DEPARTAMENTO DE ECONOMÍA

DIVESTITURES AND THE SCREENING OF EFFICIENCY GAINS IN MERGER CONTROL

Autor: Aldo González

Santiago, Ene. 2007

Divestitures and the Screening of Efficiency Gains in Merger Control

Aldo González

Departamento de Economía
Universidad de Chile

Abstract

This paper studies how the use of divestiture in merger control can affect the revelation of information about the level of efficiency gains that a proposed merger carries. We show that a decision policy that uses costly divestiture as a screening instrument presents superior results respect to a blind policy where the decision is based only on a priori beliefs about the level of efficiency gains. This new optimal policy eliminates type I error -allowing inefficient mergers- and mitigates type II error -rejecting good mergers-. If efficiency gains take place in the divested markets as well, an "informational" efficiency offense argument may arise, forcing the competition authority not to the disclose all the level of information desired if this jeopardizes the feasibility of the remedy.

Key Words:

Merger Control, Efficiency Gains, Asymmetry of Information, Divestiture.

Divestitures and the Screening of Efficiency Gains in Merger Control

Aldo Gonzalez[*]

December 2007

Abstract

This paper studies how the use of divestiture in merger control can affect the revelation of information about the level of efficiency gains that a proposed merger carries. We show that a decision policy that uses costly divestiture as a screening instrument presents superior results respect to a blind policy where the decision is based only on a priori beliefs about the level of efficiency gains. This new optimal policy eliminates type I error -allowing inefficient mergers- and mitigates type II error -rejecting good mergers-. If efficiency gains take place in the divested markets as well, an "informational" efficiency offense argument may arise, forcing the competition authority not to the disclose all the level of information desired if this jeopardizes the feasibility of the remedy.

Keywords: Merger Control, Efficiency Gains, Asymmetry of Information, Divestitures

1 Introduction

The inclusion of efficiency gains (EG) in merger control is still a controversial topic. Although at the normative level there is agreement to give a favorable consideration to the EG, the difficulty remains at the implementation level. The critical point is how the Competition Authority (CA) can learn the real magnitude of the synergies or cost savings that a merger will produce. The primary source of information are the merging firms themselves, however it is evident that they have strong incentives to present very optimistic claims of efficiency gains in order to receive a more favorable treatment of the proposed concentration. This problem is exacerbated by the lack of knowledge of the CA about the industry and the impossibility of the parties to present unequivocal evidence about productivity gains that will be realized after the merger is consummated. In consequence, the validity of the information transmitted by the firms loses power and the possibility of implementing an efficiency defense is severely constrained.[1]

As a response to this limitation, some propositions have emerged in the literature. Neven, Nutall and Seabright (1993) recommend the creation of a specialized unit, inside the CA, in order to asses ex-ante the validity of the efficiency gains claims. Counting more on incentives, Scherer (1991) proposes a temporary trial period, before final approval, where cost savings have to be verified ex-post. If the claimed efficiencies are not realized the merger should be undone. Brodley (1996), in a similar approach, suggests a two-stage revision, with an ex-ante screening and ex-post checking under the threat of restoring competitive conditions if necessary. Although these two last approaches have the merit of creating some screening because firms will have incentives to be careful about their claims of efficiency gains, the CA still faces two obstacles that play against the feasibility of these solutions. First, ex-post monitoring is needed and the realization of cost savings and synergies are not easily observed variables. Second, it requires a strong commitment form the CA to undo an ongoing merger. Even if the EG claims are not accomplished as promised, it might be not feasible to break the new merged entity and restore the competitive market conditions as they were before the merger occurred.

In the present article, we propose a mechanism that uses divestitures as screening instruments to discriminate between "good" and "bad" mergers (in pro-competitive terms). Suppose that two firms want to merge in two markets -1 and 2- and the CA is convinced to block merger in 2 but is willing

---

[1] The excepticism about proving efficiency gains in the process of merger control has been expresed among others by Bork (1978) and Posner (1976).

to accept an efficiency defense in order to allow the merger in 1. Since divestiture has to take place anyway in market 2, if the CA can impose a private cost on the firms -by the choice of the buyer or by interfering in the transaction of the assets- then it is more likely that the remedy will be accepted by good merger firms than the bad ones. This double role played by divestiture -remedy and screening instrument- we think is the main contribution of this article. This result hinges in the fact that when cost savings are bigger, other things being equal, the profitability of the merger is higher but also part of the savings are translated in lower prices and in consequence the change in consumer surplus is higher as well. Hence, mergers with higher level of efficiency gains will be willing to accept a more painful remedy than mergers that presents low values of EG.

The existing literature on merger divestiture recognizes the restoration of competition as one the main goals of this remedy, where the choice of the buyer matters for achieving that goal[2]. Here, we abstracts from this problem by assuming that the divested units are feasible business and buyers differ only by the observable entry cost in the industry. The main message on this matter is that the choice of the buyer in divestitures remains important and a new dimension to be looked at is now added if we want to consider an efficiency defense.

This mechanism cannot achieve the first best or symmetric information solution but it improves on the results with respect to the case where the CA uses only its beliefs about the efficiency gains. This benefit becomes more significant when the CA has more pessimistic beliefs because the CA is completely protected from type I error (approving bad mergers). The second feature of this approach is that it does not need any special ex-post monitoring of the realization of efficiency gains, it only requires that the CA can commit to the selected solution without renegotiating after the private information is revealed.

Clearly, the first best could be attained if the CA were able to use monetary transfers instead of divestitures as screening instrument[3]. Thus, even the full merger approval, without divestiture, would be feasible if the EG were big enough, something that is not possible with our mechanism. Thus, the policy we propose can be considered as a second best solution, where the CA attempts to implement the best possible solution, under the constraint that it has only with a limited set of instruments. Within these instruments we have the choice of the market where firms must divest and the selection

---

[2]See Motta, Polo and Vasconcelos (2002) and Parker and Balto (2000) for a more comprehensive analysis of the implementation of merger remedies.

[3]This argument is made by Rey (2002)

3

of the buyer.

We further examine the possibility that merging firms act strategically, pre-divesting in advance of presenting the deal before the CA. The benefit of selling before hand is that they can sell the assets at a higher price because they are not constrained by the conditions imposed by the CA. We found that the incentives to pre-divest depend on the beliefs of the CA. Under optimistic beliefs, any type of merger, in terms of the magnitude of EG, will divest before presenting the case. On the contrary, when beliefs are pessimistic, merging firms with high values of EG will not want to pre-divest because that destroys the instrument they have to signal that the merger is good for consumers. This result gives support for adopting a strategic skepticism about EG.

When we work under the assumption than efficiency gains can also take place in the divested market, the results present two important departures from the base model. First, the CA will have a stronger preference for divestiture. It is never optimal to allow the complete merger, or in other words the optimal second best policy does not contain any type II error (Rejecting good mergers). Second, we find an "informational" efficiency offense argument. Implementing the divestiture might not be feasible if the revealed efficiency gains are high enough. In consequence, the CA may be forced to renounce to extract the level of information desired if this significantly discourage potential buyers from entering and competing in the divested market. This conflict between screening and entry implies that the CA, in some cases, will have to push down the efficiency gains threshold and accept some type I error if he wants the remedy to work.

The paper is set out as follows. We first present the basic model and obtain the optimal mechanism. Secondly, we develop two extensions, one about pre-divesting and the other including the realization of EG also in the divested market. Finally we conclude.

2 Basic Model

Consider a simplified market situation where two otherwise symmetric firms: A and B, perfectly overlap in two markets: 1 and 2. Both firms sell a homogeneous product and compete a la Cournot[4], facing a common demand $D_i(pi, \lambda_i)$ in each market, where p is the own market price (goods are independents among markets) and λ is a parameter representing the "market power" concern or the anticompetitive danger of the merger outcome. Although market power does not have a unique definition, we link λ to the

---

[4]Results are robust to price competition and/or the case of heterogenous products.

features of the market demand. Thus, for the family of linear demand functions λ is positively related to the intercept of the function with the price axis. In the case of isoelastic demand functions, λ depends on the inverse of the own price-elasticity. Another plausible interpretation of λ is the magnitude of a competitive fringe that is present in the market but does not play strategically either before or after the merger A larger fringe will leave a smaller residual demand to the merging firms. We index the markets by the parameter λ such that: $\lambda_1 \leq \lambda_2$, denoting that in market 2 the merged firm, other things being equal, will have more market power than in the market 1.

Before merging, firms produce at constant marginal cost c in both markets. After merging, the new entity will produce at marginal cost $c' = c - \theta$, where θ represents the efficiency gains due to the merger, such that $\theta \in [0, c]$. For simplicity and to focus only in the trade-off, first exposed by Williamson, between increasing market power vs efficiency gains (due to lower marginal cost), we assume that ex-ante both markets are served only by A and B and ex-post there will be only one firm in the markets where the merger is authorized.

The Competition Authority uses the consumer surplus or price standard in order to decide about the proposed merger. This means that efficiency gains have to be big enough -and passed through to consumers in the form of lower prices- in order to offset the suppression of competition due to the merger. The CA will allow the merger in market k if only if $P_k^m(\theta) \leq P_k^d$ where the subscripts m and d stand for monopoly (ex-post) and duopoly (ex-ante). Another way to express the above condition is to require that: $\theta \geq \theta^*(\lambda_k)$ where $\theta^*(\lambda_k) \equiv \theta_k^*$ is the minimum level of efficiency gains required in order to accept the merger in market k. The threshold will depend on the market power parameter λ such that $\theta_1^* \leq \theta_2^*$. Using the interpretation of λ given above, when the demand is more inelastic, the passing-trough of cost savings will be lower. Thus, markets with higher market power will require a larger value of θ in order to satisfy the maximum level of price increase accepted from the merger (zero in this model)[5],

The CA has the power to decide in which markets the merger will be allowed and in which will not. Those markets where the merger cannot take place have to be divested, in this case the CA has the decision about who is the buyer of the divested units. As we will see later, the intervention in the selection of the buyer is another instrument available to the CA. In the markets where the merger is not consummated we assume that the efficiency

_____

[5]For more details about the condition on critical efficiency gains see Roller, Stenneck and Verboven (2001). In the Appendix A1 we obtain the expresions for θ_k^* for linear and isoelastic demand functions.

gains are not realized and the marginal cost of supplying remains at c (this assumption is relaxed later).

2.1 Consumers Gains.

We define as $S(\theta, \lambda_k)$ the change in consumer surplus resulting from the merger in market k. The merger in that market will be accepted whenever $S(\theta, \lambda_k) \geq 0$ or as we mentioned above, whenever $\theta \geq \theta_k^*$. It is further assumed that :

A1. $\frac{\partial S}{\partial \theta} \geq 0$,

A2. $\frac{\partial^2 S}{\partial \theta \partial \lambda} \geq 0$

A3. $S(0, \lambda_2) \leq S(0, \lambda_1) \leq 0$ and $S(c, \lambda_2) \geq S(c, \lambda_1) \geq 0$

    The first assumption is a normal result from monopoly pricing; the lower is the marginal cost, the lower will be the price faced by consumers. The second assumption represents the fact that a given level of cost savings is more valuable in high λ markets. This assumption may seems counter-intuitive, but using the interpretation of λ as intercept or the demand in the price axis, a very efficient merger -when θ is over the threshold θ_2^*- is more valuable in terms of the increase in consumer surplus in the bigger market[6]. A3 indicates that when there are no cost savings, no merger is socially desirable and the higher the λ, the less desirable the merger is (type I error increases with market power). On the contrary when savings in marginal cost tend to the maximum, both mergers are desirable and consumers gains are greater in the high λ market (type II error increases with λ as well). Note that we do not put any condition on the sign of $\frac{\partial S}{\partial \lambda}$, but from A2 and A3 is clear that for low levels of efficiency gains the sign of $\frac{\partial S}{\partial \lambda}$ is negative while for high levels of efficiency gains this derivative is positive.

2.2 Firms Gains

The private profitability of the merger in market k is equal to the increase in profits when moving from duopoly to monopoly, which is denoted by: $U(\theta, \lambda_k) = \Pi^M(\theta, \lambda_k) - 2\Pi^D(\lambda_k)$. We assume that once the CA clears the merger, the firm can exploit all its market power (there is no behavioral remedy). This expression does not include any cost incurred when implementing the divestiture. We further assume that:

A4. $\frac{\partial U}{\partial \theta} \geq 0$

---

[6]It can be easily checked that A2 is also satisfied when λ represents the inverse of the price elasticity of the market demand. However, this assumption is not crucial, it just allows us to provide more options to the CA when formulating its policy. The important requirement is to have an ordering condition yielding a unique sign for the cross derivative.

A5. $\frac{\partial U}{\partial \lambda} \geq 0.$

The first condition is also standard from the monopoly maximization problem, where profits decrease with marginal cost. The second condition says that for any level of efficiency gains, firms gain more when they merge in markets where they enjoy higher market power.

2.3 Divestiture

Whenever divestiture has to take place, one of the facilities of the new joint firm in the non merging market has to be sold. The buyer of those assets will be able to produce with the same ex-ante standard technology of the incumbent- at marginal cost $c-$ being in a symmetric situation for competition with him. (Remember that in market where there is no merger, cost savings do not occur). However, the buyer has to pay a fixed cost equal to F reflecting any entry barrier or sunk cost that the entrant has to incur in order to operate in the acquired business. One important implication of the "equal cost" assumption is that there is no competitive concern about the future functioning of the divested market because both firms will be in equal position to compete, in other words, consumer surplus will stay the same after the remedy. Hence, the net utility of the deal for the firms-merger in k and divestiture in j- is equal to:$U_N = U(\theta, \lambda_k) + V - \Pi^D(\lambda_j)$. Where V is the selling price of the divested assets. If the merging firms have all the bargaining power in the transaction, then $V = \Pi^D(\lambda_j) - F_j$ and the net utility becomes:

$$U_N = U(\theta, \lambda_k) - F_j. \qquad (1)$$

Merging firms will try to extract the maximum income from the transaction by selling the assets to the firm with highest willingness to pay or equivalently with the lowest cost of entry: $F_{\min}$. Since the first term of the right-hand side depends on θ, the CA can infer that $U(\theta, \lambda_k) \geq F_{\min}$ or that θ is over some threshold $\theta_{\min}$ upon acceptance of the remedy. Thus, implementing the divestiture updates the beliefs of CA about θ, reducing the uncertainty of the social desirability of the merger in k. If the buyer selection is a decision of the merging firms, then CA has to take the threshold $\theta_{\min}$ as given. What is even more valuable for CA is the possibility to select the threshold by intervening on the right hand side of the equation 1. For doing this, the CA must be able either to pick the buyer -assuming that CA knows the entry cost of entrants- or to put a ceiling in the transaction price of the divested units[7].

---

[7]Motta et al (2002) bring up the relevance of the way that the CA selects the buyer

2.4 First Best Policy

Under symmetric information about θ, CA is able to decide, without any error, where the firms can merge, and that will depend on the value of θ.

Thus, if

(i) $\theta \leq \theta_1^*:$ No merger is allowed.

(ii) $\theta_1^* \leq \theta \leq \theta_2^*$ Merger is allowed only in market 1.

(iii) $\theta \geq \theta_2^*$ Merger in 1 and 2 is allowed.

When firms have to divest in market 2 -and merge only in market 1- the CA does not care about who is buying the assets, as long it is an independent firm. Under the case (ii) the efficient solution is that the firm with the lowest fixed cost -$F_{\min}$ - buy the divested unit. The transaction among the seller and buyers in the divestiture is not needed to obtain information about θ.

2.5 Blind Policy

This policy corresponds to the decision taken by the CA when it is ignorant of efficiency gains and does not employ any information revealed by the acceptance or rejection of the proposed remedies. It just uses the agency a priori beliefs represented by $F(\theta)$. These beliefs contain any reliable information the CA may have about the proposed deal due to its know-how, expert judgement, etc. The decision is based on the expected value of $S(\theta, \lambda_k)$ that we call $E_\theta[S_k]$. Merger is allowed in market k if and only if $E_\theta[S_k] \geq 0$, otherwise it will be rejected. Note that even if $\theta_1^* \leq \theta_2^*$ it is possible to have $E_\theta[S_2] \geq E_\theta[S_1]$. This will ultimately depend on the beliefs about θ and the values of λ_1 and λ_2. In order to keep things as general as possible we do not impose any ordering condition in $E_\theta[S_k]$.

2.6 Optimal Policy Under Asymmetry of Information

The implementation of the best policy under asymmetry of information about EG between the merging firms and the CA is structured in base of the following timing. The explanation of the components of the timing are given below.

T =1 Given the beliefs of the CA about θ, the agency decides to clear unconditionally the merger in both markets or to apply the Incentive Compatible (IC) policy.

---

of the divested assets. Showing a higher willingness to pay for those assets may be a bad signal because it may reflect a higher likelihood of collusion instead of a lower production cost.

T=2. If the CA applies the IC policy, the agency makes a take or leave it offer to the merging firms. The offer is a menu that includes the markets where the firms can merge and the related remedy or divestiture.

T=3. Firms facing the menu choose their best alternative; market to merge plus remedy. Accordingly, the CA implements the choice made by the firms.

We start in T=2, at the stage of defining the IC policy. Assuming that, except θ, all the relevant markets parameters $(\lambda_1, \lambda_2, F, c)$ and beliefs about θ are common knowledge, the CA can improve the results of the blind policy by making strategic use of divestitures. As we already mentioned, the CA updates its beliefs about the value of θ upon the acceptance or rejection of the remedy from the part of the merging firms. Hence, the CA may structure a menu of options that is offered to the firms with the purpose of screening the mergers. The menu is an incentive compatible device that induces firms to self-select themselves in function of the embodied level of efficiency gains of the merger. The underlying idea behind this policy is that when mergers carry more cost savings firms will be willing to accept remedies that are more costly to them. However, given that the CA has limited instruments to elicit information-the divestiture on one of the markets and the cost of divesting - this policy cannot achieve the first best solution.

We call as *Incentive Compatible Policy* a menu given to the firms that contains a set of possible markets to merge and a respective remedy. In the menu the firms decide whether merge in market 1 and divest at cost K_1 in market 2, merge in market 2 and divest in market 1 at cost K_2 or not merge at all in any market. The costs of divesting are obtained by solving the following maximization problem:

$$Max_{\{\theta_1, \theta_2, K_1, K_2\}} : E^{SB} = \int_{\theta_1}^{\theta_2} S(\theta, \lambda_1) f(\theta) \, d\theta + \int_{\theta_2}^{c} S(\theta, \lambda_2) f(\theta) \, d\theta \quad (2)$$

Subject to the incentive compatible constraints:

i) $\quad U(\theta, \lambda_1) - K_1 \geq 0 \quad$ for $\theta \geq \theta_1$

ii) $\quad U(\theta, \lambda_2) - K_2 \geq U(\theta, \lambda_1) - K_1 \quad$ for $\theta \geq \theta_2$

Where K_1 and K_2 are the cost imposed on firms when they want to merge in market 1 and 2 respectively. The first constraint says that the cost imposed when divesting in market 2 has to be big enough to ensure that only firms with efficiency gains superior to θ_1 will accept that remedy. The second constraint says that if cost savings are even bigger than a threshold θ_2, then CA has to impose a remedy K_2 such that no firm with $\theta \leq \theta_2$ will agree to merge in market 2 and divest in market 1.

9

We first solve the Objective Function for θ_1 and θ_2 and then we obtain the K_1 and K_2 that satisfy the IC conditions.

First Order Conditions give us:

$$S(\theta_1, \lambda_1) = 0 \tag{3}$$

$$S(\theta_2, \lambda_1) - S(\theta_2, \lambda_2) = 0 \tag{4}$$

From the definition of θ_1^*, we obtain that $\theta_1 = \theta_1^*$. The second threshold θ_2 that corresponds to the value of efficiency gains above which, gains in consumer surplus are greater in market 2 than market 1 is defined as θ_{12}. From the condition of $\theta_1^* \leq \theta_2^*$ and from the assumption A2, we have that $\theta_{12} \geq \theta_2^* \geq \theta_1^*$ (see figure 1). The optimal costs of divestiture as a function of θ are given by: $K_1^* = U(\theta_1^*, \lambda_1)$ and $K_2^* = U(\theta_{12}, \lambda_2) - U(\theta_{12}, \lambda_1) + U(\theta_1^*, \lambda_1)$ where $K_2^* \geq K_1^*$ since $U(\theta_{12}, \lambda_2) \geq U(\theta_{12}, \lambda_1)$. Comparing the IC constraints with equation 1, we see that the costs of divestitures corresponds exactly to the entry cost.

The IC policy guarantees that any merger plus remedy solution chosen by the firms weakly increases consumer surplus. If efficiency gains are smaller than θ_1^* firms will not accept any remedy and the status quo prevail. If $\theta_1^* \leq \theta \leq \theta_{12}$ firms will choose to merge only in market 1. Finally in the case that $\theta \geq \theta_{12}$ firms will merge in market 2 and will divest in 1. The decision of firms is always aligned with the objective function of the CA and leads to the maximum value of consumer surplus under the constraint that merger can at most take place in one market. The value of this IC policy is :

$$E^{IC} = E_\theta \left[S_1 / \; \theta_1^* \leq \theta \leq \theta_{12} \right] \Pr{ob} (\theta_1^* \leq \theta \leq \theta_{12}) + E_\theta \left[S_2 / \; \theta_{12} \leq \theta \right] \Pr{ob} (\theta_{12} \leq \theta) \tag{5}$$

The IC policy cannot lead to the first best, because if $\theta \geq \theta_2^*$ the optimal solution would be the approval of the merger in both markets. Since the divestiture is used as an instrument for extracting information about θ, the menu cannot include the alternative of allowing the whole merger, otherwise all firms, for any value of θ, will always prefer this choice to any other menu option and the CA will lose any possibility of screening the mergers as a function of the hidden parameter θ. If the beliefs are very optimistic about how large the efficiency gains are, we cannot rule out the complete merger as the best choice. Hence, at the beginning, the CA has to decide whether to grant the merger in both markets or propose the optimal menu to the firms. This decision depends exclusively on the expected value of each policy
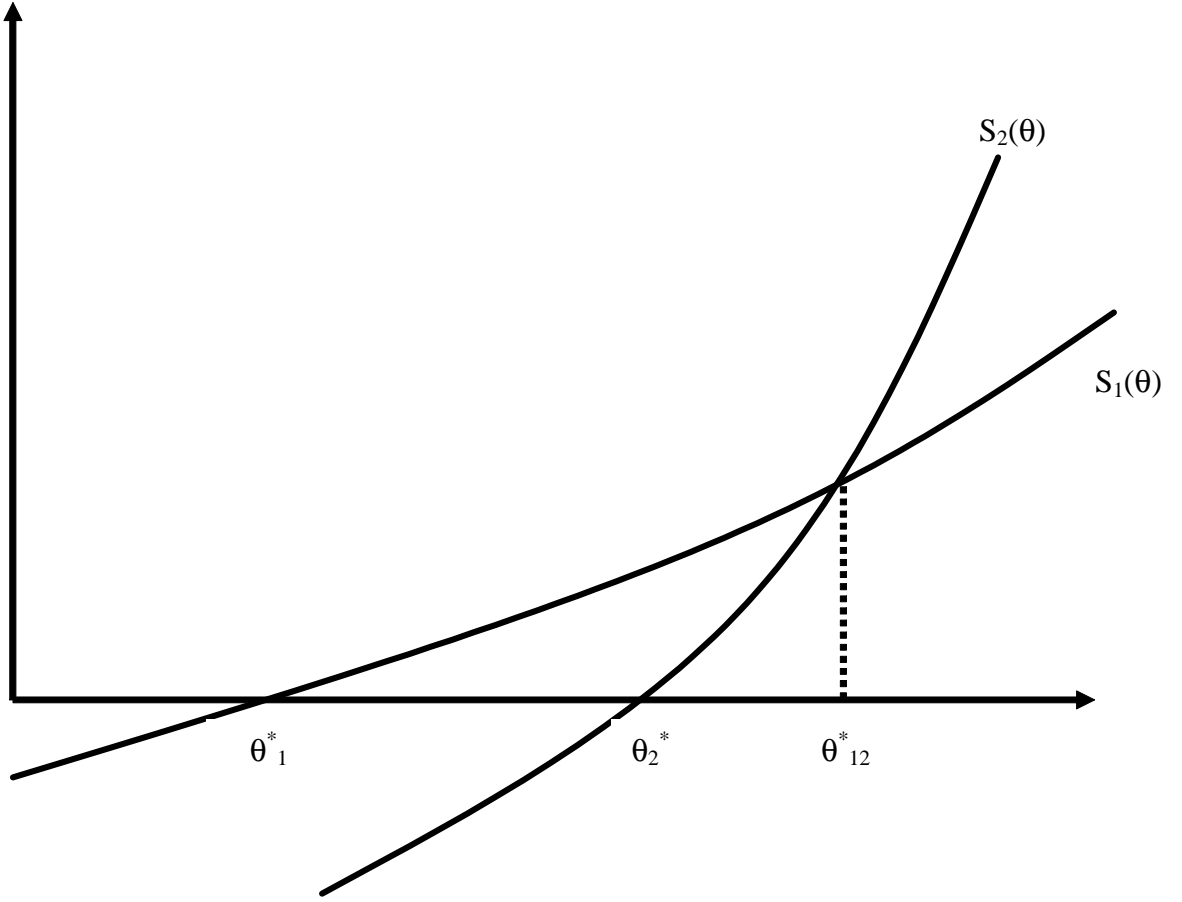
which in turn is a function of the beliefs of CA about the magnitude of the efficiency gains.

Proposition 1: *The optimal decision consists on either applying the IC policy or of allowing the merger in both markets. The IC policy tends to dominate the full merger solution the less optimistic are the beliefs about efficiency gains.*

At T=1, the CA has to select the policy to apply. For that it has to compare the value of each policy in ex-ante terms. The value of the blind policy -accepting unconditionally both mergers- is given by: equation 6 while the value of the IC policy is expressed in equation 5.

$$E^0 = E_\theta\left[S_1\right] + E_\theta\left[S_2\right] \tag{6}$$

The CA will propose the menu or IC policy to the firms if and only if: $E^{SB} \geq E^0$. Since $E^{IC} \geq E_\theta\left[S_1\right]$, $E^{IC} \geq E_\theta\left[S_2\right]$ and $E^{IC} \geq 0$, the sufficient condition that ensures that the IC is superior than the full approval of the

11

merger is that either $E_\theta [S_1] \le 0$ or $E_\theta [S_2] \le 0$. This sufficient condition has the interpretation that the beliefs about θ have a upper bound in terms of how optimistic the realization of the efficiency gains should be.[8] We can also infer that the IC policy is always superior to the complete rejection of the merger. More importantly whenever the CA will require a divestiture (in any market). It is better to use simultaneously this remedy as way to extract information about θ by making costly to divest. This is what we call the double usefulness of the divestiture. Under the blind policy, the merger in both markets will occur if and only if $E_\theta [S_k] \ge 0$ for $k = 1, 2$. Now, even if that condition is satisfied, the CA might prefer to offer the menu to firms Thus, the condition for allowing the merger in both markets -by re-writing (6) becomes: $E_\theta [S_i] \ge E^{SB} - E_\theta [S_j] > 0$, for $i \ne j$. As we can see, this condition is more stringent than just requiring a positive expected value in order to accept the merger.

The main advantage of the IC policy is that it completely removes the type I error (allowing inefficient mergers) because whenever firms accept to merge in one market and divest in the other, the CA knows that θ is over the threshold required for having a welfare-increasing merger. The type II error (rejecting good mergers), while being mitigated, is not totally eliminated since it is impossible to include the option of "merger in 1 and 2 " within a incentive compatible mechanism that employs divestitures as instruments. This remaining type II error, is the difference in terms of consumer surplus between the first best and the IC policy, but this difference becomes less significant the less optimistic are the beliefs about the efficiency gains that the merger will produce. Note that the cost (K) imposed on firms has to be higher if they want to merge in the more profitable market. This fact implies that the CA must be able to impose a more painful divestiture on the firms if they want to merge in the most profitable market. Divestitures, thus, accomplish a dual function, they restore competition where market power is a concern and at the same time they act as instruments that allow CA to extract information about EG[9].

The implementation of the IC policy requires commitment from the CA. If firms decide to merge in market 2, CA will learn that: $\theta \ge \theta_{12} \ge \theta_1^*$, which

---

[8]See the appendix A2 for a proof using the concept of first order stochastic dominance.

[9]Yao and Dahdouh (1993) mention that the "crown jewel" provision also acts as a signalling mechanism for succesful divestiture proposed by the merging parties. The idea is that if the divestiture fails (because it is not a feasible businees for instance) then the firms must sell their most valued assets: the "crown jewel". Therefore, being willing to risk such assets is a signal that the remedy will work. At the same time, they mention that even executing that provision may resolve competitive problems in the market where the "crown jewel" assets are involved.

indicates that the level of efficiency gains is over the threshold of market 2 and consequently over market 1 threshold (θ_1^*) as well. Thus, it would be optimal ex-post to consent the merger in market 1. However, if CA renegotiates the remedies, all types of mergers will take advantage of this and we will be back to the application of the blind policy. As is common to all problems of dynamic inconsistency, the best solution is to fully commit to the proposed policy without modifying it.

Results remain invariant if the CA employs total welfare instead of consumer surplus as the standard of decision. Defining total welfare as the sum of consumer surplus plus firms net profits, we have that: $W(\theta) = S(\theta) + U_N(\theta)$, where $U_N(\theta) = U(\theta) - K(\theta)$ corresponds to the profits of the merger net of divestiture costs. Since consumer surplus is increasing in efficiency gains (form assumption A1) and the net utility of firms is also increasing in θ (from the construction of the IC mechanism), then the total welfare is also increasing in θ. Moreover, since the total welfare function satisfies the conditions given by assumptions A1 to A3, the IC policy is also implementable using total welfare instead of consumer surplus as a objective function. The unique modification this change in standard produces is that the new efficiency gains thresholds (θ_1, θ_2) would be less demanding than those obtained using consumer surplus, provided that $U_N(\theta) \geq 0$ and $U_N'(\theta) \geq 0$ for all θ.

Although the execution of the IC policy involves inefficient entry, this policy never decreases total welfare, even if the CA employs consumer surplus as standard. The firm that enters in the divested market is not necessarily the one with the lowest entry cost. In the symmetric information situation, this policy would not be optimal. However under asymmetry of information this sub-optimal entry plays in favor of the CA. The inefficiency is fully absorbed by the merging firms but it is just large enough to ensure that only firms with sufficient cost savings will be willing to pay this cost. On the contrary, firms that the CA does not want to merge (for insufficient efficiency gains) will get a negative net benefit by merging and divesting and therefore they will reject the proposed divestiture.

3 Extensions

3.1 Anticipating The Remedies

So far we have not included any kind of strategic behavior from firms before presenting the merger to the CA. Should they know the mechanism given by the IC policy and the beliefs of the CA, merging firms might be tempted to pre-divest in a less costly way that the one required by the authority, thus

selling the assets to the firms with highest willingness to pay (or lowest cost of entry). In order to fix ideas, let's assume that the merger in market 2 will never be accepted because λ_2 is very high and $\theta_2^* \geq c$. Firms at most may have their merger approved in market 1. The question is whether firms will divest before presenting the merger to the CA. Suppose first that the beliefs of the agency are such that $E_\theta[S_1] \leq 0$, in this case, good type firms ($\theta \geq \theta_1$) will know that the only way to get approved the merger in market 1 is by signalling this through the costly divestiture proposed by the CA, therefore is never in their interest to sacrifice one instrument ex-ante. On the other hand, bad type firms ($\theta \leq \theta_1$) will not be better-off selling ex-ante the assets because in any case the CA will reject the merger. In consequence, pre-divesting is not a problem for the CA because firms will differentiate themselves upon their value of θ. Good type merging firms will have incentives to provide the CA with the instruments -divestitures- to prove that the efficiency gains are high. On the contrary, non desired mergers will be indifferent and their behavior ex-ante will not affect the power of the IC policy.

When beliefs are more optimistic: $E_\theta[S_1] \geq 0$, bad types will have incentives for pre-divesting in order to be exempted from the remedy and get their type revealed. Good types firms also will want to pre-divest since they will pay a less costly remedy. We obtain a pooling situation where both types want to pre-divest because they know that CA will accept the merger in market 1 anyway even without needing a screening instrument. Therefore under optimistic beliefs the CA cannot implement the IC policy. We summarize this result in the following proposition:

Proposition 2: *The possibility that prospective merging firms may take actions in advance of the remedies affects the implementation of the IC policy if and only if the beliefs of CA about efficiency gains are optimistic. In this case, any type of merger will move first, pre-divesting and leaving the CA with no option but approve the merger. On the other hand, if beliefs are pessimistic, separation of types is possible. The desired types will not pre-divest and they will be willing to incur the remedies proposed by the IC policy as a condition for having the merger approved.*

This result gives support to the CA for adopting a strategic scepticism about efficiency gains. Nevertheless, CA can overcome the problem of pooling that arises when beliefs are optimistic by employing a decision policy that is independent of the beliefs. When the discussion is only about the merger in market 1, the IC policy always dominates the blind policy, no matter what the beliefs of the CA are. Consequently, the CA may impose a policy such that only firms that accepting the remedies imposed by the IC mechanism will have their mergers approved. Thus, any pre-divestiture is deemed to be a negative signal and it gives incentives to merging firms to provide as many

14

instruments as possible to the CA to apply the screening. Nonetheless, this policy presents some difficulties. First, it requires commitment. If the firms move first by pre-divesting, then the best option ex-post for CA, if beliefs are optimistic, is to authorize the merger. Second, conditioning the approval on the history of the merging firms in relation to the sale of assets may be difficult to justify because there are several pro-efficiency reasons why firms may want to divest part of their assets before trying to merge[10].

3.2   Efficiency gains in the divested market

If the reduction in marginal cost takes place also in the divested market, there may be some important qualifications to the above analysis. As we will see, on the one hand the CA may have a better willingness to accept the merger at least in one of the markets, but on the other hand the success of the divestiture can be jeopardized if the efficiency gains revealed by the mechanism are sufficiently high. A potential buyer will hesitate to enter if he obtains information that he has to face a tough competitor in the divested market.

To model this situation, let's call $\widehat{S}_i(\theta)$ the change in consumer surplus in the divested market i when the incumbent and the entrant produce at marginal cost $c - \theta$ and c respectively. Since market i is in duopoly situation we have that $\widehat{S}_i(\theta) \geq 0$ and $\widehat{S}_i(\theta) \geq S_i(\theta)$ for all θ. First, note that is never in the interest of the CA to allow the merger in both markets, since that alternative will be always inferior to the solution of allowing merger in one of the markets and requiring divestiture in the other. Moreover, under the following assumption:

A6. $\frac{\partial \widehat{S}(c)}{\partial \lambda} \geq \frac{\partial S(c)}{\partial \lambda}$

The option of allowing the merger in market 1 and divesting in market 2 is always superior to the choice of merging in 2 and divesting in 1. The assumption A6 is a sufficient condition for making sure that in states of nature of high θ, the gains of having duopoly in the high λ market (or market with more anti-competitive concern) relative to the low λ are bigger than the same differential gains but comparing monopoly structures[11]. Thus the optimal policy consists in either to block the complete merger or to allowing it in market 1 and forcing divestiture in market 2. Then, the maximization problem becomes:

---

[10]For instance, selling unprofitable business may enhance the value of the firm before being acquired by another firm.

[11]See appendix A3.

$$Max_{\left\{\widehat{\theta}_1, \widehat{K}_1\right\}} : \int_{\widehat{\theta}_1}^{c} (\widehat{S}(\theta, \lambda_2) + S(\theta, \lambda_1)) f(\theta) \, d\theta \tag{7}$$

Subject to:

$U(\theta, \lambda_1) + \widehat{U}(\theta, \lambda_2) - \widehat{K}_1 \geq 0 \qquad$ for $\theta \geq \widehat{\theta}_1$

Where $\widehat{U}(\theta, \lambda_2) = \Pi^D(\theta, \lambda_2) - \Pi^D(\lambda_2)$, is the increase in profits in the divested market by competing with lower marginal cost.

First order conditions give us:

$\widehat{S}\left(\widehat{\theta}_1, \lambda_2\right) + S(\widehat{\theta}_1, \lambda_1) = 0$

$\widehat{K}_1^* = U\left(\widehat{\theta}_1, \lambda_1\right) + \widehat{U}\left(\widehat{\theta}_1, \lambda_2\right)$

The new threshold $\widehat{\theta}_1$ satisfies the following condition: $\widehat{\theta}_1 \leq \theta_1^*$. The requirement in terms of efficiency gains for allowing the merger in market 1 is less stringent than in the basic case. The reason for this result is that now the merger in market 1 produces a positive externality in market 2, pushing down that price. Therefore the CA may allow some increase in price in the merging market as long as it reduces prices in the other market.

The utility of merging firms, net of divestiture costs, is equal to:

$$U_N(\theta) = U(\theta, \lambda_1) + \widehat{U}(\theta, \lambda_2) + V\left(\widehat{\theta}_1\right) - \Pi^D(\lambda_2) \tag{8}$$

Where the $V\left(\widehat{\theta}_1\right)$ is the value attached by entrants to the divested assets. Assuming that all potential entrants are as well informed as the CA about θ, the maximum willingness to pay to enter is:

$$V_j\left(\widehat{\theta}_1\right) = E_\theta \left[\Pi_2^D(c, \theta) / \theta \geq \widehat{\theta}_1\right] - F_j \tag{9}$$

Where, with some abuse of notation, $\Pi_2^D(c, \theta)$ corresponds to the profits of an entrant with marginal cost equal to c that competes with a firm, the incumbent, that has a lower marginal cost with a difference of θ. Compared with the basic case, the sale value of the divested unit now depends on the level of efficiency gains, since the cost savings are also realized in the no-merging market. The market value of the assets depends on the profits the entrant can obtain from them, which in turn is a negative function of θ. Since entrants do not know θ, the valuation is made in expected value. However, the information revealed from the acceptance of the remedy affects this valuation because, like CA, entrants update their beliefs about how efficient the competitor will be. It is clear that the higher the lower bound threshold $\widehat{\theta}_1$ the lower the willingness to pay for entering, i.e. $V'\left(\widehat{\theta}_1\right) \leq 0$.

If $V\left(\widehat{\theta}_1\right)$ becomes negative even for the lowest F_j entrant, then the optimal remedy $\widehat{K}_1^*$ cannot be implemented. The best solution is to shift down the threshold $\widehat{\theta}_1$ up to the level where a remedy is feasible to implement, i.e. to set a $\widehat{\theta}_1 = \theta_1^c$ such that $E_\theta\left[\Pi_2^D\left(c,\theta\right)/\theta \geq \theta_1^c\right] - F_{\min} = 0$. Notice that this modification of the policy and its the associated cost of divestiture introduces additional type I error in the merging market. Some mergers with $\theta \leq \widehat{\theta}_1$ will have to be accepted in order to make workable the remedy[12].

A case of informational efficiency offense has been configured. While knowing that θ is above a threshold is valuable information or "good news" for the CA, this turns out to be "bad news" for potential entrants since they will be less enthusiastic about entering in a market where they have a big disadvantage, in terms of costs relative to the incumbent. The CA is obliged to adjust its disclosure policy, not revealing too much information in order to make the whole deal feasible to implement. Cabral (2003) demonstrated that the efficiency defense conflicts with the likelihood of entry after a merger for the same reason that is present in our model. An entrant faces a higher barrier when the merged firm has lower marginal cost. Our result builds in this same argument but introduces an informational dimension. Thus, there is less likelihood of entry if the entrant learns that the incumbent is going to be highly efficient after the merger. The main and paradoxical message of this section is that it is not always in the interest of the CA to disclose too much information if this puts at risk the functioning of the remedy.

Proposition 3: *If $E_\theta\left[\Pi_2^D\left(c,\theta\right)\right] \geq 0$ and $\exists\, \theta_1^c$ s.t. $E_\theta\left[\Pi_2^D\left(c,\theta\right)/\theta \geq \theta_1^c\right] = F_{\min}$. Then, if $\widehat{\theta}_1 \leq \theta_1^c$ the CA can implement the IC policy and the first best is achieved. If $\widehat{\theta}_1 \geq \theta_1^c$, the CA sets the divestiture cost at $\widehat{K}_1^c(\theta_1^c)$, the remedy is feasible but the first best is not achieved since some type I error is introduced.*

4   Conclusion

The paper shows how the CA, by making strategic use of the divestitures, can elicit valuable information about potential pro-competitive effects of mergers. Divestitures, whose primary purpose is to fix market power problems originated by mergers, may also have the role of screening devices. Our results are

---

[12]The CA maximizes the objective function 7 respect to the IC constraint plus the divestiture feasible constraint given by equation 8. There is an additional condition to be satisfied: The value of this policy has to be positive in expected terms. The magnitude of the type I error could be big enough to outweigh the benefits of the enjoying the cost savings in the divested market.

along the same lines as signaling models, where the good types are willing to undertake costly actions that allow them to differentiate themselves from the bad types. The cost imposed on merging firms, by restricting their choice of the buyer, though inefficient from the symmetric information point of view, turns out to be beneficial due to the screening function that it plays.

Although this screening instrument is not ideal (very good types should not be required to divest in a symmetric information setting but they are the more willing to accept painful remedies), we have shown that the decision process can be improved significantly especially in the cases when CA is very sceptical about the level of efficiency gains carried by the merger, or in other words, when there is more concern about type I error than type II error.

References

[1] Bork, R. (1978) "The Antitrust Paradox: A Policy at War with Itself" Free Press

[2] Brodley, J. (1996), "Proof of Efficiencies in Mergers and Joint Ventures" *Antitrust Law Journal,* Vol 64: 575-612

[3] Motta, M., Polo, M. and Vasconcelos, H. (2002). "Merger Remedies in the European Union and Overview" Working Paper

[4] Neven, D. Nuttall, R. and Seabright, P. (1993) "Merger in the Daylight", London CEPR.

[5] Posner, R. (1976)"Antitrust Law" Chicago Press.

[6] Parker, R.and Balto, D.(2000). "The Evolving Approach to Merger Remedies", Antitrust Report

[7] Roller, L.H., Stennek, J.,Verboven , F. (2001) "Efficiency Gains From Mergers" *European Economy* 5: 32-127

[8] Rey, P. (2000), "Towards a Theory of Competition Policy" IDEI, Working Paper.

[9] Scherer, F.M. (1991) "Comment". Brookings Papers in Economic Activity

[10] Williamson, O. (1968), "Economies as an Antitrust Defense: The Welfare Trade Offs," *American Economic Review*, March 1968, 58, 18

[11] Yao, D. and Dahdouh, N. (1993). "Information Problems in Merger Decision Making and Their Impact on Development of an Efficiency Defense", *Antitrust Law Journal* 62, 23 -45

5 Appendix

A1. (i)Linear demand function: $Q(P) = A - bP$. If ex-ante both firms have marginal cost equal to c then the equilibrium in Cournot competition leads to a $P^D = \frac{1}{3b}(A + 2bc)$ If the merger reduces the marginal cost by θ, the price of the monopolist will be $P^M = \frac{1}{2b}(A + b(c - \theta))$. Imposing the condition that $P^M(\theta^*) = P^D$. The critical level of efficiency gains θ^* that leaves the price equal after the merger is given by $\theta^* = \frac{1}{3}\left(\frac{A}{b} - c\right)$. Thus, we can rank the markets upon the ratio $\frac{A}{b}$, such that markets where this ratio, that represent the intercepts of the demand function in the price axis, is higher will need higher efficiency gains in order to keep prices at the pre-merger level.

(ii) Isoelastic demand function: $Q(P) = AP^{-E}$. Applying the same procedure as in the previous case, the Cournot competition yields to $P^D = \frac{1}{1 - \frac{1}{2E}}c$. After merging, monopoly price is equal to: $P^M = \frac{1}{1 - \frac{1}{E}}(c - \theta)$. The critical level of efficiency gains is given by $\theta^* = \frac{1}{2E - 1}$. Therefore, the more inelastic is the market demand the higher the level of efficiency gains required for not having a higher price after the merger.

A2. Condition for having $E_\theta[W_k] \leq 0$:

$$E_\theta[W_k] = \int_0^c W_k(\theta) f(\theta) = W_k(c) - \int_0^c \frac{\partial W_k(\theta)}{\partial \theta} dF(\theta).$$

Then $E_\theta[W_k] \leq 0 \Leftrightarrow W_k(c) \leq \int_0^c \frac{\partial W_k(\theta)}{\partial \theta} dF(\theta)$. Let's call $G(\theta)$ the distribution function of θ such that $E_\theta[W_k] = 0$

or $\int_0^c \frac{\partial W_k(\theta)}{\partial \theta} dG(\theta) = W_k(c)$.

Then we have that $\int_0^c \frac{\partial W_k(\theta)}{\partial \theta} dF(\theta) \geq \int_0^c \frac{\partial W_k(\theta)}{\partial \theta} dG(\theta) \Longrightarrow \int_0^c \frac{\partial W_k(\theta)}{\partial \theta} [F(\theta) - G(\theta)] d\theta \geq 0$.

The sufficient condition for satisfying the last inequality is: $F(\theta) \geq G(\theta)$ for all $\theta \in [0, c]$ which by definition corresponds to the case that $G(\theta)$ first order stochastically dominates $F(\theta)$. In terms of the model this means that the expectations about how favorable θ is, are bounded upward by $G(\theta)$.

A3.Let be $\Psi_1(\theta) = W_1(\theta) + \widehat{W}_2(\theta)$ the value in terms of welfare for merging in market 1 and divesting in market 2. and $\Psi_2(\theta) = W_2(\theta) + \widehat{W}_1(\theta)$ the welfare value of merging in 1 and divesting in 2. Then, $\Psi_1(0) = W_1(0)$ and $\Psi_2(0) = W_2(0)$. From A3 we know that $\Psi_2(0) \leq \Psi_1(0) \leq 0$, since $\Psi_j'(\theta) \geq 0$ for $j = 1, 2$.

Therefore if $\Psi_1(c) \geq \Psi_2(c) \Longrightarrow \Psi_1(\theta) \geq \Psi_2(\theta)$ for all $\theta \in [0, c]$.

$\Psi_1(c) \geq \Psi_2(c) \Leftrightarrow W_1(c) + \widehat{W}_2(c) \geq W_2(c) + \widehat{W}_1(c)$

$\Leftrightarrow \widehat{W}_2(c) - \widehat{W}_1(c) \geq W_2(c) - W_1(c)$

$$\Leftrightarrow \int_{\lambda_1}^{\lambda_2} \frac{\partial \widehat{W}(c)}{\partial \lambda} \geq \int_{\lambda_1}^{\lambda_2} \frac{\partial W(c)}{\partial \lambda}$$

Where the sufficient condition for satisfying the last inequality is: $\frac{\partial \widehat{W}(c)}{\partial \lambda} \geq \frac{\partial W(c)}{\partial \lambda}$ for all $\lambda \in [\lambda_1, \lambda_2]$