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ABSTRACT

Sectoral Regulators and the Competition Authority: Which Relationship is Best?*

Inspired by the creation of the new Competition Authority in Portugal, we consider the interplay between regulatory agencies with overlapping competencies; for example, a competition authority and a sectoral regulator. We analyse how authorities' incentives are affected if they can decide independently, or must follow each others' opinions, respectively, and consider how this relationship performs in the presence of institutional biases and lobbying efforts. It is found that the best results tend to be achieved when the authorities act independently of each other: the probability of coming to a decision is higher, and decisions are less vulnerable to lobbying.

JEL Classification: L51

Keywords: competition authority, institutional relationship, lobbying, sectoral regulators and strategic substitutes and complements

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Non-technical Abstract

Over the last decade a series of heavily regulated markets were at least partially liberalized, such as telecommunications, energy and transport. After deregulation these markets often continue to be subject to some sector-specific regulation at the same that they are now also subject to general competition law. This dichotomy is often accompanied by the existence (or even creation) of a sectoral regulator *and* a competition authority, whose responsibilities are partially overlapping.

A good example of the typical changes that have occurred throughout Europe and the OECD in general is provided by Portugal, a small European country that entered the European Union in 1986. It is often taken as a guiding example for most of Eastern Europe's economies.

The year 2003 saw, in Portugal, the birth of the Competition Authority, which substituted the Competition Council (Conselho da Concorrência) and the Directorate-General of Commerce and Competition (Direcção-Geral de Comércio e Concorrência) in the application of competition legislation. It also assisted to the publication of a new Competition Law (Decree-Law 10/2003, of January 18th and Law 18/2003, of June 11th). The Competition Authority started functioning on March 24th of 2003. This new Authority is an independent entity, and has found its powers of intervention, as compared to the previous law, widened to all sectors of economic activity. Only legal monopolies are excluded, for obvious reasons, and within the activities implied by their legal status.

Since it covers all sectors of economic activity, the exercise of its mission overlaps with the space of intervention of sectoral regulators. The Portuguese sectoral regulators are (in alphabetical order): ANACOM - ICP-Autoridade Nacional de Comunicações (electronic communications), Banco de Portugal (banks), CMVM - Comissão do Mercado de Valores Mobiliários (stock markets), ERSE - Entidade Reguladora dos Serviços Energéticos (energy), IMOPPI - Instituto dos Mercados de Obras Públicas e Particulares e do Imobiliário (construction), INAC - Instituto Nacional de Aviação Civil (air transport), INTF - Instituto Nacional de Transporte Ferroviário (railroads), IRAR - Instituto Regulador Águas e Resíduos (water), ISP - Instituto de Seguros de Portugal (insurance).

This overlap may or may not create conflicting interventions by the Competition Authority and the sectoral regulators. Furthermore, one must take into account the clear legal indefiniteness of the frontiers of the exercise the Competition Authority's powers, since the Law has left this definition to agreements or protocols still to be established between both parts. In some cases one can expect to see simultaneous intervention by both authorities. Even though there are important legal questions involved in the definition of the intervention of the Competition Authority and the sectoral regulators, there are significant economic effects which should not be neglected.

The overlapping of jurisdictions between competition authorities and sectoral regulators occurs in several countries, like Denmark, France, Germany, Italy, Netherlands, Spain and the UK, to name a few. The relationship between the sectoral regulators and the competition authority can be set in quite distinct ways. In some cases, the sectoral regulator has to obtain a vinculative opinion from the competition authority whenever the former intervenes in a matter of competition (Denmark). Some countries have a milder mutual consultation

system (France, Germany), with the duty of informing the other authority. Informally, the practice in Germany seems to have evolved to a situation where the sectoral regulator has the option to intervene first. Other cases, Italy and Sweden, give clear ground to the competition authority, which may have to receive an opinion from the sectoral regulator. The Netherlands follows a different path, requiring explicit coordination of decisions between authorities. The UK also goes in this direction.¹

The contribution of this study consists of discussing an issue not contemplated in the legal literature - the incentives of each authority to intervene. In particular, we will try to give an answer to the question "if we take the incentives to intervene of the different authorities into account, how should their relationship be structured?"

To arrive at an answer it is necessary to specify the types of relationships that can be established. Here we consider two extreme types. With the first type, denoted joint decision, a final decision that proof of anticompetitive behaviour has been established is reached if and only both authorities agree on this. This is meant to be a characterization of a limit situation where both authorities' decisions are binding for each other. With the second type, called independent decisions, a final decision is reached already if just one authority ends its investigation and decides it has proof of anticompetitive behaviour.

The comparison of the two relationships leads to the following results. If the equilibrium probability of detecting and proving anticompetitive behaviour is higher (less) than 1/2 then independent decisions gives rise to a lower (higher) level of intervention on the part of the two authorities, as compared with joint decisions. Still, this is not the relevant comparison: Independently of the level of intervention, independent decisions result in a higher total probability of success and higher welfare.

We then consider the effect of different weights attributed by each authority to consumers and firms' profits. With joint decisions it is optimal to counter-balance some authority's bias with an opposite bias of the other authority, as seems "intuitive". Still, with independent decisions the optimal institutional design implies that the second authority should be endowed with a bias of the same direction as the other: If the authorities' objectives are more similar the costs of excessive investigation are avoided.

Even though this is a clear result, it is more difficult to apply in practice because in reality the Competition Authority interacts with many sectoral regulators. If the latter attribute different weights to the firms in their sector it is not easy to define the appropriate objective of the Competition Authority. Still, our result at least justifies some discussion about whether the Competition Authority should (or not) take into account the interests of the industry's firms or concentrate exclusively on consumer surplus. Alternatively, this realignment can be reached if sectoral regulators' objectives are redefined such as to give more weight to consumer surplus.

Finally, an important issue is regulatory capture, when the authority's intervention is mainly aligned with the interests of the regulated firm(s). Our analysis indicates that whenever regulatory capture is a preoccupation then authorities should decide independently. That is, even if authorities are obliged to

¹For example, in the telecommunications sector, the OFT Guideline 417 sets the background for application of competition policy by either the sectoral regulator or the competition authority.

inform each other, their opinions should not be binding.

We conclude that the existence of overlap of jurisdictions between sectoral regulators and the Competition Authority may be beneficial in terms of social welfare. Even though cooperation between these authorities is important, especially through exchange of information and technical knowledge, a joint decision process should not be imposed: The independence of each authority is a vital factor for realizing the potential benefits arising from this overlap.

1 Introduction

Over the last decade a series of heavily regulated markets were at least partially liberalized, such as telecommunications, energy and transport. After deregulation these markets often continue to be subject to some sector-specific regulation at the same that they are now also subject to general competition law.² This dichotomy is often accompanied by the existence (or even creation) of a sectoral regulator *and* a competition authority, whose responsibilities are partially overlapping (OECD 2004, p. 22):

“The most common pattern is for regulators to be responsible for the prices and services of natural monopolies, while dealing with disputes about network access in co-ordination with competition authorities, who apply general rules about abuses by dominant firms that could cover the same conduct. That is, jurisdiction over access disputes is shared.”

A good example of the typical changes that have occurred throughout Europe and the OECD in general is provided by Portugal, a small European country that entered the European Union in 1986. It is often taken as a guiding example for most of Eastern Europe’s economies.

New legal dispositions enacted in May 2003 have established the jurisdiction of the Portuguese Competition Authority (Autoridade da Concorrência) over all sectors of economic activity. Unlike previous competition laws, this latest one exempts only legal monopolies, and even these only for the breadth of the concession awarded in the contract establishing the legal monopoly. The broad range of markets covered by the *ex post* control exerted by the Competition Authority clearly creates the scope for conflict with sectoral regulatory authorities. While this possibility is recognized in the definition of powers of the Competition Authority, the boundaries of its power are not clearly defined.

The resulting overlap of jurisdictions implies that either the Competition Authority and the sectoral regulatory authorities reach an agreement about timing and scope of their interventions, or that in some cases intervention by both authorities may occur. The possibility of simultaneous intervention of the sectoral regulators and the Competition Authority has been publicly discussed mainly in legal terms and in relation to the expertise and to the nature of instruments available to each authority. The typical argument runs as follows: The Competition Authority acts as a monitoring entity. It verifies *ex post* whether or not firms had adopted anti-competitive conduct. On the other hand, sectoral regulatory authorities intervene *ex ante*, enacting regulatory measures aimed at avoiding the exercise of monopoly power in regulated markets, for example the setting of high prices or inefficient investment decisions. Alternatively, one could imagine that both authorities are on an equal footing, and each investigates where it sees a need to intervene. Whether the relationship between the Competition Authority and the Sectoral Regulators will be one of control, or of cooperation between equals, is not established in the Law.

The overlapping of jurisdictions between competition authorities and sectoral regulators occurs in several countries, like Denmark, France, Germany,

²For details of how regulatory reform was performed in different countries consult the OECD’s Global Forum on Competition at www.oecd.org .

Italy, Netherlands, Spain and the UK, to name a few. The relationship between the sectoral regulators and the competition authority can be set in quite distinct ways. In some cases, the sectoral regulator has to obtain a vinculative opinion from the competition authority whenever the former intervenes in a matter of competition (Denmark). Some countries have a milder mutual consultation system (France, Germany), with the duty of informing the other authority. Informally, the practice in Germany seems to have evolved to a situation where the sectoral regulator has the option to intervene first. Other cases, Italy and Sweden, give clear ground to the competition authority, which may have to receive an opinion from the sectoral regulator. The Netherlands follows a different path, requiring explicit coordination of decisions between authorities. The UK also goes in this direction.³

We add to these legal and economic considerations a third type of argument — the determination of incentives for each authority to intervene, and the informational advantages of two independent views over the same case. The explicit acknowledgment of the incentives facing the relevant economic authorities is, of course, crucial to institutional design, since unforeseen incentive effects may lead to outcomes quite distinct from the intended ones. We address this issue, and implications for institutional design follow. In the following, for simplicity we generically refer to the commitment, objectivity and depth of investigations produced by an economic authority as its “effort”, a measure of its input into the decision process.

Our first result states that overlap of jurisdictions leads to lower effort by both authorities, as compared to a single one. This is so irrespective of whether “cooperation” or “competition” between economic authorities prevails. Cooperation, or joint decision making, is intended to mean that to reach a decision both economic authorities must have started and concluded successfully an investigation into the same matter. Thus, it requires both authorities to agree on having a case of anti-competitive behavior. It takes to the extreme the duty of consulting the other economic authority, turning the opinions of one authority binding to the other (from the Competition Authority to the sectoral regulator or vice-versa).

Under competition, or independent decision making, a case is closed as soon as one of the authorities concludes successfully the investigation, irrespective of whether the other authority has come to a conclusion or even opened a case. We find that if each authority’s equilibrium probability of finding anti-competitive behavior is larger than $1/2$, then independent interventions, even if overlapping, induce lower efforts by each authority than joint decisions (and vice-versa if this probability is less than $1/2$). Still, and more importantly, the probability that anti-competitive behavior is not challenged by economic authorities is always lower under independent decisions, and total welfare is higher.

Therefore, a first implication is that institutional design should allow for “competition” between economic authorities, based on their independence from each other, instead of forcing a joint decision process. Naturally, apart from and on top of the incentive problem focussed on above, the institutional framework of joint decisions would most probably involve higher administrative costs, anyway.

³For example, in the telecommunications sector, the OFT Guideline 417 sets the background for application of competition policy by either the sectoral regulator or the competition authority.

These result from the need to accommodate the different cultures and views of each economic authority.

There is, nonetheless, a third option to be considered - a protocol defining that one authority should decide first, with the other authority controlling the latter: Only when the latter does not intervene, will the other economic authority be able to step in with its own investigation.⁴ We find that this arrangement strongly distorts downward the incentives of the authority to be controlled, while the other authority, once it steps in, investigates as if it were alone. As a result, welfare is lower than under independent decisions.

The arguments reported above rely on the assumption that economic authorities value consumer surplus and firms' profits equally, a rather common assumption in the economics literature. However, according to public statements, the Competition Authority essentially values consumer surplus. On the other hand, the sectoral regulatory authorities tend to consider both consumer surplus and firms' profits, though not necessarily in an equal manner. In the case where at least one economic authority has a bias in its objective function (by comparison with the social welfare standard), the optimum allocation of efforts cannot be achieved.

Interestingly, a bias of one economic authority cannot be fully compensated by giving the other authority a corrective bias. If the authorities decide jointly, an opposite bias of the other authority raises welfare to the second-best but does not restore the first-best: If the legislator considers sectoral regulators to be more industry-oriented than socially optimal, then the Competition Authority should have a pro-consumers' bias, even though this is not as good as having both economic authorities unbiased. Surprisingly, if authorities decide independently then the second-best is achieved by giving the other authority the *same* bias as the first authority. The intuition behind these results is that the bias of one authority distorts the incentives of the other authority. In the case of competing authorities this distortion is best corrected by making authorities' biases more similar rather than more different to avoid excessive investigations by the other authority.

A final, and related, issue is regulatory capture. Typically, it is believed that sectoral regulators are more easily captured by firms than a general Competition Authority. Therefore it may be argued that one should rely more on the Competition Authority to ensure a level playing field in the marketplace. Still, the existence of two economic authorities with jurisdiction over the same market may render capture by firms harder. Therefore, it is of interest to address the issue of whether or not overlapping economic authorities are an instrument against regulatory capture. Though this intuition seems reasonable, one must not forget the incentives of economic authorities to intervene, which may lead to a different conclusion.

To this conventional wisdom we add that it does matter how the economic authorities interact with each other. If a joint decision framework is imposed, by concentrating lobbying efforts on the more industry-friendly economic authority firms can quite effectively deter the launch of investigations and a final decision contrary to firms' interests. This problem does not exist in the case

⁴It could be determined that in a specific set of situations one authority acts first, while in all other cases the other authority takes precedence.

of independent decisions. Thus, whenever the possibility of capture exists, our analysis suggests that institutional design must allow for intervention of both authorities, without requiring a joint decision. This implies that opinions that one authority seeks from the other should not be made binding.

Overall, to sum up our contribution: Having two economic authorities with overlapping jurisdictions, one taking care of sector-specific regulation, and a general Competition Authority, can often be welfare improving. Consequently, the recent changes in competition policy in Portugal, extending the application of competition law to all sectors of economic activity, do not imply or require, in terms of the underlying economics, the dismissal of sectoral regulators on matters of anti-competitive behavior of firms.

Although some cooperation between authorities may be desirable (in the sharing of information, sector-specific or technical expertise, for example), it would be problematic to impose a joint decision process, where a final decision on a case would be reached only under agreement of both authorities. Retaining independence in decisions is key to achieving the beneficial effects of overlapping authorities.

In the following section we start with an overview of recent legislation in Portugal and public statements by some of the actors involved to shed light on what are the intentions of legislators and regulators. Section 3 sets out our model, and Section 4 discusses the relation between the authorities. In Sections 5 and 6 we consider biases and regulatory capture. Section 7 presents some extensions of the basic model, while Section 8 concludes.

2 Institutional Background

The sectoral regulatory authorities (SRAs) in Portugal are the following, in alphabetical order: ANACOM (telecommunications), Banco de Portugal (banking sector), CMVM (stock markets), ERSE (energy), IMOPPI (construction), INAC (Civil air transport), INTF (railways), IRAR (fresh and waste water), ISP (insurance). Of these ANACOM, Banco de Portugal e ERSE are independent. The new Competition Authority (CA), Autoridade da Concorrência, officially started its activity on March 24th, 2003, after it had been created by a law passed in 2002 (Lei n.º24/2002 de 31 de Outubro) and a decree-law of 2003 (Decreto-Lei n.º10/2003, de 18 de Janeiro) which set out its statutes. In June 2003 the new Competition Law came into effect (Lei 18/2003, de 11 de Junho), with the intention of harmonizing Portuguese legislation with EU law. All of these documents, and others, mention to various degree the relation with the SRAs. The following is meant to give a quick overview of the most important points (all translations are the authors', and not necessarily precise), notwithstanding our modest legal knowledge.

- Lei n.º24/2002 de 31 de Outubro, allowing the government to create the CA;
Article 2 g) “The Authority will establish the necessary collaboration (“conveniente articulação”) between its activities and the activities of the sectoral regulatory authorities, and will receive from firms and public authorities the information and cooperation necessary for the fulfillment of

its purpose.”⁵

- Decreto-Lei n.º 10/2003, de 18 de Janeiro, containing the Statutes of the CA as an annex. The introduction mentions the “.. desirable and necessary collaboration with the respective sectoral regulatory authorities”.⁶ Its article 6 deals exclusively with the relation to the SRAs. In its points 2 and 3 it states that future law [the new competition law, see below] will define the “modes of intervention” and “participation” of the CA in areas subject to sectoral regulation, “as much as necessary in the interest of the objectives of the competition legislation”, and will define the “obligations of the sectoral regulators with respect to anti-competitive practices that they come to know about in their activities”, as well as the “collaboration with the authority on issues subject to sectoral regulation”, while point 4 enumerates the most important SRAs.
- The CA’s strategy document “Estratégia de Desenvolvimento (2003-2005)”: Two of the five main points of action identified are concerned with the relation with the SRAs (p. 16-18). On p. 17 it is stated that “The fundamental principle of work in the relations between the different regulatory authorities is that it is the [Competition] Authority that takes on the responsibility of the evaluation of competition, structure and behavior of markets, while the sectoral authority takes on the responsibility the technical aspects of the sector.”⁷ It is acknowledged that this principle needs to be adapted and made more precise for each sector, and it is proposed to sign “protocols” between the CA and the respective SRA. Furthermore, it is stated that the CA will make recommendations and try to influence the regulatory process so that restrictions on competitions are avoided.
- Lei 18/2003, de 11 de Junho 2003, the new Competition Law: Sets out the powers of the CA, which essentially will deal with the enforcement of the rules of competition. The articles dealing with the relation to the SRAs are:
 - Article 15: CA e SRAs “collaborate in the application of the competition legislation” in the terms described by the following Articles about processes on forbidden practices (27, 28, 29) and on concentrations (39);
 - Article 27, no. 4: Provisional measures (medidas cautelares) can only be imposed after the SRA states its evaluation («parecer prévio»), for which it has 5 working days.
 - Article 28, no. 2: Any decision other than closing the case can only be imposed after the SRA states its evaluation («parecer prévio»), for which the CA fixes a deadline.

⁵ Artigo 2 g) “A Autoridade procederá à conveniente articulação das suas actividades com a das autoridades reguladores sectoriais e receberá das empresas e das autoridades públicas as informações e a cooperação necessárias ao cabal desempenho das suas atribuições.”

⁶ “...desejável e necessária articulação com as respectivas autoridades reguladoras sectoriais”.

⁷ “O princípio fundamental de trabalho nas relações entre as diferentes agências reguladoras é o de que a Autoridade se responsabiliza pela avaliação da concorrência, estrutura e comportamento dos mercados, enquanto a agência sectorial se responsabiliza pelos aspectos técnicos do sector.”

- Article 29, Collaboration («Articulação») with the sectoral regulatory authorities
 - no. 1: The CA informs the SRA immediately about any suspicion, and the SRA has to comment
 - no. 2: The SRA informs the CA immediately about possible violations of the Law of Competition, and supplies material for investigation.
 - no. 3: Given no. 1 and 2 the CA can put on hold own investigations.
 - no. 4: Before a final decision the SRA informs the CA, so that CA can respond within a time limit set by itself.
 - Article 39, no. 1: The CA before taking a decision asks the SRA for its opinion.
 - no. 2: The exercise of powers of the SRA are not affected by no. 1.
 - It is interesting to note that the CA’s powers were reduced as compared to an earlier version of the law: By Article 29, no. 3 it could have sent an investigator to accompany permanently at the SRA processes about forbidden practices. This clause has been removed in the final version.
- As the Competition Law was discussed in the Portuguese Parliament, the Minister of Economics, Carlos Tavares, said in his speech to the Parliament: “..Finally, we underline the clear definition of the terms of collaboration between the Competition Authority and the Sectoral Regulatory Authorities, which constitutes a clear option for advantages of a close collaboration between the two types of entities, while not putting into question the respective own competencies.”⁸
 - In his intervention during the presentation of the new Directive Council of ANACOM in July 2002, the Minister of Economics, said that “In the area of competition – a crucial question in the sector – ANACOM must collaborate closely [«..articular e colaborar estreitamente..»] with the Competition Authority, to be created in the near future and whose role is nor to be confused with, nor to be superimposed [«..nem se sobrepõe..»] on the role of the sectoral regulators”.⁹
 - In a recent interview (Público, Suplemento de Economia, June 2nd, 2003), the president of the new CA, Abel Mateus, is quoted saying that the law did not specify all aspects of the relation between CA and SRAs, but that “In competition issues the CA must prevail”, while exhorting the SRAs to show an “attitude of large cooperation” (“uma atitude de grande cooperação”). He also said that his authority would check the government proposals for the liberalization of the electricity market. In *Semanário Económico*, on April 10th 2003, he is quoted as assuring that the CA

⁸«Finalmente, saliente-se a definição clara dos termos da articulação entre a Autoridade da Concorrência e as autoridades reguladoras sectoriais, o que constitui uma aposta clara nas virtualidades de uma cooperação estreita entre os dois tipos de entidades, sem que com isso se ponham em causa as respectivas competências próprias.» in “Intervenção do Ministro da Economia sobre o novo regime jurídico da Concorrência” (13 de Fevereiro de 2003, Assembleia da República), em <http://www.portugal.gov.pt>.

⁹“Intervenção do Ministro da Economia na posse do Conselho de Administração da Autoridade Nacional de Comunicações” (8 de Julho de 2002), em <http://www.portugal.gov.pt>.

would not deal with tariffs established by regulators (here electricity tariffs set by ERSE), but with the underlying behavior of the firms involved. This is because the SRA has the necessary technical expertise which the CA has not. As concerns the possible opening of the network and/or ownership of the Portuguese cable TV operator TVCabo to competitors in telecommunications, at a different occasion he is quoted as saying “..We are working together with ANACOM [telecoms regulator], but we will have to take the decision”.¹⁰

- Finally, at a dinner-debate of APDC in June 2003 Álvaro Dâmaso, the president of ANACOM, said that it would be necessary to develop concerted modes of action (“modos de actuação concertados”), to avoid “superpositions or omissions in the activities” of the two institutions responsible for the sector.¹¹

It seems that the different laws enumerated above, and several statements by the Minister of Economics, point to a relationship equal-to-equal between the Authority of Competition and the SRAs, even if the CA may have more powers in communication between the authorities. It also seems clear that the law does not strictly delimit the boundaries of responsibilities between the CA and the SRA. They do have to inform each other when they know of facts that of interest to the other authority, and can be investigating in parallel; they have to ask for the other authority’s opinion before coming to a decision, but it is not stated what will happen if they disagree.

On the other hand, the direction of the statements coming from the CA is quite different and does not only point to the idea of a clear separation of activities, but even to an idea of superiority of the CA over the SRAs. The future will show which point of view will prevail in practice. It is also worth mentioning that the CA and several of the SRAs have already expressed interest in establishing protocols governing the respective dominions of action and spelling out the details of their relationship.

3 The Basic Setup

The aim of the government is to maximize social welfare originating in certain markets, $W = S + \Pi$, for which it uses two regulatory authorities, 1 and 2. These authorities, have an *ex-aequo*, non-hierarchical relationship, unless explicitly stated otherwise. S and Π are consumer surplus and industry profits, respectively. Apart from section 7.2 we will assume that both authorities are not functionally different.¹² Furthermore, since we are mainly interested in how their decisions related we assume that they do not exchange information to not distract from our main point. If information were exchanged our results comparing different decision processes would still hold, while welfare would simply be higher.

¹⁰ “..estamos a trabalhar em conjunto com a ANACOM, mas nós é que vamos ter de tomar a decisão”, *Semanário Económico*, May 9th, 2003.

¹¹ Jantar-debate da APDC, 17 de Junho, texto em <http://www.apdc.pt>.

¹² We are aware that authorities may intervene at different times and with different cost, but since we are addressing the incentives to intervene a useful benchmark is identical intervention. Qualitatively the results would not differ much if we assumed that authorities were somewhat different.

For each case it considers, authority i has a utility of

$$U = S + \lambda\Pi, \quad (1)$$

where λ is authority i 's “bias” with respect to this case.¹³ For $\lambda = 1$ the authority is neutral and maximizes total welfare, while for $\lambda > (<) 1$ it is industry - (consumer-) friendly. That is, in both the latter cases the authority does not try to implement the social optimum. This bias may spring from the authority's rules, from the choice of personnel,¹⁴ or may be the result of lobbying. The latter case is especially important, and will be dealt with in section 6.

Each market under scrutiny is characterized by a unobservable state of the world taking one of two values, and observable behavior of firms that the authorities investigate.

For example:

- Marginal production cost of all firms can be low or high; the authorities investigate whether high prices stem from collusion;
- Costs of giving access to a network can be low or high; the authorities investigate whether high access prices are cost-based;
- A proposed merger raises welfare or not; the authorities investigate whether the merger should be allowed.

Let us call the states of the world “violation” and “no violation” (of competition law or regulatory rules). The probability of the “violation”-state occurring $\pi \in (0, 1)$ is exogenous and common knowledge. An investigation is successful if and only if the authorities come to a decision about the true value of the underlying state of nature. In this case remedies will be imposed if the state of nature is “violation”, and nothing will be done if the state is “no violation”. If on the other hand they do come not to a decision then the *status quo* is maintained on the presumption of no violation.¹⁵

Each market will then be characterized by three pairs of consumer surplus and profits:

1. (S_V, Π_V) , with index V for “violation” of the rules of competition; that is, high prices when costs are low, or a welfare-decreasing merger;
2. (S_R, Π_R) , with index R for “remedies”: low prices with low cost, or no merger if welfare decreases; we naturally assume $S_R > S_V$, $\Pi_R < \Pi_V$ and $S_R + \Pi_R > S_V + \Pi_V$, or

$$\Delta_S = S_R - S_V > \Delta_\Pi = \Pi_V - \Pi_R > 0 \quad (2)$$

3. (S_N, Π_N) , with index N for “no violation”: high prices if high costs, or merger if welfare increases.

¹³This is the traditional weighted welfare function of partial equilibrium analysis, with the weight λ on profits indicating the bias. Other formulations would lead to qualitatively similar results.

¹⁴For example, the first director of the new Portuguese Competition Authority stated in an interview that he was principally interested in preserving consumer surplus, not in firms' stock market value (Público, 2003).

¹⁵Implicitly, we here assume that the authorities do not impose “remedies” by mistake since they can infer the true state of the world.

Authorities 1 and 2 spend (or exert effort measured in terms of units of consumer surplus) $e_1, e_2 \geq 0$ to resolve a given case, which leads to a probability $P(e_1, e_2) \in [0, 1]$ of “success”, independently of the true state of the world. “Success” is supposed to mean that enough verifiable data has been collected so that either an enforceable decision can be made, or it is concluded that there has been no violation of the rules. “No success” in this interpretation means that the authorities’ investigations were inconclusive, in which case the *status quo* is maintained. The probability P is assumed to be twice differentiable and concave, increasing in each effort, and with $P(0, 0) = 0$. As we will see below, its economic properties are determined by the institutional relationship between the two authorities.

Each authority’s effort devoted to a given case will be determined by maximizing its utility with respect to this case.¹⁶ The first decision to be made is whether the case is to be investigated at all, which is the case if authority i ’s utility, but not necessarily total welfare, under the remedy is higher than in the “violation” state. That is, if

$$U_{iR} = S_R + \lambda_i \Pi_R > U_{iV} = S_V + \lambda_i \Pi_V,$$

or

$$\Delta_i = U_{iR} - U_{iV} = \Delta_S - \lambda_i \Delta_\Pi > 0.$$

An industry-friendly authority may be so biased that it perceives that there are no adverse welfare effects ($\Delta_i < 0$) even though the case should be investigated ($\Delta = \Delta_S - \Delta_\Pi > 0$), and it will therefore sometimes not even start investigations which could lead to an increase in welfare. In this case disagreement may appear if the other authority starts and successfully finishes investigations. Whether a decision will emanate from these investigations then depends on how the relations between the two authorities are structured.

Given the other authority’s effort e_j , if $\Delta_i > 0$ then the optimal effort of authority i (its “best response”) is determined through the maximization of its expected utility,

$$\begin{aligned} \max_{e_i \geq 0} E[U_i] &= P(e_i, e_j) (\pi U_{iR} + (1 - \pi) U_{iN}) \\ &+ (1 - P(e_i, e_j)) (\pi U_{iV} + (1 - \pi) U_{iN}) - e_i. \end{aligned} \quad (3)$$

This objective function can be rewritten as

$$E[U_i] = P(e_i, e_j) \pi \Delta_i - e_i + [\pi U_{iV} + (1 - \pi) U_{iN}].$$

Leaving out the constant terms in square brackets, the problem reduces to

$$\max_{e_i \geq 0} P(e_i, e_j) \pi \Delta_i - e_i, \quad (4)$$

the expected gross increase in welfare due to the authority’s investigation minus the cost of investigation. The necessary first-order condition is also sufficient for

¹⁶Below we will also consider budget constraints. These constraints intertwine all cases at hand, but do not qualitatively change the results unless preferences over outcomes differ widely.

a global maximum because P is concave, and defines the best response $\hat{e}_i(e_j)$ as

$$\frac{\partial P}{\partial e_i}(\hat{e}_i(e_j), e_j) = 1/\pi\Delta_i \text{ if } \frac{\partial P}{\partial e_i}(0, e_j) \geq 1/\pi\Delta_i, \quad (5)$$

$$\hat{e}_i(e_j) = 0 \text{ if } \frac{\partial P}{\partial e_i}(0, e_j) < 1/\pi\Delta_i. \quad (6)$$

That is, effort is zero if the expected gain $\pi\Delta_i$ from a successful investigation is too small; otherwise effort is positive. We immediately arrive at the following comparative statics results:

Proposition 1 *Authority i 's optimal effort is*

1. *increasing in the probability that observed behavior constitutes a violation of the rules of competition π , and in the utility differential Δ_i . It is decreasing in its bias λ_i ;*
2. *increasing (decreasing) in the other authority's effort e_j if $\partial^2 P/\partial e_i \partial e_j > (<) 0$.*

Proof. In the objective function (4) e_i has increasing differences with π and Δ_i , and increasing or decreasing differences with e_j depending on the signal of $\partial^2 P/\partial e_i \partial e_j$. ■

Depending on the cross-derivative of P , authorities' efforts are strategic complements or substitutes; in section 4 we show how this originates from the institutional relationship. Furthermore, any increase in Δ_S or decrease in Δ_Π leads to more effort, while any increase in λ_i , for example due to lobbying by firms, decreases effort.

The outcomes in the authorities' game are the Nash equilibria (e_1^*, e_2^*) given by the simultaneous solutions to each authority's maximization problem. How these equilibria depend on the parameters, in particular the biases (λ_1, λ_2) , will be discussed below in Sections 4 and 5.

4 The Relation between Authorities

In this section we focus on the definition of the probability of coming to a decision P . Assume that each authority has an individual probability $p_i(e_i)$ of completing its part of the investigation successfully. The dependence of total success P on p_i depends on how the relations between the authorities are structured. We consider here two extreme cases of most interest if the relationship between both authorities is one of equals:

1. *Joint Decision (JD):* A case comes to a decision if and only if both authorities have started and successfully completed their investigation. Thus:

$$P^{JD}(e_1, e_2) = P_2 = p_1(e_1)p_2(e_2). \quad (7)$$

2. *Independent Decisions (ID):* The case is decided if either one of the authorities has started and successfully concluded its investigation:

$$\begin{aligned} P^{ID}(e_1, e_2) &= 1 - (1 - p_1(e_1))(1 - p_2(e_2)) \\ &= p_1(e_1) + p_2(e_2) - p_1(e_1)p_2(e_2). \end{aligned} \quad (8)$$

Intermediate cases can be modelled through different forms of P , for example the case where an investigation can be concluded if one authority passes on information that can be inconclusive in itself, but may be combined with material existing in the other authority to allow for a decision.

For further reference we will also define where a hierarchical decision process, where without loss of generality authority 1 only investigates if authority 2 has not previously come to a decision (and authority 1 is notified of this, which we assume). In this sense the second authority controls the work of the first one, by stepping in if it seems that the investigation has not been diligent enough.

3. *Hierarchical Decisions (HD)*: Authority 2 investigates first, and authority 1 investigates afterwards if and only if there was no decision at the first stage.¹⁷

$$\begin{aligned} P^{HD}(e_1, e_2) &= p_2(e_2) + (1 - p_2(e_2))p_1(e_1) \\ &= p_1(e_1) + p_2(e_2) - p_1(e_1)p_2(e_2). \end{aligned} \quad (9)$$

It is remarkable that the expression for the resulting probability of success is identical to the one under independent decisions, for any (e_1, e_2) ; nevertheless the resulting equilibrium effort levels will be different because the sequence of moves and informational assumptions.

Important observations are the following:

Proposition 2 1. *Under Joint Decisions efforts are strategic complements (if one authority increases effort the other follows), while under Independent Decisions efforts are strategic substitutes (if one authority increases effort the other works less as a result).*

2. *Under both Joint and Independent Decisions each authority exerts less effort than as if it was investigating alone. If the probability that the other agency concludes successfully its part of the investigation is smaller (larger) than 1/2, more (less) individual effort is exerted under Independent Decisions than under Joint Decisions.*

3. *If in (symmetric and stable) Nash equilibrium the chosen individual probability of concluding the investigation is larger (smaller) than 1/2, then efforts are higher (lower) under Joint Decisions than under Independent Decisions.*

4. *Under Hierarchical Decisions authority 1 selects the effort level that would be optimal for a single authority, but authority 2 investigates even less than under Independent Decisions.*

Proof. Under JD we obtain

$$\frac{\partial P^{JD}}{\partial e_1} = p'_1 p_2, \quad \frac{\partial^2 P^{JD}}{\partial e_1 \partial e_2} = p'_1 p'_2, \quad (10)$$

and under ID

$$\frac{\partial P^{ID}}{\partial e_1} = p'_1 (1 - p_2), \quad \frac{\partial^2 P^{ID}}{\partial e_1 \partial e_2} = -p'_1 p'_2, \quad (11)$$

We see that $\partial^2 P^{JD} / \partial e_1 \partial e_2 > 0$ and $\partial^2 P^{ID} / \partial e_1 \partial e_2 < 0$, which proves the first statement.

As for the second one, the first-order conditions are $p'_1 p_2 = 1/\pi \Delta_1$, and $p'_1 (1 - p_2) = 1/\pi \Delta_1$, which lead to a higher p'_1 at the solution than in the

¹⁷The logic of the resulting game is analogous to the well-known Stackelberg model.

single-authority first-order condition $p_1' = 1/\pi\Delta_1$, because $p_2 \in [0, 1]$. Then the optimal e_1 must be smaller because p_1 is concave. Now for the second part of this statement: Comparing the first-order conditions we see that the best responses under the two decision processes cross at $p_j = 1/2$, where they have the same value because $p_j = 1 - p_j$. Since ID best responses are decreasing and the JD ones increasing, this implies that for $p_j < 1/2$ ID best responses are larger, while for $p_j > 1/2$ it is the JD ones who are larger.

The third statement follows from the observation that the symmetric Nash equilibria are found where best responses cut the diagonal (and since they are stable the ID (JD) best response cuts the diagonal from above (below)). In the equilibrium probabilities $p_1 = p_2$ are less than $1/2$ under ID, then the intersection of the two types of best responses at $p_j = 1/2$ lies below the diagonal. Since the JD best response remains below the ID best response to the left of this point, this implies that the JD best response cuts the diagonal below the ID Nash equilibrium. Furthermore, the opposite holds if the ID Nash equilibrium involves $p_1 = p_2 > 1/2$.

Now consider the fourth statement: The most common method of solving games where players move at different points in time is backward induction, that is, solving the game backwards. If stage 2 is reached then all that is relevant for authority 1 is that no decision has been made yet, so that this authority is in the same situation as if it were alone. Therefore it chooses the optimal effort level e^* of a single authority, leading to a probability of success, say, p_1^* . At the first stage, authority 2 foresees the other authority's future choice, and selects its effort to maximize its utility

$$\max_{e_2 \geq 0} P^{HD}(e^*, e_2) \pi \Delta_2 - e_2.$$

Since the functional form of P^{HD} and P^{ID} are identical, the optimal choice e_2^{HD} is decreasing in e^* . Since e^* is larger than the equilibrium effort under ID, e_2^{HD} must be smaller. ■

It must be noted, though, that the amount of effort, the input in investigation, is not what counts in the end, but the output: the total probability of a decision, and the resulting welfare. In this respect, more effort under a given institutional design does indeed lead to a higher probability of success, but this probability may be higher under a different design involving less effort. On the other hand, high efforts may even be excessive from the point of view of total welfare, so that too much investigation is not welfare maximizing, either.

Furthermore, in the simple hierarchical relationship defined above, the authority that is being controlled has much lower incentives to do its job, since it knows that the other authority will substitute it. Thus instead of making it work better, control actually makes it work less.

The fundamental results contained in the above proposition tell us that the institutional relations between both authorities matter much. Under JD each authority puts in effort if the other does so, but may also almost neglect a case if the other one does – the essence of strategic complementarity. On the other hand, under ID we have strategic substitutes: An authority lays back if the other authority seriously deals with a case, while it will step in if the other authority does not work hard enough.

As an illustration, consider the following example: Let $p_i(e_i) = \min \left\{ e_i^{1/3}, 1 \right\}$

and $\pi\Delta = 2$. The following Figures 1 and 2 contain the social planner's indifference curves (thin lines) and the authorities' best responses (thick lines) when they are unbiased; best responses intersect precisely at the social optimum. A consumer-friendly bias will shift a best response upwards, while an industry-friendly bias shifts it downwards. In Figure 1 we see the representation of Joint Decisions, which lead to increasing best responses. Since in this example the slope of p_i at zero is infinite, best responses are increasing at zero and there are exactly two Nash equilibria: the socially optimal one, and the zero-effort equilibrium. Figure 2 depicts the case of Independent Decisions, which result in a completely different picture. Here authorities' efforts crowd each other out, and there is no zero-effort equilibrium.

< Figures 1 and 2 here >

Still, both authorities exert *less effort* than if they were working alone. The reason is that the marginal value of effort is lower, for two different reasons: Under ID because the other authority may solve the case anyway, so the additional effort could be wasted; under JD because the other authority may not be able to successfully conclude its own investigation, and as a result any effort would be wasted. Yet, this does not mean that the *sum* of efforts is necessarily lower or higher than the effort a single authority would put in. Since p is concave there are decreasing returns to scale in investigation, which favors a higher effort level by each of the authorities – the total result is ambiguous.

More important than efforts are the equilibrium probability P of coming to a decision, and the ensuing comparison of total welfare. Here we find the following:

Proposition 3 *Assume that both authorities are unbiased.*

1. *Under Independent Decisions, the Nash Equilibrium probability $P(e_1^*, e_2^*)$ of a successful investigation is higher than with a single authority, while it is even lower than the latter under Joint Decisions.*

2. *Total welfare is higher under Independent Decisions than under both Joint Decisions and Hierarchical Decisions.*

Proof. Note first that each authority's maximization problem is equivalent to maximizing $\pi\Delta P(e_1, e_2) - e_1 - e_2$ with respect to its own decision variable e_i since authorities are unbiased; therefore the Nash equilibrium coincides with the outcome of the joint maximization over both variables. Second, note that for *any* given pair (e_1, e_2) we have the following chain of inequalities, letting $p_i = p_i(e_i)$,

$$\begin{aligned} 1 - (1 - p_1)(1 - p_2) &= p_1 + p_2 - p_1p_2 \\ &\geq p_i \\ &\geq p_1p_2, \end{aligned}$$

which are the success probabilities under ID, one authority, and JD, respectively, at identical effort levels. Furthermore, these inequalities are strict for positive levels of effort, i.e. $p_1, p_2 > 0$. Consider the following maximization problem:

$$P(\lambda) = \max_{e_1, e_2} \lambda [1 - (1 - p_1)(1 - p_2)] + (1 - \lambda) p_i.$$

Clearly $P(0)$ and $P(1)$ correspond to the equilibrium probabilities of successful investigation with a single authority, and under Independent Decisions, respectively. By the envelope theorem,

$$\frac{dP(\lambda)}{d\lambda} = [1 - (1 - p_1)(1 - p_2)] - p_i.$$

By the above inequalities this is non-negative for all $\lambda \in [0, 1]$, so that P is non-decreasing in λ . Furthermore, since for almost all λ the solution involves positive effort levels the inequalities become strict, and we have that $P(1) > P(0)$. The corresponding argument applies to the comparison between a single authority and Joint Decisions, and to the welfare comparison between Independent and Joint Decisions.

As for HD, we have already shown above that the equilibrium effort levels are different from the optimal ones under ID. Since the functional form of the welfare objective under HD and ID are the same, the HD effort levels must yield less welfare than the ID ones. ■

We thus see that Hierarchical Decisions lead to lower welfare than Independent Decisions; it does not matter much that we cannot directly compare the probabilities of success in this case. The main effect involved was mentioned above: The control relationship distorts the incentives of the authority subject to control in the “wrong” direction.

From the above arguments it does not follow, though, that welfare is necessarily higher under Independent Decisions with *two* authorities than with just one single authority. The question whether there should be two authorities or just one is straightforward to formalize if one only takes into account the variable and fixed costs of running authorities, but less so if we take into account other arguments, to be considered below.

If we assume that running each authority involves a fixed cost F , then the total expected increase in welfare achieved with one authority is

$$\Delta W^1 = \sum_k [p(e_k) \pi \Delta_k - e_k] - F, \quad (12)$$

where the sum is over the cases to be analyzed, and $\Delta_k = \Delta_{S_k} + \Delta_{\Pi k}$.

If responsibilities of the authorities are completely separated, i.e. if there is no overlap in their responsibilities, then the duplication of fixed cost must be compensated by gains in specialization. These could arise from accumulated expertise in certain types of cases, for example mergers on the one hand, and access pricing on the other hand. On the other hand, with two authorities and overlapping responsibilities we have

$$\Delta W^2 = \sum_k [P(e_{1k}^*, e_{2k}^*) \pi \Delta_k - e_{1k}^* - e_{2k}^*] - 2F, \quad (13)$$

where stars denote equilibrium actions. Clearly in terms of cost it is better to have two authorities if $\Delta W^2 > \Delta W^1$; this may happen if fixed costs are sufficiently low, and more importantly, if there are strongly decreasing returns to scale in investigation, that is if p_i is relatively more concave than P . In the latter case e_k may be larger than $e_{1k}^* + e_{2k}^*$ while the probability of success is smaller. Following the above proposition, clearly this can only happen with Independent Decisions. That is, if Joint Decisions are adopted then advantages other than cost reduction must come into play which are not modelled here.

The most important alternative approach, as in Laffont and Tirole (1993) and Martimort and Laffont (1999) assumes that regulators' objectives only include direct monetary benefits, not social targets. Therefore their model is couched in terms of "bribes" from firms to regulators, and incentive payments to regulators, in order to make the latter refrain from taking these bribes. Consequently, having two regulators, who both have their own signals of the relevant information, instead of just one, lowers the value of the bribes that firms are willing to pay. This leads to a reduction in incentive pay, which may be enough to cover the cost of having an additional regulator.

Apart from cost-based ones there are other arguments to be taken into account which can affect the trade-off analyzed above:

- An important issue is lobbying, to be dealt with in section 6, because the institutional arrangements between authorities may alleviate or aggravate the problem of capture by interest groups.
- One authority may have the implicit or explicit role to control the decisions of the other authority. Such will be the case in Portugal, where the new Competition Authority has been assigned to review the decisions by the SRAs that affect competition. In this case one may argue that the relation between authorities is hierarchical rather than equal-to-equal.
- If, as is also the case in Portugal, one authority (the CA) supervises competition many different markets, and each SRA different aspects in its assigned regulated market, then their roles are different, and new problems can arise. For example, the delineation of responsibilities may not be clear, or the CA's activities in various markets may overstretch its resources.

5 Biased Authorities

In this section we model authorities as biased maximizers of welfare, in the spirit of Olsen (1965) and Stigler (1971). These biases may stem from various sources: An orientation towards maximizing consumer surplus may explicitly be mentioned an authority's mission statement; the personality, education and employment history of the authority's directors will affect the closeness to industry or specific firms. While the first bias is institutional, the second one can at infrequent moments in time be influenced by the government, through the choice of new directors.

We will consider, first, the welfare effects of biased authorities; second, how the bias of an authority should be designed to correct for a bias of the other authority. The point of departure is the following observation:

Lemma 4 *If the authorities are not biased ($\lambda_1 = \lambda_2 = 1$) then the socially optimal levels of effort given the relation between the authorities constitute a (stable) equilibrium.*

Proof. The government's objective function is

$$TW = \sum_k [P(e_{1k}, e_{2k}) \pi \Delta_k - e_{1k} - e_{2k}] - 2F,$$

and the socially optimal effort levels are found through its first-order conditions $\pi\Delta_k\partial P(e_{ik}, e_{jk})/\partial e_{ik} = 1$ and $\pi\Delta_k\partial P(e_{ik}, e_{jk})/\partial e_{jk} = 1$. Since these are exactly the first-order conditions of the unbiased authorities, at the socially optimal effort levels e_{jk}^S and e_{ik}^S of the other authority each authority also chooses its socially optimal effort level. This equilibrium is stable because the best responses cross from above. ■

This result means that, given the institutional relations captured by P , unbiased authorities do decentralize the social optimum, and constitutes a benchmark for the analysis of the behavior of biased authorities. However, a *caveat* is necessary: This lemma does not rule out other equilibria. Indeed, with JD there always exists an additional equilibrium where both authorities exert zero effort. In this equilibrium none of the authorities will invest in a case because each expects the other authority, whose collaboration it needs, to not investigate. This equilibrium is unstable if $\frac{\partial P}{\partial e_i}(0, 0) \geq 1/\pi\Delta_i$ because the slightest increase in the other authority's effort will meet a positive response. On the other hand it is stable if $\frac{\partial P}{\partial e_i}(0, 0) < 1/\pi\Delta_i$ because then a significant effort of the other authority is needed to elicit positive effort — the best response will be zero on an interval starting at zero.

In the following we will consider the cases where both authorities are biased in the same direction, or biased in different directions.

Proposition 5 *As compared to the socially optimal equilibrium with unbiased authorities,*

1. *Under Joint Decisions (or strategic complements in general) both authorities' equilibrium efforts increase (decrease) if they are both consumer-friendly (industry-friendly), while the outcome is ambiguous if biases are opposite.*
2. *Under Independent Decisions (or strategic substitutes in general) at least one authority exerts more (less) effort if they are both consumer-friendly (industry-friendly), while the other authority's effort may increase or decrease. If biases are opposite then the industry-friendly authority works less while the other authority works more.*

Proof. Follow from upward- or downward shifts of increasing or decreasing best responses, respectively. These results hold more generally for strategic substitutes and complements. ■

Because the equilibrium efforts with biases are always different from the social optimum, by implication none of the outcomes with biased authorities is socially optimal, not even in the case where authorities have opposite biases.¹⁸ This implies that the bias of one authority *cannot* be fully compensated even by an optimal bias by the other authority. Nevertheless, it is a valid question to consider which bias a new authority should have depending the bias of the existing authority and their institutional relationship. As we will see, there is

¹⁸Dewatripont and Tirole (1999) consider “advocates” who specialize in defending one of the two sides representing an issue. Their approach is different because they assume that utility depends only on winning the case for one side, which is more likely to occur if only information in favour of one side is found. This muffles incentives of a single entity to investigate in both directions.

an interesting interaction between the decision process and biases that produces the answer — it will not simply be “correct a bias with the opposite bias”.

More precisely, we find the following:

- Proposition 6**
1. *Under Joint Decisions (or strategic complements in general) the effects of a bias by one authority can be reduced by a bias in the opposite direction.*
 2. *Under Independent Decisions (or strategic substitutes in general) the effects of a bias by one authority can be reduced by a bias in the same direction.*
 3. *Still, even at the optimal bias of the new authority welfare will never achieve the first best.*

Proof. We start from the following fundamental observation (also see Figures 1 and 2, and also Figure 3 below): Since the best response R_2 of an unbiased authority 2, seen as a function of the other authority’s effort e_1 on the vertical axis, stems from the first-order condition identical to the one of welfare maximization, the social planner’s indifference curves cut this best response when they are horizontal. This fact is precisely the expression of the maximization of welfare given the other authority’s effort, with welfare increasing at this intersection in the direction towards the welfare maximum. Furthermore, at these points any given biased best response R_1 of authority 1 (seen as a function of the authority 2’s effort e_2 on the horizontal axis) is either increasing or decreasing, depending on whether efforts are strategic complements or substitutes. We are interested in the side of this intersection where R_1 enters the region of higher welfare: This is where the new intersection (and therefore Nash equilibrium) is to be constructed by giving the right bias to the new authority 2 and shifting its best response R_2 .

Under strategic complements best responses are increasing, and if the bias is $\lambda_1 > 1$ (industry-friendly) then the best response R_1 of authority 1 is shifted downwards. Since at the intersection with authority 2’s unbiased best response welfare then is increasing upwards and R_1 cuts the indifference curve from below, higher welfare can be achieved if R_2 is shifted rightward, or in other words, if authority 2 is given a consumer-friendly bias $\lambda_2 < 1$. An analogous argument shows that for $\lambda_1 < 1$ the optimal choice involves $\lambda_2 > 1$.

With strategic substitutes best responses are decreasing, there R_1 will cut the indifference curves from above. If it is shifted downwards ($\lambda_1 > 1$, industry-friendly) then welfare is higher to the left, and the optimal R_2 is shifted to the left. This implies that in this case authority 2 should also be industry-friendly, $\lambda_2 > 1$. The case $\lambda_1 < 1$ leads to the analogous result $\lambda_2 < 1$.

In all cases the highest indifference curve reached in this way is below the social optimum — because a biased R_1 does not pass through the social optimum in any circumstance. ■

The reasoning behind these results is that biases change how much authorities spend on investigating, so they create over- or under-spending from a social point of view. These effects are non-trivial because one authority’s bias not only determines how well this authority works, but through a strategic effect also distorts the incentives of the other authority. Anyhow, the more surprising

result is clearly the second one: How can a bias be corrected by “worsening” the problem? Let us see what happens if in the case of $\lambda_1 > 1$ authority 2 would be endowed with a $\lambda_2 < 1$: As one can easily confirm in Figure 3, as a result authority 2 would heavily overspend to compensate, while authority 1 spends even less than before — total welfare decreases even further because of decreasing returns to scale. Giving the *same* bias to authority 2 raises authority 1’s equilibrium effort e_1 and lowers e_2 , which raises welfare because authority 2 had been spending too much and authority 1 too little.

< Figure 3 here >

So far we have assumed that the introduction of a new authority leaves the bias of the existing authority unaffected. This may not always be the case, as the old authority may feel that since now it shares the responsibility of market outcomes with someone else it will be less bound by pressure from interest groups. We leave this issue for further exploration.

6 Lobbying and Capture

The decision to establish two regulatory authorities can be influenced by attempts of the government to make lobbying and capture more difficult. The argument could go like this: Not only would lobbyists have to knock on two doors to advance their interests, but also the authorities could control each other. Yet the validity of this argument must be seen in the light of the precise relationship between the two authorities. We have seen above that the welfare effects of biases can be unexpected depending on this relationship.

For concreteness, we assume that the lobby trying to influence the authorities is an industry pressure group. This is also the more relevant case because of the known large difficulty in organizing a joint effort by dispersed consumers. The questions to be answered are: Is lobbying more or less successful with two authorities? Will lobbyists concentrate on one authority, or lobby with both?

One caveat is in order: We consider lobbying as a long-term investment by lobbying groups which they make before actually knowing for which specific issues they will need the authority’s bias. This seems a reasonable assumption given that regulators part from given standpoints (which they defend), and that argumentation and counter-argumentation take time. Furthermore, if lobbying only occurred in the event of a violation then it in itself would be proof of violation — which is logically inconsistent.

To answer the first of the above questions we will consider the extreme case where the lobby attempts to prevent the investigation altogether; then we consider how would be spent on lobbying if the investigation cannot be stopped. Assume the industry pressure group must spend the amount of $m_i(\lambda_i)$ to move authority i ’s bias to $\lambda_i \geq \lambda_{i0}$, where m_i is increasing in λ_i , and λ_{i0} is the initial bias of the authority due to other reasons than lobbying. The aim of our analysis is to determine the minimum lobbying expenditure necessary to prevent the investigation.

If there is a single authority, it will not investigate if

$$\pi(\Delta_S - \lambda_i \Delta_\Pi) p'_i(0) \leq 1. \quad (14)$$

For this it is sufficient in any case to convince the authority that there is no case altogether, for which it is sufficient to set $\lambda_i = \Delta_S/\Delta_\Pi$, resulting in $\Delta_i = 0$. If $p'_i(0) < \infty$ then this outcome can be achieved more cheaply, with

$$\lambda_i \geq \frac{\Delta_S}{\Delta_\Pi} - \frac{1}{\pi \Delta_\Pi p'_i(0)}, \quad (15)$$

which happens when the authority acknowledges that there is a case, but believes it to be too insignificant to warrant investigation.

Whether this outcome can be achieved with two authorities depends on their decision process. This can be most easily seen in the cases of Joint or Independent Decisions. With Joint Decisions it is clearly enough that one authority does not investigate, that is,

$$\lambda_1 \geq \frac{\Delta_S}{\Delta_\Pi} - \frac{1}{\pi \Delta_\Pi p'_1(0)} \text{ or } \lambda_2 \geq \frac{\Delta_S}{\Delta_\Pi} - \frac{1}{\pi \Delta_\Pi p'_2(0)}. \quad (16)$$

Yet, with Independent Decisions the case will not be investigated if

$$\lambda_1 \geq \frac{\Delta_S}{\Delta_\Pi} - \frac{1}{\pi \Delta_\Pi p'_1(0)} \text{ and } \lambda_2 \geq \frac{\Delta_S}{\Delta_\Pi} - \frac{1}{\pi \Delta_\Pi p'_2(0)}, \quad (17)$$

Though at a rather basic level, these arguments show clearly that the structure of the decision process between authorities strongly influences the vulnerability to lobbying, and that the mere creation of a second authority as such does not solve the problem if not done carefully.

Let us now consider lobbying efforts in the more realistic case where authorities will investigate in any case. Here we are interested in knowing to which authority the lobby will turn its attention. The following results are less conclusive, and need more future investigation. The lobby would like to minimize the expected loss of a decision against them plus the amount spend on lobbying:

$$\min P(e_1, e_2) \pi \Delta_\Pi + m_1(\lambda_1) + m_2(\lambda_2). \quad (18)$$

We obtain the following result:

Proposition 7 *If the lobby cannot prevent the investigation it spends more on the authority that is more industry-friendly. Under Independent Decisions (strategic substitutes) it may also lobby more with the authority that has less strongly decreasing returns to scale in investigation.*

Proof. The Lagrangian of the lobbyist's maximization problem is the following:

$$\begin{aligned} L(\lambda_1, \lambda_2, e_1, e_2; \mu_1, \mu_2) &= P(e_1, e_2) \pi \Delta_\Pi + m_1(\lambda_1) + m_2(\lambda_2) \\ &+ \mu_1 \left(\frac{1}{\partial P / \partial e_1} - \pi (\Delta_S - \lambda_1 \Delta_\Pi) \right) \\ &+ \mu_2 \left(\frac{1}{\partial P / \partial e_2} - \pi (\Delta_S - \lambda_2 \Delta_\Pi) \right) \end{aligned} \quad (19)$$

The first line contains the objective function to be minimized. The second and third lines contain the first-order conditions prescribing positive efforts as an equilibrium of the authorities's game given the λ 's; the multipliers μ_i are

negative because the first-order conditions are binding upwards. The Kuhn-Tucker conditions describing the minimum are, for $i = 1, 2$

$$\frac{\partial L}{\partial \lambda_i} = m'_i + \mu_i \pi \Delta_\Pi \geq 0, \quad \lambda_i \geq \lambda_{i0}, \quad \frac{\partial L}{\partial \lambda_i} (\lambda_i - \lambda_{i0}) = 0, \quad (20)$$

$$\frac{\partial L}{\partial e_i} = \frac{\partial P}{\partial e_i} \pi \Delta_\Pi - \mu_i \frac{\partial^2 P / \partial^2 e_i}{(\partial P / \partial e_i)^2} - \mu_j \frac{\partial^2 P / \partial e_i \partial e_j}{(\partial P / \partial e_j)^2} = 0, \quad (21)$$

$$\frac{\partial L}{\partial \mu_i} = \frac{1}{\partial P / \partial e_i} - \pi (\Delta_S - \lambda_i \Delta_\Pi) = 0. \quad (22)$$

Solving $\partial L / \partial e_i = 0$ and $\partial L / \partial e_j = 0$ for μ_i yields

$$\mu_i = \Delta_\Pi \pi \left(\frac{\partial P}{\partial e_i} \right)^2 \frac{(\partial^2 P / \partial^2 e_j)(\partial P / \partial e_i) - (\partial P / \partial e_j)(\partial^2 P / \partial e_i \partial e_j)}{(\partial^2 P / \partial^2 e_i)(\partial^2 P / \partial^2 e_j) - (\partial^2 P / \partial e_i \partial e_j)^2} < 0 \quad (23)$$

In this expression the denominator is positive because P is concave; the numerator will be strictly negative if $\partial^2 P / \partial e_i \partial e_j > 0$, and may approach zero only if $\partial^2 P / \partial e_i \partial e_j < 0$.

From (20), little money will be spend on authority i if and only if μ_i is small compared with $m'_i(\lambda_{i0}) / \pi \Delta_\Pi$. Under strategic complements or substitutes this will occur if $\partial P / \partial e_i \approx 0$, or by (22) if the authority is strongly consumer-friendly. Under strategic substitutes there is the second possibility that the numerator of μ_i could be close to zero. This happens if the curvature of P with respect to e_j is low (because of the concavity of P then the curvature with respect to e_i must be sufficiently large), or that $\partial P / \partial e_j$ is rather flat. The effect of this is that an increase in λ_j induces a large reduction in e_j . ■

This result implies that regardless of the relation between authorities lobbyists will not distribute their efforts evenly if they cannot prevent the investigation. In this case they will not bother to change the position of the “hostile” authority, but rather invest in the support from the “friendly” authority.

On the other hand, with strategic substitutes, or Independent Decisions, the money is spent on the authority whose effort is easier to influence. Mathematically this effect is also present with strategic complements, for example Joint Decisions, but is always overshadowed by the interaction between authorities. Since in the latter case a reduction in one authority’s effort also reduces the other’s, the lobby finds it optimal to exploit this effect on both authorities.

Finally, the above proposition is quite straightforwardly adaptable to consumer groups’ lobbying. The objective function (18) is changed to

$$\max P(e_1, e_2) \pi \Delta_S - M_1(\lambda_1) - M_2(\lambda_2), \quad (24)$$

where M_i denotes the consumer group’s spending and is decreasing in $\lambda_i \leq \lambda_{i0}$. Again, spending will be low on authority i if μ_i is close to zero. Since conditions (21) essentially remain the same, and therefore the expressions for μ_i , consumer groups will lobby more heavily with the industry-friendly authority.

7 Extensions

In this section we present some extensions of the basic model. They present paths for further research, and do not yet lead to conclusive answers.

7.1 The Effects of Unclear Responsibilities

Here we will shortly discuss the issue of unclear responsibilities, modelled as a modification to authorities' utility functions. This is not the only way to capture this aspect, but the one most consistent with our approach.

The problem of unclear responsibilities is a complex one, which may stem from the political and juridical process that defines the field of action of each of the authorities. A simple way to capture this in our simple model is through the weight that a certain issue has in the authorities' objective functions

$$U = \sum_k (w_k P(e_{ik}, e_{jk}) \pi \Delta_{ik} - e_{ik}). \quad (25)$$

Here we assume that the importance a case assumes is measured by the factor w_k , while expenditures on cases e_{ik} naturally count as equally for all cases. The first-order condition for an interior optimum is

$$w_k \pi \Delta_{ik} \frac{\partial}{\partial e_{ik}} P(e_{ik}, e_{jk}) = 1, \quad (26)$$

which makes clear that a case with less weight will receive less effort. More importantly, remembering from (6) the fact that no effort will be expended on a case if

$$w_{ik} \pi \Delta_{ik} \frac{\partial}{\partial e_{ik}} P(0, 0) < 1, \quad (27)$$

we see that if $\partial P / \partial e_i$ is finite at zero then for weights w_{ik} sufficiently small no effort at all will be dedicated to this case. This means that if none of the authorities has this type of case on their list of priorities then it may disappear in a "vacuum of responsibility".

These effects are reinforced if authorities are subject to a budget constraint (money or time) $\sum_k e_{ik} \leq E_i$. If the Lagrange multiplier of this constraint is $\mu_i \geq 0$, then the first-order conditions for an interior solution become

$$\pi \Delta_{ik} \frac{\partial}{\partial e_{ik}} P(e_{ik}, e_{jk}) = \frac{1}{w_{ik}} + \frac{\mu_i}{w_{ik}}. \quad (28)$$

The resulting effects are: All efforts are smaller if the constraint is binding. Furthermore, if the weight w_{ik} is small then it magnifies the effect of the budget constraint: *Ceteris paribus*, effort is more strongly reduced as compared to the situation without a budget constraint.¹⁹

Is there a way out? Returning for simplicity to the case without budget constraint in (27), we see that it is more likely that no effort is the outcome if the marginal increase in probability $\partial P(0, 0) / \partial e_{ik}$ is small. If we compare the extreme cases of Joint or Independent Decisions, we see that

$$\begin{aligned} \text{Joint Decisions:} & \quad \frac{\partial}{\partial e_{ik}} P(0, 0) = p'_i(0) p_j(0) \\ \text{Independent Decisions:} & \quad \frac{\partial}{\partial e_{ik}} P(0, 0) = p'_i(0) (1 - p_j(0)) \end{aligned} \quad (29)$$

Given that $p_j(0)$ is zero or close to zero, $\partial P(0, 0) / \partial e_{ik}$ will always be larger with Independent Decisions than with Joint Decisions. The same will be true

¹⁹ Actually, this argument applies to the increase in $\partial P / \partial e_i$, while the exact reduction in e_i still depends on the curvature of $\partial P / \partial e_i$ which has no direct economic meaning.

with any relation between the two authorities where a failure to investigate by one of them does not destroy the incentives for the other authority to do so.

Conclusion: The responsibilities of the authorities should be made clear, otherwise some events may not receive due attention. Furthermore, this situation is less likely to appear with Independent Decisions than with Joint Decisions.

7.2 Transversal and sectoral regulation

Assume now that authorities do make errors: They may receive a wrong signal that a violation has occurred. Given that a SRA has more knowledge about the sector it regulates than a transversal CA it seems reasonable to assume that the probability of making such an error will be higher for the CA. On the other hand, the SRA may be more subject to lobbying and therefore have a bias $\lambda_s \neq 1$. If the decision is to be made by one of the two authorities (alone) should look into a particular case then there will be a trade-off between the CA's higher probability of errors and the SRA's bias. We will consider how the bias of the CA should be set, and which authority should take on which cases.

Assume that during a successfully concluded investigation both the SRA and the CA receive the correct signal that a violation has occurred as before with probability π , and the wrong signal that a violation has occurred while in fact none has occurred with probabilities $\pi_s < \pi_c$. The remaining event, a correct signal of no violation, is received with probabilities $1 - \pi - \pi_s$ and $1 - \pi - \pi_c$, respectively.

The effect on consumer surplus and on industry profits of an authority's error are $\delta_S, \delta_\Pi > 0$, but this time we assume $\delta_S - \delta_\Pi < 0$: the error lowers total welfare. Given its bias λ_s , the SRA maximizes

$$\begin{aligned} U_s &= p(e_s) (\pi (\Delta_S - \lambda_s \Delta_\Pi) + \pi_c (\delta_S - \lambda_s \delta_\Pi)) - e_s \\ &= p(e_s) (\pi \Delta + \pi_s \delta - (\lambda_s - 1) (\pi \Delta_\Pi + \pi_s \delta_\Pi)) - e_s. \end{aligned} \quad (30)$$

We assume that it raises welfare to investigate even the presence of errors, therefore $(\pi \Delta_\Pi + \pi_s \delta_\Pi) > 0$. Then social welfare is maximized for λ_1 , while any $\lambda_1 > (<) 1$ yields under-(over-)investment. The welfare resulting from the SRA's action is $W_s^* = p(e_s^*) (\pi \Delta + \pi_s \delta) - e_s^*$.

As concerns the CA, its optimal bias is trivially $\lambda_c = 1$: Given its higher probability of error, social welfare is maximized as a solution of the problem $W_c^* = \max_e p(e) (\pi \Delta + \pi_c \delta) - e$, which the CA replicates when it has precisely the same objective function. This result becomes clear when we take into account that the CA will act instead of the SRA, and not in conjunction with it — there is nothing to compensate given that the SRA will not be active.

If the SRA had no bias it would clearly be preferable that it conduct the investigation and not the CA, therefore this situation defines the welfare benchmark. With a biased SRA welfare under both authorities' investigations will be lower, but which of the two authorities will be active depends on whether $W_c^* > W_s^*$.

Consider the following example: Let $p(e) = \sqrt{e}$ for $e \leq 1$. Then CA is better if

$$(\pi \Delta + \pi_c \delta)^2 \geq (\pi \Delta + \pi_s \delta)^2 - (\lambda_s - 1)^2 (\pi \Delta_\Pi + \pi_s \delta_\Pi)^2. \quad (31)$$

The first observation is that the SRA is better if λ_s is close enough to 1, and that the SRA's biases in both directions are equally bad (This may be special to this example). Second, the left-hand side is decreasing in the CA's probability of error π_c , so π_c must be small enough. The trade-off becomes clear in the following Figure 4: The CA is better than an almost unbiased SRA only if π_c is close to π_s , otherwise the case is better investigated by the SRA. On the other hand, if the bias of the SRA is large enough then it may always be better to leave the case to the CA.

< Figure 4 >

8 Concluding Remarks

In the case of Portugal, it seems that the law does not define very clearly the boundaries between the areas of responsibility of the Competition Authority (CA) and the Sectoral Regulatory Authorities (SRAs). In this work we have focused on how the relationship between the two authorities determines the incentives both authorities have to investigate cases.

Between the two alternatives of having the authorities decide jointly or independently, we found that the second hypothesis performs far better. First, with independent decisions the probability that cases are solved is highest, even though each authority may give less attention to the case than if it were alone. Second, Independent Decisions are less vulnerable to lobbying, while, third, it is also less likely that no authority feels responsible for a given case.

A further interesting result is that, if the bias of one authority is to be corrected by a bias of the other authority, the best choice is not necessarily an opposite bias. Indeed, with Independent Decisions the optimum is achieved at the same bias, avoiding excessive distortions in incentives.

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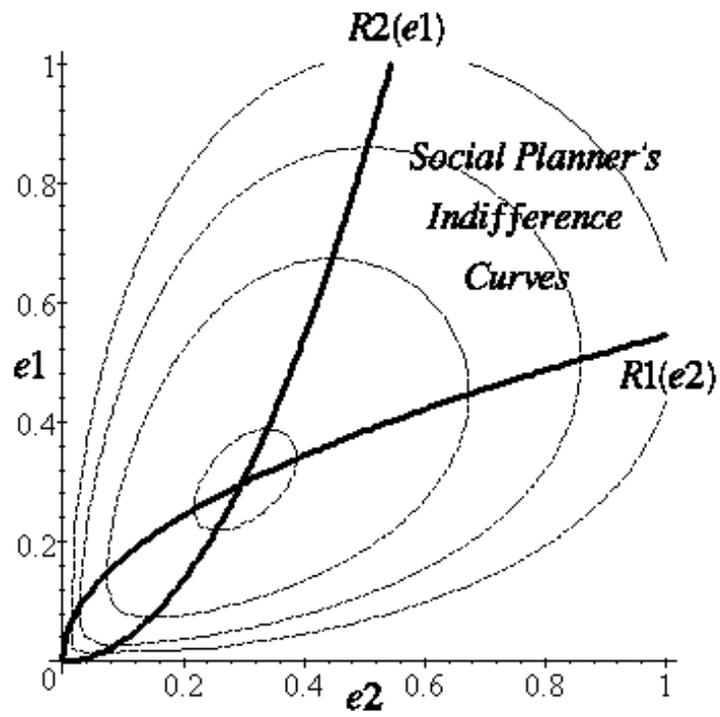


Figure 1: Unbiased best responses and indifference curves with Joint Decisions
 $(p_i(e) = e^{1/3}, \pi\Delta = 2)$.

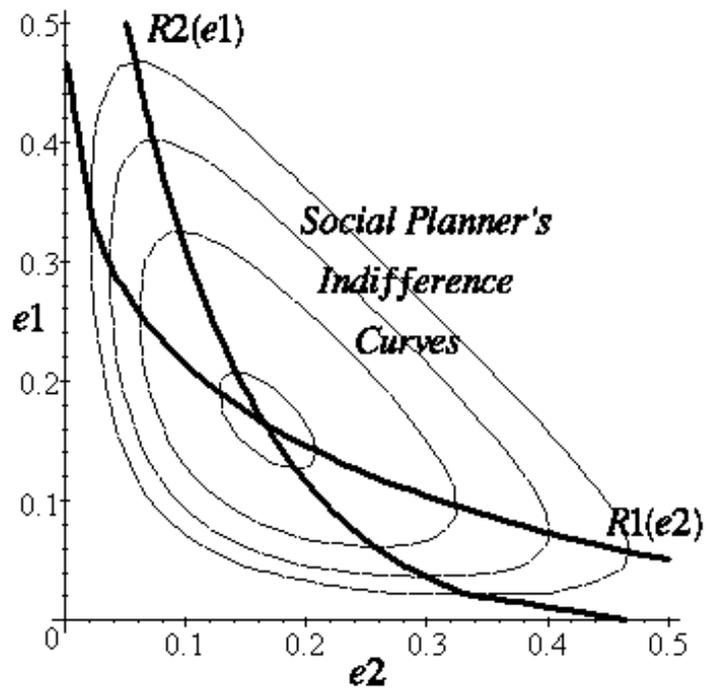


Figure 2: Unbiased best responses and indifference curves with Independent Decisions ($p_i(e) = e^{1/3}$, $\pi\Delta = 2$).

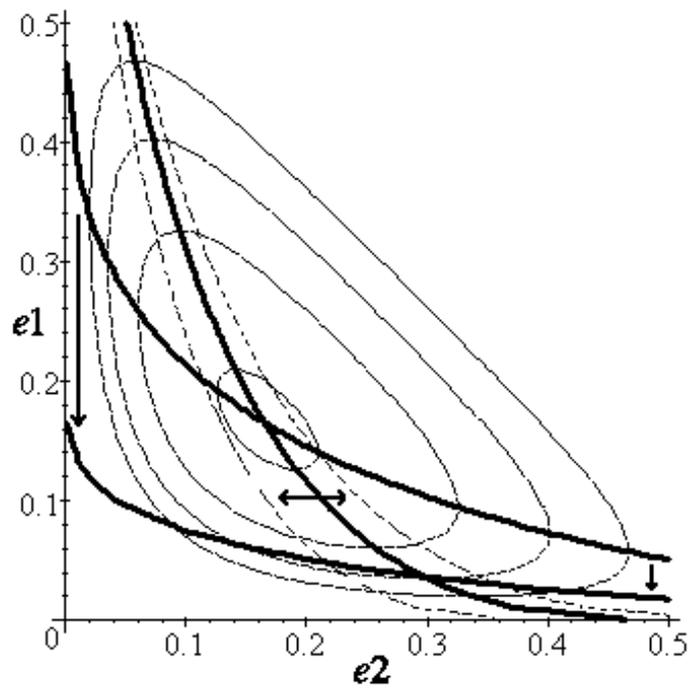


Figure 3: With Independent Decisions the best remedy to a downward-shifted R_1 is a left-shift of R_2 (same bias), while a right-shift lowers welfare.

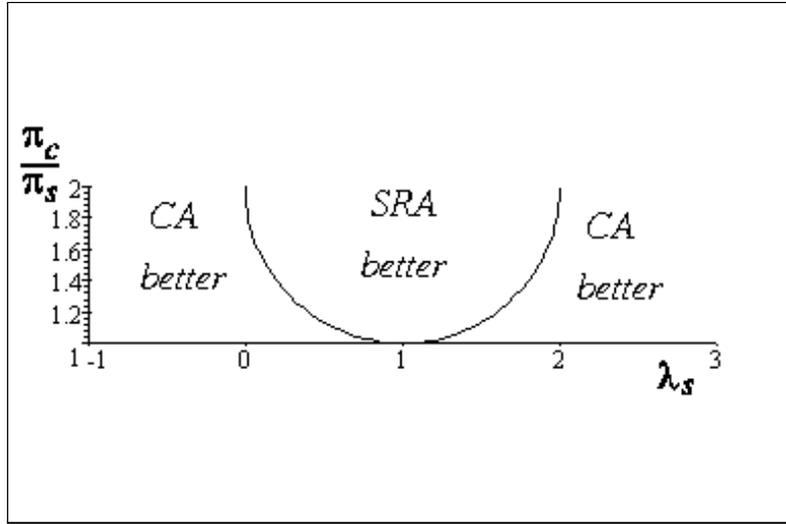


Figure 4: The trade-off between bias λ_s and the relative probability of error π_c/π_s (with $\pi\Delta = 2$, $\pi_s\delta = -1$, $(\pi\Delta_{\Pi} + \pi_s\delta_{\Pi})^2 = 1$).