Anticipating the Long-Term Ideology of a Policymaker

Vitor Miguel Ribeiro$^{1,2}$

$^1$ FEP-UP, School of Economics and Management, University of Porto
$^2$ CEF.UP, Research Center in Economics and Finance, University of Porto
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Vitor Miguel Ribeiro

CEF.UP and Faculdade de Economia, Universidade do Porto.

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Abstract. We consider a duopoly with horizontally differentiated firms, where firms decide the long-term plans (locations) in addition to short-term issues (prices). As in Bárcena-Ruiz and Casado-Izaga (2014), we introduce a third entity in the city by considering the presence of a policymaker that targets the long-run ideology (location) to the regulated sector. While in Bárcena-Ruiz and Casado-Izaga (2014), the sequential long-run decision between firms occurs after the definition of a long-run orientation by the policymaker, here we consider that one of the firms anticipates the long-term guidance of the policymaker. We find that an anticipatory movement conducted by a firm relatively to the long-run guidance of the policymaker gives to the anticipatory firm control of the majority of the market and the long-term plan of the policymaker is biased to the right of the city center. This result sharp contrasts with Bárcena-Ruiz and Casado-Izaga (2014) where, introducing a sequential move on the long-run decision of firms, the long-term plan of the policymaker is undeviating. Interestingly, we find that the anticipatory movement has null impacts the over equilibrium profits. Finally, the equilibrium social welfare is harmed due to a reduction in the equilibrium consumer surplus.

Keywords: Spatial competition, Long-run decision, Policymaking decision, Price competition.

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E-mail: vmsrib@hotmail.com. Corresponding address: Rua Dr. Roberto Frias, 4200-464, Porto, Portugal.
1 Introduction

The location of firms is a traditional topic covered by the economic literature since the "principle of minimum differentiation" of Hotelling (1929). As analyzed in d’Aspremont et al. (1979), the linear transportation cost is a critical assumption since it generates mathematical inconveniences to the purpose of reaching an equilibrium price. In this sense, the adoption of quadratic transportation costs relatively to the distance that each consumer travels to attend to a particular firm allowed the establishment of the "principle of maximum differentiation". The idea of sequential decisions starts with the canonical contribution of Stackelberg (1952). Under a deterministic demand, the leader has a first-mover advantage and the follower has an information advantage but, given the fact that accommodates the leader’s decision relatively to a certain strategic variable, necessarily gets a lower equilibrium profit relatively to the case of a simultaneous move. Lambertini (1994) and Tabuchi and Thisse (1995) extend d’Aspremont et al. (1979) by allowing firms to locate outside the city boundaries stimulated by the fact that firms have incentives to locate where there are no consumers. As mentioned in Bárcena-Ruiz and Casado-Izaga (2014), when firms simultaneously decide their location, the equilibrium dictates that both companies "will be symmetrically located outside the city boundaries at a distance from the rival equal to 1.5 times the size of the city". In the situation of a sequential decision, the leader locates in the midpoint of the market and the follower locates at a distance from the leader equal to the size of the city.

There are several different extensions conducted from the mentioned pillar models. Thissé and Wildasin (1992) consider a single public facility with a fixed location and two private firms that choose endogenously their locations. However, in their framework, the price of the good sold by the two firms is exogenously given. Bárcena-Ruiz and Casado-Izaga (2005) introduce the possibility of a firm contracting a manager. In this sense, the presence of managerial incentive contracts made possible an extension of Lambertini (1994) and Tabuchi and Thisse (1995). Matsumura and Matsushima (2012) provide a similar study but to infer that locating outside a linear city can benefit consumers. More recently, Bárcena-Ruiz and Casado-Izaga (2014) study the topic of waste management regulation and describe the firms’ strategic location given the optimal position of a col-
lection point. In their own words, "the collection point acts as a centripetal force for the location of both firms because there exists a cost reduction effect that pushes both firms to locate closer to the collection point". In particular, in the case of a sequential move, the authors find that the leader locates at the same place of the collection point and the follower locates far from it.

In Bárcena-Ruiz and Casado-Izaga (2005), Matsumura and Matsushima (2012) and Bárcena-Ruiz and Casado-Izaga (2014), the decision of firms concerning their locations is considered to be the long-term ideological plan of each firm and the price competition constitutes the required interaction between firms to the definition of the short-term decision. In Bárcena-Ruiz and Casado-Izaga (2014), the decision on the location of the collection point can be analogously considered as a long-term ideological plan of a public regulatory entity.

In this sense, we intend to provide an extension of Bárcena-Ruiz and Casado-Izaga (2014). Whereas in Bárcena-Ruiz and Casado-Izaga (2014), the sequential long-run decision between firms occurs after the definition of a long-run orientation by a policymaker, in our model, we consider that one of the firms anticipates the long-term guidance of the policymaker. The anticipation of regulatory policies is assiduously verifiable, both in mature and embryonic markets. We provide two real-world examples to spice the motivation of our manuscript.

The first example relies on the regulation of the energy sector. In Portugal, ERSE is the national regulatory authority (NRA) responsible for the definition of the control parameters in the energy sector. The strategic interaction between firms and regulatory authorities is already under the scrutiny of the economic literature. Laffont and Tirole (1993) document that, given the timing of the regulatory interference, there exists the possibility to occur a ratchet effect. This effect is conducted by a price cap regulated firm and it consists in a strategic conduct where the regulated company fully exploits the dynamics towards the price cap regulatory scheme. The firm focuses in the effort of a cost reduction in the initial phase of the regulatory period and progressively reduces the cost control efforts as the regulatory period approaches the end. Then, the regulated firm overestimates the costs that will incur in the following regulatory period and so on.
Therefore, the aim of this demeanor is to induce the policymaker to relax its control over the CAPEX of the regulated firm.\footnote{This behavior has been confirmed by several empirical studies. For a set of regulated firms in the UK water and sanitation sector, Botasso and Conti (2009) find evidence of cyclical sector strategic behavior over the regulatory period. Joskow (2013) discusses this strategic behavior considering companies operating in the electricity transmission and distribution. Giulietti and Price (2005) conclude the presence of a cyclic strategic behavior in several regulated UK businesses.} Thus, the adoption of such modus operandis by regulated firms can determine an alteration or an amendment of the regulatory directive and, subsequently, the long-term orientation of the regulated sector. The implementation of strategic long-term investments by regulated companies also seems to influence the long-term guidelines coming from policymakers. Interestingly is to observe that for 2014 (the previous year to the arrival of the new regulatory period of 2015-2017), in the case of the Portuguese electricity distribution, the regulated firm – EDP Distribuição – estimates a reduction of CAPEX around 28% but, simultaneously, establishes an additional investment effort in smart grids, which is precisely the strategic investment component that the policymaker will provide greater incentives in the upcoming regulatory period. In this sense, we can infer that the long-term decision of the policymaker is sequential to the long-term decision of the regulated firm.\footnote{In this sense, an interesting analysis would undertake to test for Granger causality between long-term decision of the regulated firm and long-term orientation conducted by the policymaker. See the news on EDP Distribuição investments in the following links: http://www.jornaldenegocios.pt/empresas/detalhe/edp_corta_investimento_na_rede_electrica_em_28.html http://www.edpdistribuicao.pt/pt/infocenter/noticias/2013/}

A second situation where our framework fits well is on the new emergent market of online betting exchange. The new gamblers live online and are called punters. Usually, punters use betting houses to formulate a bet against the house and, after observing the occurrence of a certain event and after the bet being matched by the house, the player realizes if it makes (or not) a positive profit. In this sense, punters incur in a speculative movement. However, punters may also deal with hundreds of transactions per minute and constitute the so called online trading. In Portugal, this market lacks of regulatory intervention. In this sense, all the present long-term decisions conducted by the dominant firm serving the market are defined previously to an eventual future regulatory mediation,
whose scope of intervention is still dubious.³

The goal of this manuscript is to compare our equilibrium results with the conclusions of Bárceña-Ruiz and Casado-Izaga (2014), where the sequential move of the long run decision occurs between firms, but after both firms observing the long-term guidance defined by the policymaker.

Firstly, we find that an anticipatory movement conducted by a proactive firm relatively to the long-run guidance of the policymaker implies that the proactive firm will always be located at the right of the city’s midpoint and the long-term plan of the policymaker is biased favouring the anticipatory firm. We also conclude that the anticipatory firm controls the majority of the market, however, the equilibrium market share is precisely the same as in the case where the sequential game is conducted after both firms observing the long-run decision of the policymaker. We realize that the equilibrium price of the anticipatory (accommodated) firm increases (decreases) and that there exist null impacts over the equilibrium profits of both firms. This is due to the fact that the resulting interaction between the positive location effect and the negative price effect on the proactive firm has the same magnitude and, thus, fade mutually. Finally, we conclude that the equilibrium social welfare is harmed by the same magnitude of the reduction on the equilibrium consumer surplus since equilibrium profits remain unchanged.

The remainder of the paper is organized as it follows. Section 2 explains the model. Section 3 conducts the analysis of the game and section 4 disposes the main results of our research. Conclusions are drawn in section 5 and an Appendix with the relevant proofs is disposed in section 6.

³The dominant firm serving the Portuguese market is Betfair. In the words of Croxson and Reade (2014), "Betfair was one of the very first betting exchanges on the market and has grown to be overwhelmingly the largest, (...) has a turnover of over $50m per week, (...) accounts for 90% of all exchange-based betting activity worldwide, it currently has over two million registered users, counts with two million trades a day, six times the number of trades on the London Stock Exchange, (...) and the exchange now covers a vast variety of events, mostly sporting".
2 Model

We consider a duopoly with horizontally differentiated firms that deal with two types of decision-making: short-term and long-term issues.

On the demand side of the market, consumers are located at \( x \) and are distributed uniformly and with unitary density along the interval \([0, 1]\). They incur a quadratic transportation cost relatively to distance \( td^2 \), where \( t \) is a positive constant that measures the degree of horizontal differentiation between firms and \( d \) is the distance traveled from the firm’s location to the consumer’s home. There is a continuum of single-homing consumers that inelastically demand one unit of the good. Each consumer derives a surplus from consumption, gross of price and transportation costs, denoted by \( v \), that is sufficiently large such that the whole market is fully covered.

On the supply side of the market, there are two private firms indexed by \( i (i = \{A, B\}) \), located at \( a \) and \( b \), respectively \((\{a, b\} \in \mathbb{R})\). Therefore, firms may locate outside the interval where consumers are distributed. We consider that firm \( A \) is located to the left of or at the same point as firm \( B \) such that \( a \leq b \). Then, the indirect utility of an agent that is located at \( x \in [0, 1] \) that chooses firm \( A \) is given by:

\[
u^A(x) = v - p^A - t(x - a)^2, \tag{1}\]

while the indirect utility of an agent that is located at \( x \in [0, 1] \) that chooses firm \( B \) is given by:

\[
u^B(x) = v - p^B - t(b - x)^2. \tag{2}\]

Note that, as in Bárcena-Ruiz and Casado-Izaga (2005) and Matsumura and Matsushima (2012), the location decision is considered to be the long-term ideological plan of each firm. Without loss of generality, we normalize the firms’ production costs to zero.\(^4\)

As in Bárcena-Ruiz and Casado-Izaga (2014), we introduce a third entity in the city by considering the presence of a policymaker located at \( r \in \mathbb{R} \). The production of the good involves to follow a certain long-term ideology. When the long-run ideology of firm

\(^4\)The results remain qualitatively the same if we assume the same positive (and non-discriminatory) marginal cost.
i mismatches the long-term guidance of the policymaker, firm i incurs in a cost. The ideological mismatch cost of firm A \((M^A)\) and the ideology mismatch cost of firm B \((M^B)\) are given by the following equations, respectively:

\[
M^A = g(a - r)^2 D^A, \tag{3}
\]

\[
M^B = g(b - r)^2 D^B, \tag{4}
\]

where \(g\) is a positive constant that measures the mismatch degree between the long-term ideology of each firm relatively to the regulator’s long-term guidance and \(D^i\) is the demand of firm \(i\). Thus, the ideological inconsistency costs are quadratic with respect to the distance travelled from each firm to the regulator’s location and proportional to the amount of firm’s market share. We also consider that the long-run decision of the firms and of the regulator cannot be changed in the future. The definition of the regulator’s long-run standpoint is decided only by the regulator whose purpose is social welfare maximization.

As usually, the social welfare \((W)\) consists in the sum of the profits of firms and consumer surplus:

\[
W = \pi^A + \pi^B + CS. \tag{5}
\]

The profit of firm \(i\) is given by:

\[
\pi^i = (p^i - M^i)D^i, \tag{6}
\]

where \(p^i\) denotes the price set by firm \(i\) \((i = \{1, 2\})\) whilst the consumer surplus \((CS)\) is given by:

\[
CS = v - p^A D^A - p^B D^B - \int_0^\bar{x} t(x - a)^2 dx - \int_0^\bar{x} t(b - x)^2 dx. \tag{7}
\]

Rearranging (7), the \(CS\) equals:

\[
CS = v - p^A D^A - p^B D^B + \frac{t \bar{x}^2}{3} (a - b) + t \bar{x} (b^2 - a^2) + tb - \frac{t}{3} - tb^2. \tag{8}
\]

\(^5\) Bárcena-Ruiz and Casado-Izaga (2014) is a framework applied to the regulation of waste management such that the production of a certain good involves the generation of wastes and these wastes must be transported from each firm location to a waste collection point (the public entity). Thus, the waste transportation cost of firm \(i\) is described by a similar equation as ours. In this sense, we follow the exact same assumptions of Bárcena-Ruiz and Casado-Izaga (2014), although applying our focus on a mismatch between the long-term guidance defined by the policymaker and the long-term ideology followed by the firms.
Using (1) and (2), the location of the indifferent consumer between attending to firm A and firm B is given by:

$$\bar{x} = \frac{a + b}{2} + \frac{p^B - p^A}{2t(b - a)}.$$  \hspace{1cm} (9)

Thus, the respective demand of firm A is given by:

$$D^A(p^B, p^A, b, a) = \begin{cases} 1, & \text{if } \bar{x} > 1; \\ \bar{x}, & \text{if } 0 \leq \bar{x} \leq 1; \\ 0, & \text{if } \bar{x} < 0, \end{cases}$$  \hspace{1cm} (10)

and since demand is totally inelastic follows:

$$D^B(p^B, p^A, b, a) = \begin{cases} 1, & \text{if } \bar{x} < 0; \\ 1 - \bar{x}, & \text{if } 0 \leq \bar{x} \leq 1; \\ 0, & \text{if } \bar{x} > 1. \end{cases}$$  \hspace{1cm} (11)

Our model is precisely the same adopted by Bárcena-Ruiz and Casado-Izaga (2014). However, the timing differs since our aim is to understand the impact of an anticipatory movement of a firm regarding the long-term decision set by the policymaker. Then, the timing of the game is the following: in the first stage, the (anticipatory) leader firm A decides its long-term ideology, location $a$; in the second stage, the policymaker decides the long-term guidance of the regulated sector, location $r$; in the third stage, the (accommodating) follower firm B decides its long-term plan, location $b$; finally, in the last stage of the game, both firms engage in price competition. Nonetheless, we shall first analyze the last stage of the game, since we rely on the backward induction method.

3 Analysis

3.1 Stage 4 - price competition

Using (6), (3), (4) and given the long run decisions $a$, $r$ and $b$, the equilibrium profits of firms $A$ and $B$ are given by:

$$\pi^A = \left[p^A - g(a - r)^2\right] \left(\frac{a + b}{2} + \frac{p^B - p^A}{2t(b - a)}\right);$$  \hspace{1cm} (12)
\[ \pi^B = [p^B - g(b - r)^2] \left[ 1 - \left( \frac{a + b}{2} + \frac{p^B - p^A}{2t(b - a)} \right) \right]. \]  

(13)

Deriving (12) and (13) relatively to \( p^A \) and \( p^B \) we obtain the first order condition for each firm. Solving both simultaneously, follows that the equilibrium prices are given by:

\[ p^A(a, b, r) = \frac{t(b - a)(2 + b + a) + g[2a(a - 2r) + b(b - 2r) + 3r^2]}{3}; \]

(14)

\[ p^B(a, b, r) = \frac{t(b - a)(4 - b - a) + g[2b(b - 2r) + a(a - 2r) + 3r^2]}{3}; \]

(15)

respectively. Substituting (14) and (15) into (9), (6) (8) and (5) follows that the demands, profits and social welfare are given by:

\[ D^A(a, b, r) = \frac{t(2 + b + a) + g(a + b - 2r)}{6t}; \]

(16)

\[ D^B(a, b, r) = \frac{t(4 - b - a) - g(a + b - 2r)}{6t}; \]

(17)

\[ \pi^A(a, b, r) = \frac{(b - a)[t(2 + b + a) + g(a + b - 2r)]^2}{18t}; \]

(18)

\[ \pi^B(a, b, r) = \frac{(b - a)[t(4 - b - a) + g(a + b - 2r)]^2}{18t}; \]

(19)

\[ W(a, b, r) = s \frac{5(g + t)^2(b^3 - a^3) - 4b^2(g + t)(5gr + 7t) - a^2(g + t)[-20gr + 8t + 5b(g + t)]}{36t} \]

\[ - \frac{a[5b^2(g + t)^2 - 4(gr - t)(5gr + t)] + 4b(gr + 2t)(5gr + 4t) - 12t(3gr^2 + t)}{36t}. \]

(20)

### 3.2 Stage 3 - Long-run decision of the accommodated firm

Given the long run decisions \( a \) and \( r \), using (19) and deriving relatively to \( b \) follows that the reaction function of the follower firm B is given by:

\[ b(a, r) = \frac{a}{3} + \frac{4t + 2gr}{3(g + t)}. \]

(21)

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6Since this stage coincides with Bárcena-Ruiz and Casado-Izaga (2014), the second order conditions are always satisfied. See Appendix 6.1 for technical details.

7The second order condition is always satisfied. See Appendix 6.2 for technical details.
Substituting (21) into (20), follows that social welfare equals:

\[
W(a, b, r) = s - \frac{40g^3(a - r)^3 + 15g^2t(5 + 8a)(a - r)^2 + t^3 [49 + a(-51 + 5a(15 + 8a))]}{243t(g + t)}
- \frac{3gt^2 [27 - 64r - 10a(5 + 4a)r + 81r^2 + 3g(27 + a(-17 + 10a(5 + 4a))]}{243t(g + t)}.
\]

(22)

### 3.3 Stage 2 - Long-term guidance of the policymaker

Given the long run anticipatory decision \(a\), the policymaker maximizes social welfare relatively to the sectorial ideological long-term plan, \(r\). Deriving (22) relatively to \(r\) follows that:

\[
r(a) = \frac{25gt + 81t^2 + 40ag(g + t) - 3g^2\sqrt{\gamma}}{40g^2},
\]

(23)

with \(\gamma = \frac{t^2[5g^2(-43+144a)+90gt(5+8a)+729]}{g^4}\). Substituting (23) into (18), follows that the profit of firm \(A\) is given by:

\[
\pi^A(a) = \frac{(25gt + g^2\sqrt{\gamma} - 27t^2)^2 (35gt - g^2\sqrt{\gamma} + 27t^2)}{3600g^3t(g + t)}.
\]

(24)

### 3.4 Stage 1 - Long-run decision of the anticipatory firm

In this subsection, the anticipatory firm \(A\) defines the location \(a\) that maximizes its profits. Deriving (24) relatively to \(a\), we obtain that the optimal long run decision of firm \(A\) is given by:

\[
a^* = \frac{11g + 9t}{18(g + t)} = \frac{11}{18} + \frac{g}{9(g + t)}.
\]

(25)

Substituting (25) into (23), (21), (14), (15), (16), (17), (18), (19), (8) and (5) follows that the equilibrium outcomes are given as it follows:

\[
r^* = \frac{11}{18}, \quad b^* = \frac{3}{2} - \frac{8g}{9(g + t)},
\]

\[
p^{A*} = \frac{t^2(109g + 108t)}{81(g + t)^2}, \quad p^{B*} = \frac{2t^2(59g + 27t)}{81(g + t)^2},
\]

\[
D^A* = \frac{2}{3}, \quad D^B* = \frac{1}{3};
\]

(27)

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8The second order condition is always satisfied. See Appendix 6.3 for technical details.

9The second order condition is always satisfied. See Appendix 6.4 for technical details.
\[ \pi^{A^*} = \frac{8t^2}{9(g+t)}, \quad \pi^{B^*} = \frac{2t^2}{9(g+t)}; \]  
\[ CS^* = v - \frac{t\left(31g + 423t\right)}{324(g+t)}, \quad W^* = v - \frac{t\left(31g + 63t\right)}{324(g+t)}. \]  

The following Proposition summarizes.

**Proposition 1 (Market equilibrium outcomes under an anticipatory long-term decision regime)** In the game where, in the first stage the (proactive) leader firm decides its long-term plan, in the second stage the policymaker defines the ideological guidance of the regulated sector, in the third stage the (reactive) follower firm chooses its long-run decision and, in the fourth stage, both firms engage in price competition: (i) the equilibrium locations of the firms A and B and of the policymaker are given by (25) and (26), respectively; (ii) the equilibrium prices and market shares of firms A and B are given by (27); (iii) the equilibrium profits of firms A and B are given by (28) and (v) the equilibrium consumer surplus and equilibrium social welfare are given by (29).

**Proof.** The proof is straightforward from the above methodological description. ■

## 4 Main Result

We start by restoring the results of Bárcena-Ruiz and Casado-Izagá (2014) under simultaneous and sequential long-term business decisions of firms, respectively.\(^\text{10}\)

**Remark 1 (Simultaneous long-term decisions between firms)** In the game where, in the first stage the policymaker defines the long-term plan, in the second stage the firms simultaneously choose their long-run decisions and, in the third stage, both firms engage in price competition, the equilibrium outcomes are given by:

\[ a^* = -\frac{1}{4} + \frac{3g}{4(g+t)}, \quad b^* = \frac{5}{4} - \frac{3g}{4(g+t)}, \quad r^* = \frac{1}{2}; \]

\(^{10}\)The only difference in the results relies on the definition the social welfare, which we assume to be equal to \(\pi^A + \pi^B + CS\) instead of a weighted sum \(\alpha(\pi^A + \pi^B) + (1 - \alpha)CS\).
Remark 2 (Sequential long-term decisions between firms) In the game where, in the first stage the policymaker defines the long-term plan, in the second stage the leader firm A decides the long-term decision, in the third stage the follower firm B defines the long-run decision and, in the forth stage, both firms engage in price competition, the equilibrium outcomes are given by:

\[ p^*_A = p^*_B = \frac{3t^2(11g + 3t)}{16(g + t)^2}, \quad D^*_A = D^*_B = \frac{1}{2}, \quad \pi^*_A = \pi^*_B = \frac{3t^2}{4(g + t)}; \]

\[ CS^* = v - \frac{t(3g + 85t)}{48(g + t)}, \quad W^* = v - \frac{t(4g + 13t)}{48(g + t)}. \]

We are now able to understand the impacts of a firm anticipation on the long-term plan relatively to the policymaker of a regulated market. In particular, we are interested in comparing the equilibrium outcomes of Proposition 1 with the equilibrium outcomes of Remark 2. The following Lemma summarizes the main findings of this manuscript.

Lemma 2 (Impacts of an anticipatory firm relatively to the long-term guidance of the policymaker) An anticipatory movement conducted by a firm relatively to the long-run guidance of the policymaker implies that: (i) The long-term plan of firm A is located at the right of the city’s midpoint; (ii) The long-term plan of the policymaker is biased favouring the proactive firm; (iii) The anticipatory firm controls the majority of the market; (iv) The equilibrium price of the anticipatory (accommodated) firm increases (decreases); (v) Null impacts over the equilibrium profits of both firms; (vi) The equilibrium social welfare is harmed by the same magnitude of the reduction on the equilibrium consumer surplus.
Lemma 2 shows that Proposition 1 constitutes a sharp contrast relatively to Remark 2. This finding is surprising and, thus, lacks of a deeper explanation.

Firm A incurs in an ideological proactivity in order to get a location advantage effect, in particular, firm A intends that such location would stand, in equilibrium, as far to the right of the city central point, which allows this firm to gain a stronger positional comparative advantage over its rival. However, the aim of firm A is also to predict the policymaker’s long-run ideology. Note that, if this long-term guidance is established at the left of the city’s midpoint, this could lead firm A to losing some fraction of its market share. Then, the most interesting aspect of proactiveness is that it influences the long-term decision of the policymaker. In particular, the bias takes place because the policymaker ceases to occupy the central position of the city and turns to occupy a position on the right of the city center, which approximates his long-term plan to the long-term orientation of firm A. In this sense, the independence principle of regulatory policy relatively to private firms’ long run standpoint that Stern (1997) points out, no longer holds.

Given this standpoint, firm B reacts. The intuition, as described in Corollary 3 (in Appendix), is that the weaker (stronger) the degree of horizontal product differentiation between the firms relatively to the degree of mismatch between the long-term ideology of firms and the regulator’s long-term guidance, the more (less) firm B locates closer to its rival. Note that, the equilibrium distance is given by $b^* - a^* = \frac{t}{g+t}$, which is precisely the same distance as in Bárcena-Ruiz and Casado-Izaga (2014). Then, if $g = 0$ the leader firm turns to locate in the middle of the city and the follower locates at $\frac{3}{2}$, which is the result of Lambertini (1994). As confirmed by Bárcena-Ruiz and Casado-Izaga (2014), as $g$ increases the follower comes closer to the leader who has a first mover advantage. However and in contrast to Bárcena-Ruiz and Casado-Izaga (2014), in our setting the first mover never locates at the same place of the policymaker, since $t > 0$. The proactive firm is always located at the right of the city center but also at the left of the policymaker location.
The anticipatory movement of firm A allows this firm to charge a higher equilibrium price and leads to a reduction of firm’s B equilibrium price. The resulting interaction between the positive location effect and the negative price effect on the proactive firm determines that, in equilibrium, both firms get the same unalterable equilibrium profit and market shares, respectively. Summing up, the proactive decision of firm A has a null impact over the equilibrium profit of both firms.

However, this action influences negatively the equilibrium social welfare. The intuition is that consumers are harmed due to the long-term orientation of the policymaker being skewed in favor of the firm A.

5 Conclusions

We consider a duopoly with horizontally differentiated firms, where firms decide long-term plans in addition to short-term decisions. As in Bárcena-Ruiz and Casado-Izaga (2014), we introduce a third entity in the city by considering the presence of a policymaker that targets the long-run ideology of the regulated sector. While in Bárcena-Ruiz and Casado-Izaga (2014), the sequential long-term decision occurs after the long-run orientation defined by the policymaker, here we consider that one of the firms anticipates the long-term guidance of the policymaker. This is perfectly verifiable not only in mature markets (e.g., energy sector) but also in embryonic markets (e.g., online betting exchange sector).

We find that an anticipatory movement conducted by a firm relatively to the long-run guidance of the policymaker gives to the anticipatory firm control of the majority of the market and the long-term plan of the policymaker is biased favouring the proactive firm. This result sharp contrasts with Bárcena-Ruiz and Casado-Izaga (2014), where the long-term plan of the policymaker is undeviating. We also find that such anticipatory movement has null impacts the over equilibrium profits. Finally, the equilibrium social welfare is harmed due to a reduction in the equilibrium consumer surplus.

This manuscript intends to provide a contribution to the literature of horizontal prod-
uct differentiation and sequential decision games and to help policymaking decision. In particular, the purpose is to alert for the negative collateral effects that an anticipation long-run decision of a firm relatively to legislative public policy has on consumers and on social welfare, especially in markets where consumers are unprotected due to the existence of legal loopholes. Such conclusion corresponds precisely to the situation currently happening in the online betting exchange markets. In the absence of regulatory instructions and, taking into account that such guidance is being anticipated by the operating monopoly of the market (Betfair), consumers are the disadvantaged side of the equation. This manuscript also opens a huge range of possibilities for new research paths. Researchers are now able to incorporate topics such as strategic delegation, tax policy, vertical differentiation and many others into this theoretical framework.
6 Appendix

The Appendix contains the details on the second order conditions.

6.1 Stage 4 - price competition

The second order conditions that secure that the equilibrium prices in this stage are local maxima are given by:

\[
\frac{\partial^2 \pi^A}{\partial (p^A)^2} = \frac{\partial^2 \pi^B}{\partial (p^B)^2} = -\frac{1}{t(b-a)} < 0, \]

which always holds, \( \forall a \leq b \). □

6.2 Stage 3 - Long-run decision of the accommodated firm

The second order condition that secures that the equilibrium location \( b \) is a local maximum is given by:

\[
\frac{\partial^2 \pi^B}{\partial b^2} = \frac{g + t}{g} \left[-4(gr + 2t) + (g + t)(a + 3b)\right].
\]

To secure profit maximization, we need to accomplish:

\[
\frac{\partial^2 \pi^B}{\partial b^2} < 0 \iff b < \frac{4}{3} \frac{(gr + 2t)}{(g + t)} - \frac{a}{3}. \tag{30}
\]

The reaction function described in expression (21) is the unique condition always verified under (30). □

6.3 Stage 2 - Long-term guidance of the policymaker

The second order condition that secures that the equilibrium location \( r \) is a local maximum is given by:

\[
\frac{\partial^2 W}{\partial r^2} = \frac{-240g^3(a - r) - 30g^2t(5 + 8a) - 486gt^2}{243t(g + t)}.
\]
To secure social welfare maximization, we need to verify the following condition:
\[
\frac{\partial^2 W}{\partial r^2} < 0 \iff r < \frac{4ag^2 + 25gt + 40agt + 81t^2}{40g^2}.
\] (31)

Then, condition (23) is the unique reaction function that fulfills condition (31).

6.4 Stage 1 - Long-run decision of the anticipatory firm

The second order condition that secures that the equilibrium location \(b\) is a local maximum is given by:
\[
\frac{\partial^2 \pi^A}{\partial a^2} = \frac{-864t(5g+t) [g(2 + 9a)g + 9t(1 + a)]}{g^6 \left\{ \frac{5g^2(-43 + 144a) + 90g(5 + 8a) + 729t^2}{g^4} \right\}^{\frac{1}{2}}
\]
To secure profit maximization, we need to verify the following condition:
\[
\frac{\partial^2 \pi^A}{\partial a^2} < 0 \iff a > -\frac{2g + gt}{9(g + t)}.\] (32)

Then, the equilibrium candidate (25) is the unique equilibrium location that satisfies condition (32).

Also, concerning the substitution of (25) into (23), notice that this implies, in equilibrium:
\[
r^* = \frac{11}{18} + \frac{9t(5g + 9t)}{40g^2} - \frac{9}{40g^2} \sqrt{\frac{t^2(5g + 9t)^2}{g^4}} = \frac{11}{18} + \frac{9t(5g + 9t)}{40g^2} - \frac{9\sqrt{t^2(5g + 9t)^2}}{40g^2\sqrt{g^4}}
\]
which leads to the equilibrium location \(r^*\) of expression (26). All the other substitutions are, then, straightforward.

6.5 Main Proof

Proof of Lemma 2

We focus our comparison on the most interesting case (Remark 2). We start by studying equilibrium locations \(a^*, r^*\) and \(b^*\), corresponding to the decisions of stages 1, 2 and 3, respectively.
(i) Regarding the equilibrium location of firm A, $a^*$, using (25) follows that:

\[
\begin{align*}
&\begin{cases}
\frac{11g+9t}{18(g+t)} > \frac{1}{2} ; \\
\frac{11g+9t}{18(g+t)} < 1;
\end{cases} 
\iff 
\begin{cases}
g > 0, \\
t > -g, \quad \forall g > 0 \cap t > 0.
\end{cases}
\end{align*}
\]

(33)

Then, the equilibrium location of firm A shifts to the right of the city central point.

(ii) Considering the equilibrium location of the policymaker, $r^*$, using (26) it is straightforward that:

\[
\begin{align*}
\frac{11}{18} > \frac{1}{2}, \quad \forall g > 0 \cap t > 0.
\end{align*}
\]

Then, the equilibrium location of the policymaker shifts to the right of the city central point and, thus, is biased favouring firm A.

(iii) Regarding the equilibrium location of firm B, $b^*$, using (26) follows that:

\[
\begin{align*}
&\begin{cases}
\frac{3}{2} - \frac{8g}{9(g+t)} > \frac{1}{2} ; \\
\frac{3}{2} - \frac{8g}{9(g+t)} < 1; \\
\frac{3}{2} - \frac{8g}{9(g+t)} < \frac{3}{2};
\end{cases} 
\iff 
\begin{cases}
g + 9t > 0, \\
t < \frac{7}{9}g, \quad \forall g > 0 \cap t > 0. \\
g > 0,
\end{cases}
\end{align*}
\]

(34)

Then, the equilibrium location of firm B is necessarily located at the right of the city central point. However, we obtain the following result in equilibrium.

**Corollary 3 (Equilibrium location of firm B)** For any $g > 0$ follows that $b^* < \frac{3}{2}$.

Then, the equilibrium location of firm B comes as it follows: (i) if $t \in (0, \frac{7}{9}g)$ implies $b^* \in \left(\frac{1}{2}, 1\right)$; (ii) For $t = \frac{7}{9}g$, follows $b^* = 1$; Finally, if $t > \frac{7}{9}g$ then $b^* \in \left(1, \frac{3}{2}\right)$.

The intuition of the above result is that the lower the degree of horizontal product differentiation between the firms relatively to the degree of mismatch between the long-term ideology of firms and the regulator’s long-term guidance, the more firm B locates closer to its rival.

(iv) In terms of market shares, we conclude that they do not change according to (27).

(v) The analysis of the equilibrium price of firm B dictates that the equilibrium price of firm B strictly decreases since:

\[
\begin{align*}
\frac{2t^2(59g+27t)}{81(g+t)^2} > \frac{t^2(5g+2t)}{3(g+t)^2} \iff 354g > 405g,
\end{align*}
\]
which is impossible, $\forall g > 0$.

**(vi)** Turning into the equilibrium price of firm $A$, we solve the inequality:

$$
\frac{t^2(109g + 108t)}{81(g + t)^2} - \frac{4t^2}{3(g + t)} > 0 \iff \frac{gt^2}{81(g + t)^2} > 0, \ \forall g > 0 \cap t > 0,
$$

to conclude that the equilibrium price of firm $A$ is strictly increasing.

**(vii)** A quick check to expression (28) allow us to conclude that the equilibrium profits are invariable, once compared to the ones exposed in the Remark 2.

**(viii)** The analysis of the equilibrium consumer surplus requires to solve:

$$
\frac{v - t(31g + 423t)}{324(g + t)} > \frac{v - t(3g + 7t)}{36(g + t)} \iff -\frac{gt}{81(g + t)} > 0.
$$

(35)

Obviously, condition (35) never holds, $\forall g > 0 \cap t > 0$ and, since equilibrium profits are unchanged, the equilibrium social welfare is reduced by the exact same amount of the reduced equilibrium consumer surplus, which finalizes the proof of Lemma 2. \qed
References


