes the welfare under the constraint of non-negative profit and the constraint of supply (the quantity sold must be less than the operator's supplies). This case is one that involve the greater welfare for the collectivity. It's the situation that the regulator will prefer to choose if it can do so. This market structure is not possible because of the european commission's resistence of keeping a monopoly structure on retail market. Despite that, this benchmark is usefull. The competitor, in our problem of GR, will entail an oligopoly competition. All quantity bought by the incumbent could not be sold because of the modification of the competitive structure in the retail market. In some cases, the incumbent must withdraw gas that cannot be sold. The asumption on supply condition given by the benchmark is usefull at two levels. First, we can restrain the incumbent's supply condition (u, K_o) to a fluctuation interval in which the incumbent's losses are very limited. Second, in this interval, the regulator can always set a GR price r such as the incumbent does not endure its long term take or pay contracts. In addition, if supply costs are lower, then the regulator can always set the GR price equal to costs and the incumbent's profit is always positive. It has negociated "for the best" and does not endure its long term take or pay contracts An empiric asumption could be held when all supply quantity were not be sold. The incumbent can go on the spot market to sell excess quantity towards an other market. Like this, it can limit its loss if the spot price is lower than its costs or to earn an additional profit if spot price is greater than its costs. The positive effect is the improvement of the spot market liquidity. The negative effect could be a trade off between retail market supply and the presence on the hub.

Conclusion 1 *The solutions of this benchmark limit supply conditions (K_o, u) to a fluctuation interval $K_o u \in \left]0, \frac{1}{4}\right[$. In this one, the regulator can set a GR price so that the incumbent does not endure its long term take or pay contracts.*

2.3 The introduction of a GR programme

2.3.1 The context

The competitor does not have sufficient access to the ressource to be active on the market. The regulator observes that incumbent has a competitive access to gas and decides to force the incumbent to serve its competitor with a GR programme. The competitor is going to be able to buy competitive gas and the perpective of a positive profit appears so it can become active on the market. Each operator realized a duopoly profit. The competitor have only the GR as a competitive possibility of supply. It is constrained by the quantity it can buy from incumbent. According to the released quantity, the two operators could be constrained by the incumbent's supplies.

The incumbent releases a proportion α of its supply K_o. The GR price is r and is cost reflective. The competitor does not sell more than the quantity it can buy : it is constrained by the GR. This constraint is $q_e \leq \alpha K_o$. The two operators cannot sell more than the incumbent's supply : there is a constraint that applies to both operators. This one is $q_e + q_o \leq K_o$.

The profit expressions are $\Pi_o(q_e, q_o, r) = P(q_e + q_o)q_o - uK_o + rq_e$ for the incumbent and $\Pi_e(q_e, q_h, r) = P(q_e + q_o)q_e - rq_e$ for the competitor. The optimal quantities (and associated prices) must respect the two precedent constraints.

A condition to the success of the GR programme is necessary. The competitor must have access to gas at a competitive price to make positive profits. The value of the GR price r is important. The regulator knows this element and, if he decides a GR programme, it's because he has good information and he knows for sure that the competitor can buy competitive gas. If not, he will not take a GR programme which would be inefficient. The asumption $r \in \left]0, \frac{1}{2}\right[$ justifies itself here because it ensures that, for all values of α or K_o, there exists a cournot equilibrium where the two constraints are inactive.

This GR programme can implies a new situation for the two operators. Each can be constrained and this situation depends on the released proportion α, the GR price r and the incumbent's supply K_o. In a Bertrand olipopoly, this is interpreted by capacity constraints. An available strategy is to let the competitor serves first the market. The other operator then can serve the rest of the market at a monopoly price (Gelman and Salop, [1983]). In a Cournot game, strategies are to set quantities that would be the best reply to those of the competitor and these quantities must respect constraints.

2.3.2 Strategies of the cournot game

The two operators simultaneously choose their strategies. They maximize their own profits taking into account the two constraints. They try to play their best reply to the other strategy. If they cannot play it, they are constrained. The optimal solutions are those of the simultaneous optimization programme :

$$\left\{ \begin{array}{c} \underset{q_o}{Max}\Pi_o(q_o, q_e, r) = P(q)q_o - K_o u + r q_e \\ \underset{q_e}{Max}\Pi_e(q_o, q_e, r) = P(q)q_e - r q_e \end{array} \right. \quad s/c \left\{ \begin{array}{cc} q_e \leq \alpha K_o & (\lambda_e) \\ q_e + q_o \leq K_o & (\mu_o, \mu_e) \end{array} \right.$$

Each operator endures the market constraint $q_e + q_o \leq K_o$. Taking into account the result of Breton and Zaccour (2001), each firm has a multiplier value associated to this constraint. They are μ_e for the competitor and μ_o for the incumbent. The meaning is that each has a different relaxation cost of the constraint of one unit.

To solve this problem, we use the Khun and Tucker's conditions. We at first consider the GR constraint and add in a second step the market constraint. This solution allow us to find without complications different zones where operators play one equilibrium.

Consider in the first step the GR constraint. Only the competitor endures this. We have to solve a simultaneously optimisation system where competitor maximizes its profit under GR constraint and where incumbent maximizes its profit with simplicity. The multiplier value of the constraint is λ_e. Two equilibria are solutions of the programme. The first one, indiced by "c", is the classic Cournot equilibrium, where all operators can play their best reply function. The constraint is inactive and λ_e^c is null. The value of the equilibrium is $\left\{ \begin{array}{c} q_e^c = \frac{1}{3} - \frac{2}{3}r \\ q_o^c = \frac{1}{3} + \frac{1}{3}r \\ \lambda_e^c = 0 \end{array} \right.$. We remark that this equilibrium can only exist if $r < \frac{1}{2}$. This relation is always verified by asumption.

If the constraint is active, we have a second equilibrium, indiced by "κ" and "m". The competitor cannot play its best reply strategy whereas the inculbent can. The multiplier value $\lambda_e^{m,\kappa}$ is positive. The equilibrium is $\begin{cases} q_e^\kappa = \alpha K_o \\ q_o^m = \frac{1}{2} - \frac{1}{2}\alpha K_o \\ \lambda_e^{m,\kappa} = \frac{1}{2} - \frac{3}{2}\alpha K_o - r \end{cases}$. These quantities and multiplier depend on values of α, r and K_o which are exogeneous. We can represent these two equilibria in a (K_o, α) graph, where r is fixed. We can have all different cases with the variation of r in the interval $\left]0, \frac{1}{2}\right]$. We obtain two different areas where one equilibrium can be palyed.

We can now introduce the market constraint $q_o + q_e \leq K_o$. In the two precedent areas, this constraint can be active or not.

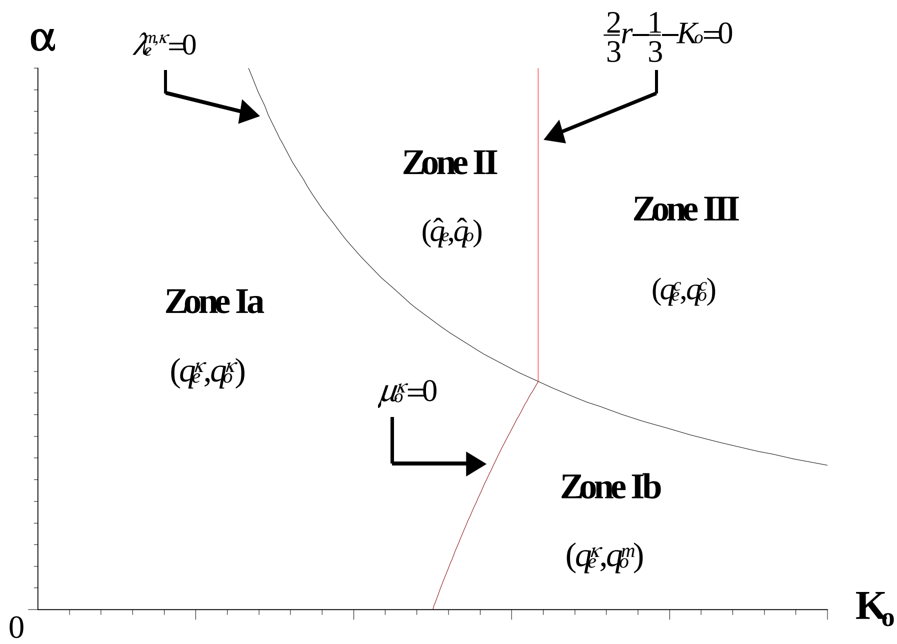
In the first area, we know that the GR constraint is active. The competitor cannot play its best reply strategy and its only possibility is playing $q_e^\kappa = \alpha K_o$. The incumbent maximizes its profit under the market constraint, which can be active or not. The optimization programme is $\underset{q_o}{Max}\ \Pi_o(q_o, r)$ $with\ \alpha K_o + q_o \leq K_o$. μ_o^κ will be the multiplier associated to the market constraint. Two equilibria exist. The first equilibrium is the same that we have found above, i,e the competitor is constrained by GR constraint and the incumbent can play its best reply strategy. We denote this equilibrium (q_e^κ, q_o^m). To the second equilibrium, the market constraint is active and all players are constrained. This new equilibrium is indiced by "κ" and its caracteristics are : $\begin{cases} q_e^\kappa = \alpha K_o \\ q_o^\kappa = (1-\alpha) K_o \\ \mu_o^\kappa = 1 + \alpha K_o - 2K_o \end{cases}$. The positivity or negativity of μ_o^κ cut the first zone in two smaller parts, that we call zone Ia and zone Ib. In the zone Ia, two constraints are active and the equilibrium is (q_e^κ, q_o^κ). In the zone Ib, only the GR constraint is active and the equilibrium is (q_e^{κ}, q_o^m).

In the second area, we know that the GR constraint is inactive. The market constraint can be or not active. The optimisation programme is the following :

$$\begin{cases} \underset{q_o}{Max}\Pi_o(q_o, q_e, r) = P(q)q_o - K_o u + rq_e \\ \quad \underset{q_e}{Max}\Pi_e(q_o, q_e, r) = P(q)q_e - rq_e \end{cases} \qquad s/c\ q_e + q_o \leq K_o \quad (\mu_o, \mu_e)$$

Solving this simultaneous system, we have two equilibria. The first one is the Cournot equilibrium (q_e^c, q_o^c) that we have seen above (the two multipliers μ_e^c and μ_o^c are nulls). The second one lead us to a multiplicity of equilibria. This multiplicity have been demonstrated by Breton and Zaccour (2001). Caracteristics of this equilibrium, indiced by "$\widehat{\ }$", are the followings : $\begin{cases} \widehat{q_e} = 2K_o + \widehat{\mu_o} - 1 \\ \widehat{q_o} = 1 - \widehat{\mu_o} - K_o \\ \widehat{\mu_e} = 2 - 3K_o - \widehat{\mu_o} - r \\ \widehat{\mu_o} > 0 \end{cases}$. Variations of $\widehat{\mu_o}$ values lead from an equilibrium to an other. These two quantities must be positive. We can restrain variations of $\widehat{\mu_o}$ to the interval $]\max(0, 1-2K_o), 1-K_o[$. In addition, $\widehat{\mu_e}$ must be positive so this equilibrium can exist. The relation $K_o < \frac{2}{3} - \frac{1}{3}r$ assures that $\widehat{\mu_e} > 0$. We can difine two new zones of equilibrium. In the zone II, the two operators cannot play Cournot and the equilibrium is the multiplicity $(\widehat{q_e}, \widehat{q_o})$, with $\widehat{\mu_e} > 0$ and $\widehat{\mu_o} > 0$. In the zone III, the two firms can play the Cournot equilibrium (q_e^c, q_o^c) with $\mu_e^c = \mu_o^c = 0$.

Finaly, we obtain four different areas where one equilibrium can be played by the two firms. We can represent them in a (K_o, α) plane for a given r. These areas are explained in the following figure :



The three curves $\lambda_e^{m,\kappa} = 0$, $\mu_o^\kappa = 0$ and $\frac{2}{3} - \frac{1}{3}r - K_o = 0$ define our different areas. We can see they will depend on variables α, K_o and r. They have been drawn in a (K_o, α) plane for a given r. They are a decreasing function of r, except $\mu_o^\kappa = 0$ that is constant in r. If r increases, $\lambda_e^{m,\kappa} = 0$ and $\frac{2}{3} - \frac{1}{3}r - K_o = 0$ move to the origin of axes.

The intersection point of these curves, named point A, has its coordinates in the (K_o, α) plane equal to $(K_o^A = \frac{2}{3} - \frac{1}{3}r, \alpha^A = \frac{1-2r}{2-r})$ to a given r. They are decreasing functions of r. If r increases, the point A is moving towards the origin of axes and it is always on constant curve $\mu_o^\kappa = 0$.

Remark 2 *If we assume that GR pricing is an increase function of u, we notice that more the incumbent is efficient, lower is the GR price. Curves* *move in the opposite way of the origin of axes and zones Ia and Ib increase while zones II and III decrease. If (K_o, α) are in zone Ia to a given r, the two constraints are actives. The incumbent cannot play its best reply function, it endures a rationing. More the incumbent is efficient, more it can be rationed. This rationing has been shown by Breton and Zaccour (2001) and benefits the less efficient operator (the competitor).*

Remark 3 *The triplet (K_o, α, r) allows us to know where the incumbent and the competitor will be and what equilibrium they are going to play. We saw that if $r \geq \frac{1}{2}$, else $q_e^c \leq 0$. In addition, the zones Ia and Ib desappear. Only zones II and III are staying in the (K_o, α) plane for a given r. But, like $q_e^c \leq 0$, the Cournot equilibrium is not a possible one. Then, only the multiple equilibrium is possible. This situation is a limit that can't help us to answer to the problematic that follows.*

Conclusion 4 *We obtain four equilibrium strategies when we solve our optimisation problem. Each operator plays a strategy in a fixed area of the (K_o, α) plane for a given r. The equilibrium (q_e^κ, q_o^κ) is played in the area where all constraints are active, defined by the curves $\alpha K_o > 0$, $\mu_o^\kappa > 0$ and $\lambda_e^{m,\kappa} > 0$ (zone Ia). The second pair of strategies (q_e^κ, q_o^m) is played in the area where only the GR constraint is active, defined by curves $\alpha K_o > 0$, $\mu_o^\kappa < 0$ and $\lambda_e^{m,\kappa} > 0$ (zone Ib). The multiplicity of equilibria $(\widehat{q}_e, \widehat{q}_o)$ appears when only the market constraint is active, in the area defined by curves $\lambda_e^{m,\kappa} < 0$ and $\frac{2}{3} - \frac{1}{3}r - K_o > 0$ (zone II). The Cournot equilibrium can be played when the two constraints are inactive, i,e in the area defined by curves $\lambda_e^{m,\kappa} < 0$ and $\frac{2}{3} - \frac{1}{3}r - K_o < 0$ (with $K_o \leq 1$ and $\alpha < 1$).*

Proposition 5 *In the zone Ia, the incumbent's supplies K_o are too smalls to relaxe the two constraints, and a high proportion α does not change the equilibrium (q_e^κ, q_o^κ). If the supply K_o is more important, then one constraint relaxes. If the proportion α is higher, $\alpha \geq \alpha^A$, then the GR constraint becomes inactive, only the market constraint stays active. The proportion level is sufficient to relaxe the GR constraint but the supply level K_o is too small to make the market constraint inactive. We are in the zone II and the equilibrium is the multiple one $(\widehat{q}_e, \widehat{q}_o)$. If the proportion level is small, $\alpha < \alpha^A$ and (K_o, α) are in the space defined by curves $\lambda_e^{m,\kappa} > 0$ and $\mu_o^\kappa < 0$, else the GR constraint always is active but the market constraint becomes inactive. The supply level K_o is sufficiently high to relaxe the market constraint but the proportion is to small to make the GR constraint inactive. We are in the zone Ib and the equilibrium is (q_e^κ, q_o^m). When the two variables K_o and α are high, i,e (K_o, α) are in the space defined by $\lambda_e^{m,\kappa} < 0$ and $\frac{2}{3} - \frac{1}{3}r - K_o < 0$, then the two constraints are inactive and the equilibrium is the Cournot one (q_e^c, q_o^c). This proposition is for a given GR price r. If the value of r increase (decrease), all the curves move towards (in the opposite direction of) the origin of axes. Zones II and III increase (decrease) while zones Ia and Ib decrease (increase). If the GR price is high (small), the competitor buy less (more) GR.*

2.4 Incentives for an operator to efficacity in a GR programme context

In general, the regulator publishes GR programmes a long time before its implementation. All potentials participants are well informed on the released quantities and on the GR pricing (auction mecanism with floor price or

WACOG with system of quantity allocation on the basis of first come, first served or on a pro rata basis). However, they often know the price they have to pay after the implementation. In the two pricing, the regulator must evaluate incumbent's costs, to set the WACOG or the floor price. There exists a time lapse between the announce of GR programme and its implementation. In this lapse of time, applicants give to the regulator or to the authority organizing the GR programme a documentation file to be selected enabling them to participate for the allocation of GR. We have seen that long term take or pay contract clauses foresee price renogaciations in the case of impredictable market evolutions. Incumbent and producers renegociate terms of contracts to compensate negative market evolutions for one of the two parties. Incumbent can renegociate its supply costs, knowing that regulator has decided a GR programme and that pricing is based on its unit cost u. The incumbent can accept producers' conditions or negociates "for the best" its new importation terms. When it chooses this option, it wants, with a unit cost u increase, to influence the GR price r. Doing so, it can modify the equilibrium zone in which the two operators will be able to locate themselves (equilibrium zones are decreasing functions of r). The incumbent will be in a bbetter situation in terms of profits. The competitor has no possibility to influence r. It plays always its equilibrium strategy and has no incentives to deviate. In the new equilibrium zone, the two operators always play their best strategy, i,e their equilibrium strategy. In the following subsection, we are going to study this incumbent's incentives to renegociate "for the best" its supply terms in a context of GR, knowing that princing reflects costs and that it could be in a greater position in terms of profits if it accepts producers' conditions. To study the effect, we are going to compare incumbent 's profits in different equilibria.

In this subsection, we will name :

- $\Pi_o^\kappa(q_e^\kappa, q_o^\kappa)$ the incumbent profit when all constraints are active. The equilibrium is (q_e^κ, q_o^κ);

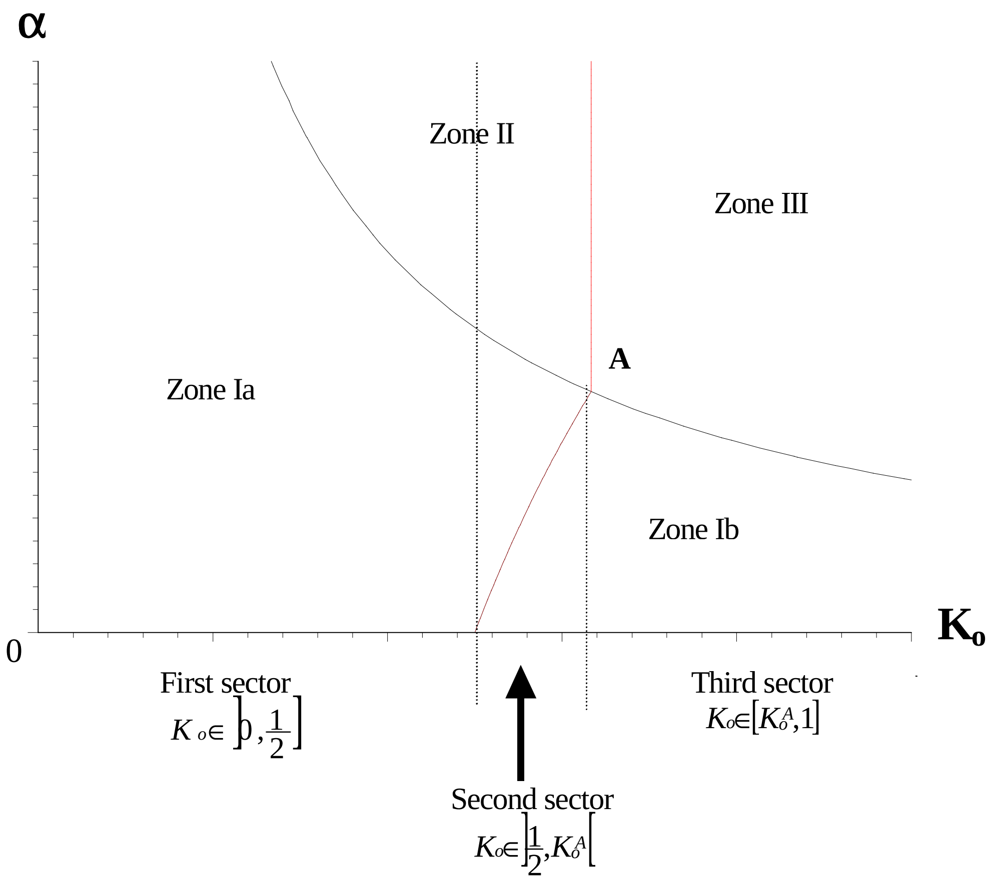
- $\Pi_o^{\kappa,m}(q_e^\kappa, q_o^m)$ the incumbent profit when only the GR constraint is active. The equilibrium is (q_e^κ, q_o^m);

- $\widehat{\Pi_o}(\widehat{q}_e, \widehat{q}_o)$ the incumbent profit when only the market constraint is active. The equilibrium is $(\widehat{q}_e, \widehat{q}_o)$;

- $\Pi_o^c(q_e^c, q_o^c)$ the incumbent profit when all constraints are inactive. The equilibrium is (q_e^c, q_o^c).

We begin with the study of the zone Ia and Ib. Let $\Delta_1\Pi_o$ be the difference between the incumbent's profit in zone Ia Π_o^κ and in zone Ib $\Pi_o^{\kappa,m}$, $\Delta_1\Pi_o = \Pi_o^\kappa(q_e^\kappa, q_o^\kappa) - \Pi_o^{\kappa,m}(q_e^\kappa, q_o^m)$. The sign of $\Delta_1\Pi_o$ is always positive. The incumbent prefers the equilibrium (q_e^κ, q_o^m) to the equilibrium (q_e^κ, q_o^κ). This preference is very intuitive because, in one case, it is constraint and in the other, it can play its best reply function while its competitor cannot do it. However, the incumbent cannot have any influence on the zone where it can be located. These two zones are complements because of the constance of $\mu_o^\kappa = 0$ in r. This situation depends only on exogeneous variables that are the supply level K_o and the released proportion α. It has no influence on these two variables because the first one is the result of past negociations (we consider K_o like a fixed variable) and the regulator fixes the second one.

To study others cases, we can separate our four zones in three sectors. They will depend on the value of incumbent supply K_o. The following figure resumes the three new sectors.

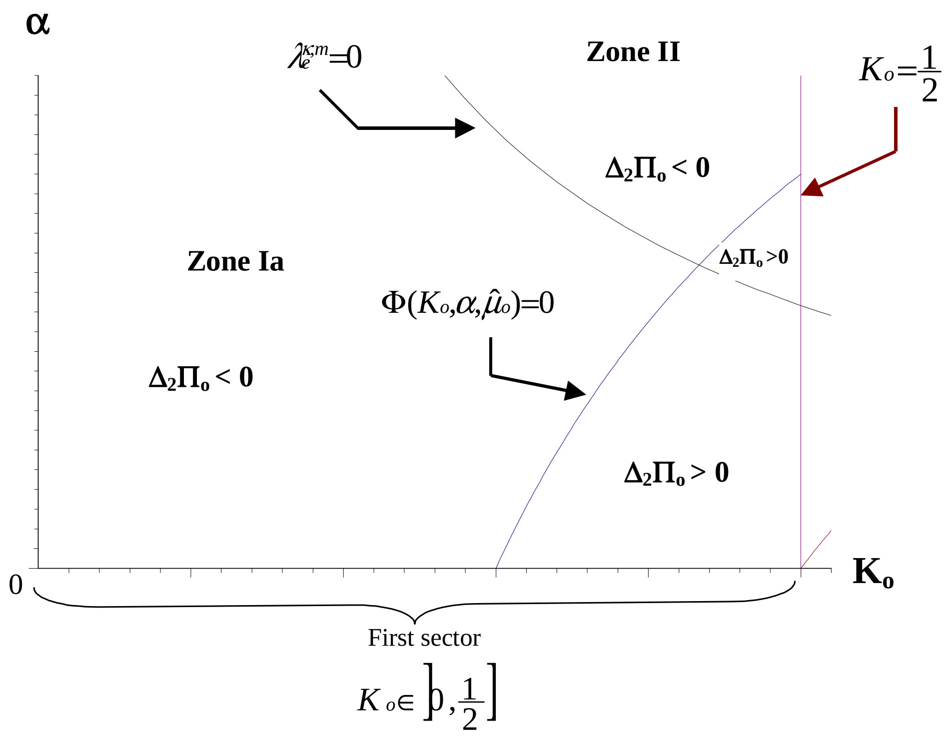


In the first sector, we have $K_o \in \left]0, \frac{1}{2}\right]$, $K_o = \frac{1}{2}$ is the abscissa of the intersection point between the abscissa axe $\alpha = 0$ and the curve $\mu_o^\kappa = 0$. In this sector, we will compare two areas, the zone Ia and the zone II.

In the second sector, we have $K_o \in \left]\frac{1}{2}, K_o^A\right[$ with $K_o^A = \frac{2}{3} - \frac{1}{3}r$. Here, we will compare zones Ia, Ib and II.

In the third sector, we have $K_o \in \left[K_o^A, 1\right]$ and we will compare zones Ib and III.

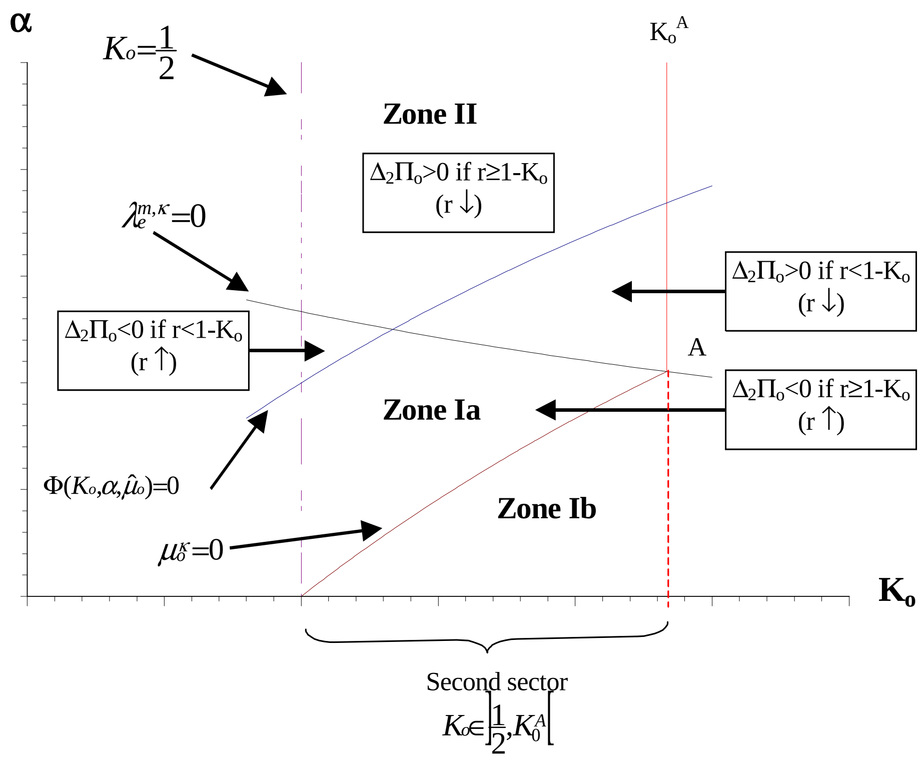
If $K_o \in \left]0, \frac{1}{2}\right]$ (first sector), two equilibria may occur : (q_e^κ, q_o^κ) and $(\widehat{q_e}, \widehat{q_o})$. We know that $\widehat{\mu_o}$ is in the interval $]1 - 2K_o, 1 - K_o[$. $\Delta_2 \Pi_o$ will be the difference between incumbent's profits when its equilibrium strategy is q_o^κ and when it will play $\widehat{q_o}$. This difference is $\Delta_2\Pi_o = \Pi_o^\varkappa - \widehat{\Pi}_o = (-1 + K_o + r)(\alpha K_o - 2K_o + 1 - \widehat{\mu_o})$. We know that $(-1 + K_o + r)$ is negative like $K_o \in \left]0, \frac{1}{2}\right]$ and $r < \frac{1}{2}$. Then, the sign of $\Delta_2\Pi_o$ is the opposite sign of $\Phi(K_o, \alpha, \widehat{\mu_o}) = \alpha K_o - 2K_o + 1 - \widehat{\mu_o}$. $\Phi(.) = 0$ is an increasing function in $\widehat{\mu_o}$ in the (K_o, α) plane and a constant one in r (like $\mu_o^\kappa = 0$). It is greater than $\mu_o^\kappa = 0$ and it is on the left side of this later curve in the (K_o, α) plane. Because of the position of $\Phi(.) = 0$, we can have two possible situations, each depending on the position of the pair(K_o, α). These are $\Phi(.) > 0$ and $\Phi(.) < 0$. We note that the origin of axes is always in the plane where $\Phi(.) > 0$. If the pair (K_o, α) is in zone Ia with $\Phi(.) > 0$, $\Delta_2\Pi_o$ is negative. For this pair (K_o, α), the incumbent earn a greater profit in the case of multiple equilibrium $(\widehat{q_e}, \widehat{q_o})$ than in the two active constraints equilibrium (q_e^κ, q_o^κ). Then, the incumbent has incentives to increase its unit cost u to increase the GR price r. Doing so, the zone II increases and the pair (K_o, α) can become part of this zone II. The incumbent increases its profit if it adopts this strategy. If (K_o, α) is in zone Ia with $\Phi(.) > 0$, the incumbent prefers to sell a smaller GR quantity at a higher price and sell the complement of its supply K_o at the market price. If the pair (K_o, α) is in zone II with $\Phi(.) < 0$, $\Delta_2\Pi_o$ is positive. For this pair (K_o, α), the incumbent earns a greater profit in the case of the two active constraint equilibrium (q_e^κ, q_o^κ) than in the multiple one $(\widehat{q_e}, \widehat{q_o})$. It has incentives to decrease its supply unit cost. Doing so, this pair (K_o, α) would belong to the zone Ia and it can earn more profit. If the pair (K_o, α) is in zone II with $\Phi(.) > 0$ or in zone Ia with $\Phi(.) < 0$, it has no incentives to change to its membership zone. It cannot earn more profit if it changes the equilibrium zone. If (K_o, α) is in zone II with $\Phi(.) < 0$, the incumbent prefers to sell more GR quantities at a lower GR price and sell the complement of its supply at the market price. The following figure summarizes these incentives.



Lemma 6 *For the small values of K_o ($K_o \in \left]0, \frac{1}{2}\right]$), the incumbent has incentives to increase the GR price r. In a renegociation round, it can accept the producers'conditions to increase its supply unit cost u. It earns more profit selling less GR quantity at a greater GR price and the complement of its supply at the market price. These incentives decrease when K_o is greater.*

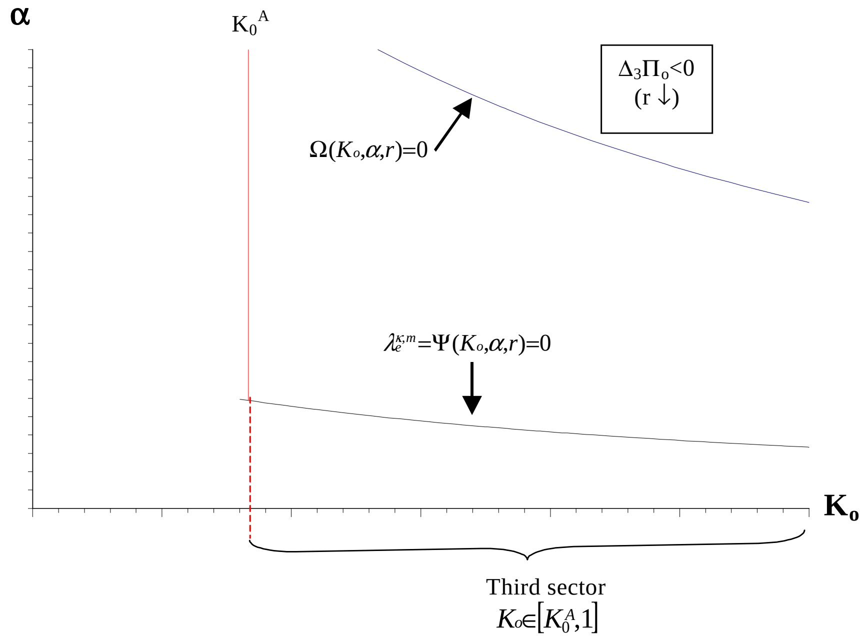
If $K_o \in \left]\frac{1}{2}, K_o^A\right[$, three equilibria may occur : (q_e^κ, q_o^κ) in zone Ia, (q_e^κ, q_o^m) in zone Ib and $(\widehat{q}_e, \widehat{q}_o)$ in zone II. We have seen that the incumbent always prefers the equilibrium (q_e^κ, q_o^m) to the (q_e^κ, q_o^κ) one. But it cannot have any influence on its localisation that depends on exogeneous variables K_o and α. We can add that it cannot move from the zone II to the zone Ib. The argument is that the only intersection between these two zones is the point A. This point and frontier curves move in the same way and, like the curve $\mu_o^\kappa = 0$ is constant in the (K_o, α) plane to all r, there is no pair (K_o, α) in zone Ib that can move towards zone II by any modification and inversely. The incumbent can only move here, if the GR price is changing, from the zone Ia towards the zone II again. We have seen that the différence between incubent's profits associated to these two equilibria was $\Delta_2 \Pi_o = \Pi_o^{\varkappa} - \widehat{\Pi}_o = (-1 + K_o + r)\left(\alpha K_o - 2K_o + 1 - \widehat{\mu_o}\right)$. The GR price r is able to be higher or lower than $K_o - 1$ like $K_o \in \left]\frac{1}{2}, K_o^A\right[$ and $r < \frac{1}{2}$. This price is playing a great rôle in the incumbent's incentives to move from an equilibrium to an other one. If $r < 1 - K_o$, the sign of $\Delta_2 \Pi_o$ is the opposite one to $\Phi(K_o, \alpha, \widehat{\mu_o})$. If (K_o, α) is in the zone II with $\Phi(K_o, \alpha, \widehat{\mu_o}) < 0$, then $\Delta_2 \Pi_o$ is positive. The incumbent has incentives to be efficient and to negociate "for the best" to earn more profit with the equilibrium of zone Ia. The incumbent prefers to sell more GR quantity at a lower GR price and the complement at the market price. If (K_o, α) is in the zone Ia with $\Phi(K_o, \alpha, \widehat{\mu_o}) > 0$, then $\Delta_2 \Pi_o$ is negative. The incumbent prefers to sell less GR quantity to a greater GR price and the complement at the market price. It has incentives to increase its costs, and r, to move from zone Ia equilibrium towards Zone II equilibrium. If (K_o, α) is in the zone II with $\Phi(K_o, \alpha, \widehat{\mu_o}) > 0$ or in the zone Ia with $\Phi(K_o, \alpha, \widehat{\mu_o}) < 0$, the incumbent cannot earn more profit if it changes from the equilibrium zone. It has no incentives to move from one zone to another. If $r \geq 1 - K_o$, the sign of $\Delta_2 \Pi_o$ is the same sign of the function $\Phi(K_o, \alpha, \widehat{\mu_o})$. We can observe the opposite incentives of the precedent case. If (K_o, α) is in the zone II with $\Phi(K_o, \alpha, \widehat{\mu_o}) > 0$, then

$\Pi_o^{\varkappa} > \widehat{\Pi}_o$. The incumbent wants to sell more GR quantities because of the greater minimum level of GR price r and to sell the complement of its supplies at the market price. It has incentives to lower its unit cost to earn more profit selling greater quantities on the GR side. If (K_o, α) is in the zone Ia with $\Phi(K_o, \alpha, \widehat{\mu_o}) < 0$, then $\widehat{\Pi}_o > \Pi_o^{\varkappa}$. The incumbent prefers to sell less GR quantities at a greater GR price and the complement of its supply at the market price. It has incentives to raise its unit cost u. If (K_o, α) is in zone II with $\Phi(K_o, \alpha, \widehat{\mu_o}) < 0$ or in zone Ia with $\Phi(K_o, \alpha, \widehat{\mu_o}) > 0$, the incumbent cannot earn more profit in an other equilibrium zone. It has no incentives to move from one to another equilibrium. The following figure illustrates our case.



Lemma 7 *If the GR proportion α is lower and the GR price is higher (we are in zone Ia with $\Phi(K_o, \alpha, \widehat{\mu_o}) < 0$ and $r \geq 1 - K_o$), the incumbent has incentives to raise its unit cost because the GR floor price is higher so to earn more profit if it could sell less GR quantity but at a greater price and the complement of its supplies at the market price. In other cases, with $r \geq 1 - K_o$, it has no incentives to move or to increase its costs. If the GR proportion is in the medium values with a low GR price and K_o (we are in zone Ia with $\Phi(K_o, \alpha, \widehat{\mu_o}) > 0$ and $r < 1 - K_o$), the incumbent has incentives to raise its unit cost to sell less GR quantities but at a greater GR price and the complement of its supplies at the market price. In other cases, with $r < 1 - K_o$, it has no incentives to move or to increase its costs.*

The third sector is $K_o \in \left[K_o^A, 1\right]$ where two equilibria could be played : (q_e^c, q_o^c), the Cournot equilibria, and $(q_e^{\varkappa}, q_o^m)$, the equilibrium where only the GR constraint is active. $\Delta_3\Pi_o$ will be the difference between incumbent's profits when the equilibrium is the Cournot one and when the equilibrium is $(q_e^{\varkappa}, q_o^m)$. $\Delta_3\Pi_o = \Pi_o^c - \Pi_o^{\kappa,m} = -\frac{1}{36}\left(2r - 1 + 3\alpha K_o\right)\left(10r - 5 + 3\alpha K_o\right)$. We can note $\Psi(K_o, \alpha, r) = 2r - 1 + 3\alpha K_o$ and $\Omega(K_o, \alpha, r) = 10r - 5 + 3\alpha K_o$. $\Delta_3\Pi_o$ is of the opposite sign of the product $\Psi(.).\Omega(.)$. These two functions have the same slope in the (K_o, α) plane for a given r; they have no intersection point. It's easy to verify that, in the (K_o, α) plane for a given r, $\Omega(.)$ is above $\Psi(.)$. Finally, in the (K_o, α) plane for a given r, $\Psi(.) = 0$ is the same equation as $\lambda_e^{\kappa,m} = 0$. If $\Omega(.) < 0$, then the incumbent has no incentives to move from its position zone to an another one to change the equilibrium. It cannot reach superior profit levels. On the other hand, if $\Omega(.) > 0$, i,e for high values of GR proportion α, the incumbent has no incentives to increase its unit cost of supply. It earns a greater profit if it sells all GR quantities and then plays its best reply function than these two operators play their Cournot strategies. The following figure illustrates this case.



Lemma 8 *The incumbent has no incentives to move from its equilibrium zone to an other if* $\Omega(.)$ *is negative in the* (K_o, α) *plane for a given* r*. These incentives are increasing in* r*. For high values of GR proportion* α*, i,e when* $\Omega(.)$ *is positive in the* (K_o, α) *plane for a given* r*, incentives for efficiency (to decrease its costs) is strong. Doing so, it can sell all GR quantities at a lower GR price but it increases its profit selling its best reply at the market price.*

Proposition 9 *For the small values of K_o ($K_o \in \left]0, \frac{1}{2}\right]$), the incumbent has incentives to increase its unit cost and the GR price r. These incentives decrease when K_o is greater. For higher values of K_o, incentives depend on the GR price and GR proportion levels. If the GR proportion α is lower and the GR price is higher, the incumbent has incentives to raise its unit cost because the GR floor price is higher so as to earn more profit selling less GR quantities at a higher GR price. If the GR proportion is in the medium values with a low GR price and low value of K_o, the incumbent keeps an incentive to raise its unit cost to sell less GR quantities but at a greater GR price so as to earn more profit. In all other cases, it has no incentives to move or to increase its costs.*

In this model, the regulation is considered as permanent. The contracts released belong to the competitor for the rest of the time. First beliefs will be that the incumbent, as it does not recover these contracts, has strong incentives to raise its costs to increase the GR price and the costs of its competitor. We show that it is not always the case. The incumbent can earn more profit in being efficient.

Proposition 10 *If the asymmetric regulation (Gr programme) is permanent, on contrary to first beliefs, the incumbent can have strong incentives to be efficient.*

3 Conclusion

The asymmetric regulation (GR programme) could entail strategic behaviour. We have shown that it exists in some cases where, if the level of supply

K_o and GR proportion α are respecting some conditions, the incumbent has incentives to be inefficient to increase the GR price r. Doing so, it earns more profit selling less GR quantities but at a higher price and the complement of its supply at the market price. These incentives are strong if the level of supply is small and inexistant for greater value of K_o. If we are in the medium values of K_o, these incentives depend on the GR price level, in addition to the pair (K_o, α). If the GR price is high, incentives exist if the GR proportion is small. The incumbent prefers selling less GR at a higher price and the other quantities at the market price. If the GR price is low, these incentives exist for medium values of GR proportion and lower supplies K_o. The incumbent prefers to sell more GR at a lower GR price. In others cases, it has no incentives to be inefficient or to move to an equilibrium towards another one. Here, the asymmetric regulation is permanent. Our result is going on contrary to first beliefs because the incumbent has not always incentives to raise its costs when it does not reclaim its released contracts.

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