Integração Vertical em Telecomunicações e Fechamento Através de Preços de Acesso

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Resumo

É conhecido na literatura de economia da regulação os incentivos que uma empresa verticalmente integrada no setor de telecommunicações, proprietária das redes local e de longa distância, possui de fechar este último mercado para concorrentes demandantes de interconexão. Isso ocorreu no mercado de telecomunicações americano, dada a dependência dos novos concorrentes na longa distância (MCI e Sprint) nas redes de acesso locais da AT&T que possibilitariam conexão com usuários finais. Objetivando evitar estes problemas e introduzir concorrência pelo menos no segmento de longa distância, a reforma das telecomunicações no Brasil seguiram muito proximamente a experiência americana no processo antitruste que resultou na quebra da AT&T em 1984, reduzindo a verticalização prévia da estatal TELEBRAS antes da privatização. Há uma extensa literatura econômica sobre a idéia de fechamento vertical. Grande parte desta literaturase concentra na idéia de uma integração vertical entre firmas nos segmentos à jusante e à montante do mercado gerando um resultado de fechamento. Neste artigo, focamos mais diretamente a questão do incumbente monopolista verticalmente integrado decidindo preços de acesso cobrados ao rival entrante no segmento de longa distância. Apresentamos dois modelos referentes à idéia de fechamento vertical em telecomunicações através dos preços de acesso no contexto de um oligopólio de Cournot e Bertrand com demanda e funções custo lineares. Ambos modelos indicam o mesmo resultado: Utilizando uma definição apropriada do que significa fechamento vertical através de preços de acesso, esse fenômeno não ocorre nestes modelos. Este se constitui em um resultado surpreendente tando em vista o apelo intuitivo da idéia mais geral de fechamento vertical o qual confirma a intuição da escola de Chicago da década de setenta relacionada a esta idéia. O ponto relevante é que o incumbente verticalmente integrado pondera os impactos do fechamento sobre o seu negócio de longa distância tanto quanto em seu negócio de acesso. Em determinadas circunstâncias, será preferível fazer lucros pela provisão de acesso do que operar ele próprio o serviço de longa distância. Em particular, não há um viés sistemático do incumbente verticalmente integrado contra o entrante comparado ao monopolista provedor de acesso. Assim, chega-se à conclusão que o fechamento vertical através de preços não deveria ser tomado como uma justificativa razoável para a estratégia de quebra vertical da TELEBRAS e mesmo na experiência antitruste dos EUA.

Palavras-chave: concorrência, fechamento vertical, telecomunicações**,** preços de acesso.

Vertical Integration in Telecommunications and Foreclosure Through Access Prices

Abstract

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It is known in regulatory economics the incentive that a vertically integrated company in the telecommunications sector, owning a local and a long distance network, has to foreclose interconnecting competitors in the long distance market in its local loop bottleneck. This occurred in the US telecommunications market, given the dependence of the new long distance competitors (MCI and Sprint) on the AT&T local networks to connect with end users. Aiming to avoid these problems and introduce competition at least in the long distance segment, the telecom reform in Brazil followed closely the US antitrust experience in the AT&T divestiture of 1984, reducing the previous verticalization of the state-owned company TELEBRAS before privatization. There is an extensive economic literature on the idea of vertical foreclosure. Most of this literature concentrate on the idea of a vertical merger between firms in the downstream and upstream markets generating foreclosure. We aim to focus more directly in the issue of a vertically integrated incumbent deciding access prices to the entrant rival in the long distance segment. We present two models that refer to vertical foreclosure in telecommunications through access prices in the context of Cournot and Bertrand competition with simple linear demand and cost functions. Both indicate the same thing: Under a suitable definition of what means vertical foreclosure through prices, this phenomena does not happen. This is a surprising result in view of the intuitive appeal of the idea behind vertical foreclosure and confirms at least in part the intuition of Chicago's view in the seventies related to this idea. The relevant point is that the vertically integrated incumbent weights the impact of foreclosure in his downstream segment as well as in his access business. In certain circumstances, it will be better to make profits by providing access rather than by operating by himself in the long distance. In particular, there is not a systematic bias of the vertically integrated incumbent against the entrant compared to an independent monopolist access provider. So, we find that vertical foreclosure through prices should not be taken as a suitable justification for the strategy of vertical break-up of TELEBRAS and even for the vertical break-up of AT&T.

Key-words: competition, vertical foreclosure, telecommunications, access pricing.

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JEL: L12, L22, L42

Introduction

The incentive that a vertically integrated company owning a local and a long distance network in telecommunications has to foreclose interconnecting competitors from the long distance market in its local loop bottleneck is a known phenomena in telecommunications. This occurred in the US telecommunications market, given the dependence of the new long distance competitors (MCI and Sprint) on the AT&T local networks to connect with end users. In the US antitrust trial that resulted in the vertical break-up of AT&T in 1984, the company was charged of using its market power to reduce downstream competition, raising rival costs through refusal to deal, high local interconnection charges and reduction of the quality of access[2]. In the UK, these problems also appeared after the privatization of British Telecom (BT), which is usually attributed to the absence of a policy of vertical break-up as implemented in the antitrust suit in the US[3] and the lack of appropriate action by OFTEL[4]. The long distance service reform in Brazil followed closely the US antitrust experience in the AT&T divestiture of 1984[5], reducing the previous verticalization of the state-owned company, TELEBRAS[6].

The theoretical rationale behind this behaviour rests on the economics of vertical foreclosure. A vertically integrated incumbent owning the local service bottleneck and the long distance service will use its ownership of the essential facility represented by the local service to get rid of its competitors in the long distance, mainly refusing to deal and/or charging a very high access price to the latter. While intuitive and very used in the antitrust literature, this simple idea was under severe attack from the theoretical point of view and has received relevant transformations as time goes by. Furthermore, as we will see below, the literature is more concerned in assessing vertical mergers than to address the most

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[2] Viscusi, Vernon and Harrington (VVH-1995, p. 504/505) summarize the history of AT&T negotiations with MCI about the requests for local network interconnection: "*The initial response of AT&T to entry in 1969 by MCI was simply to refuse to interconnect with them. In the FCC decision in 1971, the FCC said AT&T should interconnect with their competitors, but the terms were left open to AT&T. This did not improve the situation, because AT&T placed considerable restrictions on the specialized common carriers. Only on 1974 did the FCC order interconnection in its Bell System Tariff Offering decision. When MCI expanded entry into message toll service, the same problem arose. Their entry was approved by the US court of appeals in 1975, but not until 1978 was AT&T forced to interconnect with MCI's Execunet service.Only in 1978 were firms like MCI allowed to interconnect with the local operating company as long lines. Even after achieving this right, the competitors to AT&T in the Intercity Telecommunication Market were still not treated equally. It is generally believed that AT&T's competitors were given poorer quality connections by Bell operating companies. Customers had to dial twenty digits to make a long distance call with MCI, but only eleven with AT&T. The result was that consumers saw AT&T as offering a higher-quality product, which forced its competitors to offer a discount to compete. It was this type of behaviour that led to the original antitrust suit against AT&T*".

[3] The lack of vertical break-up is also found in the Canadian experience as shown by Crandall and Waverman (1995,p. 67/68).

[4] According to Armstrong, Cowan and Vickers (1994, p. 239) "*Mercury should be protected against anticompetitive behavior by BT, and it is unfortunate that resolution of the question of interconnection was held up for as long as it was...*".

[5] This was considered the largest antitrust settlement of all history and started in November, 1974 lasting almost 10 years until full implementation.

[6] It is worthwhile to mention that the USA instituted a more radical vertical break-up compared to Brazil. See Mattos (2001).

simple case of an already established vertically integrated incumbent that faces a new entrant in the potentially competitive long distance segment.

The purpose of this article is to define vertical market foreclosure through access prices from the perspective of an established vertically integrated incumbent facing entrants and show through a Cournot and a Bertrand models the incentive that the former has to foreclose or not. We will see that, according to the Chicago's tradition, the two models point for the complete absence of vertical foreclosure if we adopt a suitable definition for this phenomena.

In the next section, we provide a survey of the literature on the vertical foreclosure issue in the economic literature. Sections 3 and 4 present, respectively, the Cournot and Bertrand models of vertical foreclosure. Section 5 concludes.

2) The Economics of Vertical Foreclosure: A Survey

There are two main theories behind any antitrust intervention in vertical integrations in the US: i) entry barriers and ii) "market foreclosure" or "essential-facility" doctrine.

The entry barrier theory is based on the fact that vertical integration may increase the capital requirements for another firm to enter the market[7]. Following this rationale in the case of denial of access to the incumbent local loop, every long distance carriers would have to enter also the local distance service to be able to provide long distance service. This could make the cost to compete in the long distance service prohibitively high[8].

The market foreclosure idea remains as the most important rationale for antitrust intervention on vertical merger and potentially anticompetitive practices. Rey and Tirole (1997,p.1) state the fundamentals of the "market foreclosure" reasoning in the antitrust literature and jurisprudence:

"*According to the received definition, foreclosure refers to any dominant firm's practice that denies proper access to an essential input it produces to some users of this input, with the intent of extending monopoly power from one segment of the market (the bottleneck segment) to the other (the potentially competitive segment). The excluded firms on the competitive segment are than said to be "squeezed" or to be suffering a secondary line injury. Essentiality means that the dominant firm's product cannot cheaply be*

[7] According to Perry (1989, p. 197), this theory was originally conceived with the first body of theoretical work related to the concept of barriers to entry of Bain in 1956.

[8] The barrier of entry theory brings the presumed anticompetitive effects of the vertical merger under the more general idea coming from the Bain tradition that any large expenditure necessary to start up a business is a barrier to entry. The main criticism of this general view and thus to the view that a vertical merger creates or increases as a barrier to entry was by Posner (1979) as quoted by VVH (1995, p. 160):"*Suppose that it costs $ 10,000,000 to build the smallest efficient plant to serve some market; then, it was argued, there is a $10,000,000 "barrier to entry", a hurdle a new entrant would have to overcome to serve the market at no disadvantage vis-à-vis existing firms. But is there really a hurdle? If the $ 10,000,000 plant has a useful life of, for example, tem years, the annual cost to the new entrant is only $1,000,000. Existing firms bear the same annual cost, assuming that they plan to replace their plants. The new entrant, therefore, is not at any cost disadvantage at all*".

duplicated by users who are denied access to it. Examples of essential facilities or bottlenecks to which competition law has been applied include a stadium, a railroad bridge or station, a harbor, a power transmission or a local telecommunications network, and a computer reservation system. The foreclosure or essential facility doctrine states that the owner of an essential facility may have an incentive to monopolize complementary or downstream segments as well. This doctrine was first discussed in the United States in Terminal Railroad Association v. U.S. (1912), in which a set of railroads formed a joint venture owning a key bridge across the Mississipi river and the approaches and terminal in Saint Louis and excluded non-member competitors".

In the case of AT&T, the local loop was considered an essential facility given the difficulty of duplication by competitors, mainly because of its natural monopoly characteristics.

The foreclosure theory was severely criticised by the Chicago school, mainly through the writings of Bork (1978) and Posner (1976)[9] that argued the lack of economic rationality for firms to reckon with a vertical merger strategy to raise their profits, by foreclosing the market. For these authors, the single explanation for vertical integration would be the generation of efficiencies. Rey and Tirole (1997, p. 7) summarises the Chicago criticism:

"*The thrust of the Chicago School critique of this doctrine is that there is only one final product market and therefore only one monopoly power to be exploited, and that it is not obvious how the monopolist could further extend its monopoly power*".

Given the lack of rationality to exclusionary behaviour in the foreclosure approach, these authors defended the intrinsic efficiency aspects of the vertical mergers. The force of this criticism resulted in a decrease of tightness of the antitrust policy toward vertical mergers in the US[10]. Indeed, there are many critiques of the foreclosure theory. Surveyed by Ordover, Saloner and Salop (1990, p. 128/129), one of these critiques can be applied to the essential facility case of an integrated company owning a bottleneck like the telecom local network case. According to these authors, this critique relates to the fact that "*..lost upstream profits*" due to downstream competitor foreclosure "*may exceed the increased downstream profits*" of the integrated firm and thus there would be no reason to foreclose. As we will see in our models below, this effect holds in our models.

The emergence of these critiques was mainly due to the lack of a rigorous analysis of the economic rationality of vertical foreclosure. Several authors started to provide more

[9] See Comanor (1969) for a full critique of the foreclosure idea as well. This author (p. 259) argues that "*although vertical integration may well have the important effect of extending high concentration levels from one stage of production to another, it cannot be held responsible for high concentration prior to integration. And it is the latter that results in market power which is exercised through vertical relationships*". The main point for this author was that the degree of market power would not be "*additive at successive stages*" which is the core of the Chicago critique.

[10] See Perry (1989,p. 244/247) for a brief history of the whole legal evolution of the vertical merger control in the US until that time. The Clayton act did not apply to vertical mergers until 1950, when it was amended by the Celler-Kefauver act.

rigorous economic rationales, improving the understanding of the possible economic reasoning behind foreclosure[11], escaping from the naive leverage version of the theory that was used by the US courts until the seventies. Tirole (1988, p.193/198) provides a survey of these efforts from the end of the seventies up to the publication of his textbook. One important aspect that emerged is that socially inefficient market foreclosure could be obtained through a myriad of generic strategies aiming to raise rival costs[12] including exclusionary vertical long term contracts[13] rather than only vertical mergers. Concerning the issue of market foreclosure by vertical integration, Tirole (p. 195) states that, with few exceptions, the main failure of the economic literature was not explaining why integrated firms do not sell or buy on the intermediate goods market instead of foreclosing. The two exceptions were published afterwards on the papers of Salinger (1988) and Ordover, Saloner and Salop (1990).

Salinger (1988) shows that the vertically integrated firm after the merger does not participate in the upstream input market but only supply its downstream associated company, foreclosing the access of other downstream firms. Ordover, Saloner and Salop (1990) structure a model where vertical foreclosure can emerge as an equilibrium in a successive duopoly setting. The model is a four-stage game where the final equilibrium is obtained through backward induction. The main importance of the paper is that it replies the six main criticisms against the foreclosure doctrine[14]. The main result of their model is that the vertical merger hurts both downstream companies. At the same time, both upstream firms are benefited and the consumer is unambiguously hurt, since final price always increases. The full structure of the game results in the two downstream firms facing a prisoner dilemma regarding who will be the first to integrate[15].

Hart and Tirole (1990) build a rich and complex set of hypotheses under which foreclosure can emerge[16]. The model consists of two potential suppliers at the upstream and

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[11] According to Rey and Tirole (1997,p. 4): "*The Chicago school view has had the beneficial effect of forcing industrial economists to reconsider the foreclosure argument and to put it, we believe, on firmer ground*".

[12] See Salop and Scheffman (1983). Salop and Scheffman (1987) extend the basic model of 1983 to other situations, including the one where a dominant integrated firm prefers not to produce their own inputs more efficiently and buy more expensive inputs in the market aiming to raise the rival costs. Anyway, in this case, the vertical integration is not the source of foreclosing behavior. See also Salop and Kratenmark (1993).

[13] The most known model of exclusive dealing arrangement that forecloses inefficiently the market comes from Aghion and Bolton (1987), also summarised by Tirole (1988 p.196/198). The model replies formally the criticisms from Bork (1978) and Posner (1976) that criticized the decision of the courts in the exclusionary contracts of the case United Shoe Machinery Corporation of 1922 on the basis that there was not any incentive for the buyers to feed a monopoly on the other side of the market, signing contracts that exclude competitors.

[14] The first stage of the game happens when both downstream firms bid to acquire one of the upstream suppliers. In the second stage, input prices are determined. As one of the bidding downstream companies acquire one upstream firm, the other downstream firm bids to acquire the remaining supplier in the third stage. Finally, downstream prices are chosen in the fourth stage.

[15] The authors summarize this intuition stating that "*the fear of being foreclosed drives each firm to attempt to foreclose the other. As a result, all the rents from foreclosure are dissipated through the bidding and all the profits accrue to the upstream firm(s)*".

[16] As in the former model of Salinger (1988), foreclosure can occur, but total welfare can still increase. In other words, foreclosure is not a necessary condition to justify antitrust intervention based on welfare grounds.

two potential buyers at the downstream level deciding or not to merge vertically in a strategic way, i.e., whether considering what they think the other pair of upstream/downstream firms may do in response to a vertical merger. Three variants of the basic model are constructed: a) *ex post monopolization* is the single variant that results in output contraction, being the most closely connected to the usual intuition of the antitrust authorities*; b) scarce needs* where the downstream firms face capacity constraints and the main reasoning for vertical integration is the need of one of the upstream firms to ensure that the downstream firm purchases its supplies and not from the rival's.; c) *scarce supplies* where the upstream firms face capacity constraints and the main reasoning for the vertical merger is the need of one of the downstream firm to ensure that the upstream firm channels its scarce supplies to it instead to the other downstream firms[17]. There are a variety of possible outcomes within each one of these three variants. This derives mainly from the incorporation in the model of two potential gains from mergers, that are i) avoidance of wasteful facility duplication (investment costs) by the remaining firms and ii) pure efficiency gains, which include the elimination of an eventual hold-up problem on the merged firm investment. When the investments are relationship specific rather than industry specific, holdup problems are relevant and, thus, efficiency considerations[18] may be balanced. However, the incentive to merger for assuring scarce supply or demand implying foreclosure in Hart and Tirole's model increases as well and thus net impact on welfare is ambiguous.

The model of Rey and Tirole (1997) provides a rationale for the foreclosure theory closer to the first variant of the Hart and Tirole (1990) model. But differently from the 1990 model, this one explicitly relates the market foreclosure idea to the known Coase model of the "durable good" monopolist. Rey and Tirole (p.10/17) show that the bottleneck facility owner facing oligopolists in the complementary market may not be able to credibly commit that he will maintain the monopoly result in the contracts with each of these players. This result can be obtained with the bottleneck monopolist offering to each of the oligopolists a "take it or leave it" contract that specifies the quantity supplied and the total remuneration. The upstream firm always has an ex-post incentive to open secret renegotiations, acting opportunistically against the downstream contractors. Anticipating this result, each downstream oligopolist does not accept the contracts that ensues the monopoly result for the upstream bottleneck. This represents a decrease on the bottleneck monopolist's profit.

There are two main ways to deal with this problem: an exclusive dealing arrangement with one of the oligopolist or a merge. In both cases, the bottleneck monopolist refuses to deal with the others, foreclosing the market. In this case, the

[17] Perry (1989, p. 206/208) presents a brief survey of the earlier literature on the assurance of supply argument mainly summarizing the important model of Carlton (1979). This paper of Hart and Tirole seems to be the first one to link more explicitly the argument of assurance of supply with the market foreclosure result. Bolton and Whinston (1993) almost simultaneously build another model resting on the same basic reasoning of Hart and Tirole (1990), but on a multilateral (and not bilateral) context. The authors conclude that "*transaction costs saving are often a two-wedged sword, with the alleviation of supply assurance concerns for merging parties often exacerbating supply assurance concerns for other downstream firms and leading to a form of market foreclosure*".

[18] In the traditional line of Williansom (1975, 1985), Klein, Crawford and Alchian (1978) and Grossman and Hart (1986).

temptation for opportunistic behaviour is eliminated. The monopolist bottleneck is able to extract all monopolist rents from the complementary market and the chosen downstream firm will not fear about opportunistic behaviour. In this regard, the result is a departure from the conventional wisdom since foreclosure does not aim to extend market power from one market to another, but rather reestablish the market power from a situation where the oligopolists in the complementary market fear the opportunistic behaviour from the bottleneck monopolist.

In the case of the relationship between long distance carriers and the local loop bottleneck in telecommunications, this problem is not so sharp. The Coasean problem applied to this bottleneck facility framework is more acute when the bottlenecks are at more upstream levels and far from the direct contact with the consumer. This happens because when the monopolist is at the interface with the consumer, he is more inclined to internalise negative externalities between oligopolists (p.18). Therefore, as in the case of the local loop the monopolist is directly responsible for the connection with the customer, this source of incentive to foreclose is reduced. However, though it reduces foreclosure concerns, the location of the bottleneck monopolist at the interface with the final consumers decreases welfare (p.25), given that his ability to charge monopoly prices is greater.

More recently, Kuhn and Vives (1999), extending and formalizing a conjecture raised by Perry (1989), link the foreclosure caused by vertical integration and the "excess entry" result from Mankiw and Whinston (1986) arising from the "business stealing effect". In their model, foreclosure brings down the number of players in the market more in line to the social optimum. Thus, vertical integration by increasing foreclosure and hurting competitors can increase efficiency and social welfare.

The "excess entry result" was also addressed by Vickers (1995) in the context of the linkages between a natural monopoly market with a potentially competitive one. The novelty of his analysis for our purpose is the introduction of price regulation at the monopolistic level, mainly access regulated prices, considering the information asymmetry of the regulator. This is a crucial departure from the previous literature on foreclosure and applies more closely to the situation of the regulated sectors, including telecommunications. The basic trade-off of the cost and benefits of keeping vertical integration is stressed by the author (p. 4):

"*Vertical integration has the disadvantage that the regulator's task is made harder insofar as the monopolist has incentives to raise rivals' costs, but it may have the advantage of offsetting excess entry and hence allowing a more efficient production structure in the competitive industry*".

The "efficiency" effect comes directly from saving fixed costs. The author also show that when the firm in the bottleneck level is allowed to enter the competitive level (vertical integration), the optimal regulated access price is higher, increasing the market share of the vertical integrated firm and decreasing their average cost. This shows that if the target is to avoid foreclosure, even regulated interconnection prices are not perfect substitutes for vertical separation to avoid some degree of market foreclosure strategy.

The models described above represent the core of the current literature on foreclosure. However, almost all of them (with the exception of Vickers' model) are focused on the effects of vertical mergers and not on the more simple idea that an already integrated firm owning an essential facility will (or will not) often have an incentive to foreclose supply to downstream competitors.

We construct some models to address this simple question. In these models, the problem of the upstream monopolist commitment explored by Rey and Tirole (1997) is meaningless, since one upstream firm and one downstream firm are already working together as a single firm. There are no capacity constraints on either sides of the market as in Hart and Tirole (1990), since we suppose fixed marginal costs. There is not downstream prisoners dilemma as in Ordover, Salop and Saloner (1990) and there is no need to suppose the same assumptions of Salinger (1988). The model does not requires less than perfect information of the regulator as in Vickers (1995).

3) **Foreclosure Through Access Prices in a Cournot Model**

To study vertical foreclosure through prices, we can first define this phenomena in a broader sense, since full foreclosure is a particular and extreme case of a general case of discrimination of a vertically integrated incumbent against an entrant.

The first candidate rule to obtain a proper definition would be the access market price differential with marginal access cost. However, since the provision of access is also a business, we can expect that even an independent non-integrated bottleneck supplier will charge access prices greater than the marginal access cost. So, the access price/marginal cost differential does not only capture the incentive of a vertically integrated incumbent to protect its own downstream business, but also its incentive to make positive profits in the access business. Thus, we have to pick a definition that eliminates this "access business profit-seeking" effect that will occur regardless of vertical integration. This is made through the following definition:

Definition 1- There is partial vertical foreclosure through access pricing from the upstream bottleneck segment to a downstream potentially duopolistic segment, when both downstream competitors have the same efficiency, but there is a positive access price differential between the situation where the upstream access provider is a vertically integrated firm and the situation where the access provider is an independent non-integrated access supplier that is able to price discriminate in his access business and faces the same number of downstream firms from the first situation.

Since the access price of the independent access provider will contain an access business profit-seeking effect, differently from the marginal access cost, the differential between the access price of the vertically integrated firm and the independent provider will isolate for the effect of the ownership of the upstream access provider in the access price rule, capturing for the vertical foreclosure incentive.

Note that the source of the bias could also stem from an efficiency differential and not from vertical integration. That is why, we restrict the comparison to the case of equal efficiency (equal marginal cost).

Furthermore, it is important to allow for the independent access provider to price discriminate whenever he wishes. We will come back for the motivation behind this hypothesis ahead.

The requirement of the independent supplier facing the same number of downstream firms avoids potential differences associated to a different number of downstream firms, not directly related to the incentives for vertical foreclosure.

Suppose a vertically integrated monopolist incumbent facing an entrant in the downstream market. Assume that the entrant is not able to enter the local service (upstream) if he did not enter the long distance service yet[19][20]. The inverse demand function and the profit functions of the upstream (*1u*) and downstream (*1d*) segments of the incumbent firm and the entrant firm (*2d*) in the long distance business are given, respectively, by:

$$P(q_1 + q_2) = 1 - q_1 - q_2 \quad (1)$$

$$\prod_{1u}(q_1, q_2) = (a - c)(q_1 + q_2) \quad (2)$$

$$\prod_{1d}(q_1, q_2) = q_1(1 - q_1 - q_2) - C_1(q_1) \quad (3)$$

$$\prod_{2d}(q_1, q_2) = q_2(1 - q_1 - q_2) - C_2(q_2) \quad (4)$$

Variable q_i is the quantity traded by the downstream firm i (i=*1d,2d*). $C_1(q_1)$ and $C_2(q_2)$ are the total costs, respectively, of the incumbent and entrant downstream firms. a is the access price charged by the upstream incumbent, *1u* for both downstream firms *1d* and *2d*. We suppose that one unit of access results in one unit of long distance service provided and there are no fixed costs at all. The parameter c is the marginal cost of the upstream firm providing any input (access) quantity q_i to the downstream firms. The expressions for the total costs of the downstream firms are:

$$C_1(q_1) = aq_1 + c_1q_1 \quad (5)$$

$$C_2(q_2) = aq_2 + c_2q_2 \quad (6)$$

The parameters c_1 and c_2 are the constant marginal costs of each downstream firm. As the upstream firm is integrated with the downstream *1d*, their profits must be aggregated. Notice that when we derive the aggregate profit function of the vertically integrated incumbent, the terms including the access price a cancel out in the sum. This is a revenue to the upstream firm but an expense to the downstream firm. The profit equation of the vertically integrated and entrant firms are, respectively

[19] We can suppose that the marginal cost of the entrant, given that he does not operate in the long distance, is infinity. The role of this assumption is to force the dependence of the entrant in the long distance to the incumbent local network in the short run.

[20] For the sake of simplicity, we also restrict to the case of two downstream companies and not "n".

$$\prod_1 = q_1(1 - q_1 - q_2) + aq_2 - c(q_1 + q_2) - c_1 q_1 \qquad (7)$$

$$\prod_2 = q_2(1 - q_1 - q_2) - (a + c_2)q_2 \qquad (8)$$

The oligopolists play a Cournot-Nash game in the downstream market. Given the parameters of this game, the vertically integrated incumbent chooses the optimal value of the access price *a* that he charges the entrant. We assume that the parameters are such that there are only interior solutions. The reaction functions of both companies in the downstream market are given by:

$$\frac{\partial \prod_1}{\partial q_1} = 1 - 2q_1 - q_2 - c - c_1 = 0$$

$$q_1 = \frac{1 - c - c_1 - q_2}{2} \qquad (9)$$

and

$$\frac{\partial \prod_2}{\partial q_2} = 1 - 2q_2 - q_1 - c - c_2 = 0$$

$$q_2 = \frac{1 - a - c_2 - q_1}{2} \qquad (10)$$

Solving for q_1 and q_2, we get:

$$q_1^* = \frac{1 + a - 2c_1 - 2c + c_2}{3}$$
$$q_2^* = \frac{1 + c - 2c_2 - 2a + c_1}{3} \qquad (11)$$

The profit of the vertically integrated incumbent replacing (11) in (7) and (8) will be given by :

$$\prod_1 = \frac{(1 + a - 2c_1 - 2c + c_2)}{3}[1 - \frac{(1 + a - 2c_1 - 2c + c_2)}{3} - \frac{(1 + c - 2c_2 - 2a + c_1)}{3} - c_1 - c]$$
$$+ (a - c)\frac{(1 + c - 2c_2 - 2a + c_1)}{3}$$

$$\frac{\partial \prod_1}{\partial a} = \frac{2}{3}\frac{(1+a-2c_1-2c+c_2)}{3} + \frac{(1+c-2c_2-2a+c_1)}{3} - \frac{2(a-c)}{3} = 0$$

$$\frac{5}{9} - \frac{10a}{9} - \frac{c_1}{9} + \frac{5c}{9} - \frac{4c_2}{9}$$

$$a^* = \frac{1}{2} - \frac{c_1}{10} + \frac{c}{2} - \frac{2c_2}{5} \qquad (12)$$

Next, we have to compare the optimal access price of the vertically integrated firm given in (12) with that from an independent access supplier. There are two possibilities. First, the independent access provider cannot price discriminate and settles the same access price *a* to both downstream companies. Second, the independent access provider is able to price discriminate and settles different access prices to each of the two downstream firms. Note, however, that the vertically integrated firm is implicitly supposed to price discriminate between the access price settled to the entrant (given in 12) and the access price settled to himself (*c* by definition). If we do not allow price discrimination for the independent access provider, the comparison of the access price he settles and the access price of the vertically integrated firm given in (12) can be reflecting this asymmetry. In other words, besides foreclosure, there would be also the effect of the ability to price discriminate of the vertically integrated firm not possessed by the independent provider. That is why we made explicit the possibility of price discrimination in the definition of foreclosure above. So, a_1 is the access price settled by the upstream firm to the downstream firm 1 and a_2 the access price settled to the downstream firm 2.

Next, we restate (2), (7) and (8) for the case of an independent access supplier in the upstream with two companies in the downstream segment of the market:

$$\prod_{1u} = (a_1 - c)q_1 + (a_2 - c)q_2 \qquad (2')$$

$$\prod_1 = q_1(1 - q_1 - q_2) - a_1 q_1 - c_1 q_1 \qquad (7')$$

$$\prod_2 = q_2(1 - q_1 - q_2) - a_2 q_2 - c_2 q_2 \qquad (8')$$

Differentiating (7´) and (8´), respectively, with respect to q_1 and q_2, and solving the system, we get:

$$q_1 = \frac{1 + a_2 + c_2 - 2a_1 - 2c_1}{3}$$

$$q_2 = \frac{1 + a_1 + c_1 - 2a_2 - 2c_2}{3} \qquad (11')$$

The independent access supplier incorporates (11´) in his problem (2´) and chooses optimally a_1 and a_2:

$$\prod_{1U} = (a_1 - c)[\frac{1 + a_2 + c_2 - 2a_1 - 2c_1}{3}] + (a_2 - c)[\frac{1 + a_1 + c_1 - 2a_2 - 2c_2}{3}]$$

$$\frac{\partial \prod_{1U}}{\partial a_1} = \frac{1 + a_2 + c_2 - 2a_1 - 2c_1}{3} - \frac{2}{3}(a_1 - c) + \frac{1}{3}(a_2 - c) = 0$$

$$a_1 = \frac{1 + 2a_2 + c_2 - 2c_1 + c}{4}$$

Given the symmetry of the problem:

$$a_2 = \frac{1 + 2a_1 + c_1 - 2c_2 + c}{4}$$

Solving for a_1 and a_2, we get:

$$a_1^* = \frac{1 - c_1 + c}{2}$$
$$a_2^* = \frac{1 - c_2 + c}{2} \qquad (12')$$

The difference between (12) and (12´) (only a_2^*) is:

$$\frac{1}{2} + \frac{c}{2} - \frac{c_1}{10} - \frac{2c_2}{5} - \frac{1}{2} + \frac{c_2}{2} - \frac{c}{2} = \frac{c_2 - c_1}{10} \qquad (13)$$

So, the vertically integrated firm settles an access price that is greater than the access price picked by an independent provider if and only if he is more efficient than the entrant. Equation (13) results in Proposition 1.

Proposition 1: Given a downstream duopoly playing a Cournot game with the linear demand function (1) and variable linear cost functions in the downstream ($(a_1+c_1)q_1$ and $(a_2+c_2)q_2$) and upstream segments ($c(q_1+q_2)$), there will be <u>no</u> incentive for vertical foreclosure by the incumbent against an entrant through access pricing as defined in Definition 1 resulting from a vertical integration of one of the downstream firms and the upstream firm.

This matches the Chicago intuition, but with further insights. What equation (13) is saying is that when the incumbent is less efficient than the entrant, the former tends to charge a lower access price compared to what would charge an independent access provider. This occurs because when the vertically integrated incumbent is less efficient, he loses twice if he discriminates against the entrant: First, he does not extract a higher amount of profits from the most efficient player and, second, he derives a lower amount of profits through his own (less efficient) downstream subsidiary. On the other hand, the independent access provider loses just once if he discriminates against the most efficient entrant, by not extracting a higher amount of profits from the most efficient player. By the same token, the vertically integrated incumbent earns twice when his downstream subsidiary is more efficient. So, the vertically integrated incumbent is more sensitive to the cost differential than the independent access provider. But this is not a vertical foreclosure strategy as

defined in definition 1. Discrimination occurs when the reduction in the upstream profits by discriminating against the entrant is lower than the gains in the downstream market and this just happens when the entrant is less efficient than the downstream subsidiary of the incumbent.

The Chicago's view is right by stating that the incumbent earn more in some circumstances by providing access than by foreclosing and thus it is not so obvious that the latter conduct should always be expected. Note, however, that this statement cannot be taken as universal since the model here developed is restricted to specific linear demand and cost functions. Checking how general is this finding is an interesting topic for further research.

4) Foreclosure Through Access Prices in a Bertrand Model

Suppose now that the dowsntream competitors play a Bertrand instead of a Cournot game. Assume that the downstream demand curve is given by (1).

We assume that c_2 can be different from c_1. In this case, prices will equal the highest "total marginal cost" in equilibrium in the long distance downstream segment. Total marginal cost equals the individual marginal cost c_i plus the access price settled by the upstream subsidiary of the vertically integrated incumbent a. So, the vertically integrated incumbent controls part of the marginal cost of his downstream rival ($a+c_2$) through the access price settled by the upstream subsidiary and take as given his own marginal cost ($c+c_1$).

We have three hypothesis:

If

$$a + c_2 > c + c_1$$

(Hypothesis 1)

Then, in a Bertrand equilibrium

$$P^{hip1} = a + c_2 \qquad (14)$$

In this case, only the vertically integrated incumbent produces, given that the access price is very high and his profit will be:

$$\Pi_{11} = (a + c_2 - c)Q(a + c_2) \qquad (15)$$

Now, suppose that

$$a + c_2 < c + c_1$$

(Hypothesis 2)

Then, in a Bertrand equilibrium

$$P^{hip2} = c + c_1 \qquad (16)$$

In this case, just the downstream entrant produces. The vertically integrated incumbent gives up from his downstream operation and operates in the long distance only providing access. The profit of the vertically integrated incumbent will be:

$$\prod_{12} = (a - c)Q(c + c_1) \qquad (17)$$

In the third hypothesis, we have:

$$a + c_2 = c + c_1$$
$$\Rightarrow a = c + c_1 - c_2$$

(Hypothesis 3)

And the vertically integrated incumbent settles the access price exactly at the level that establishes the equality above. This means that both produce and we suppose that they divide the downstream market in the same proportion. The profit of the vertically integrated firm will be:

$$\prod_{13} = (c + c_1 - c)\frac{Q(c + c_1)}{2} + (c + c_1 - c_2 - c)\frac{Q(c + c_1)}{2} =$$

$$(c_1 - \frac{c_2}{2})Q(c + c_1) \qquad (18)$$

Notice that we can drop hypothesis 2 where the entrant produces alone. Comparing $\prod_{13}$ (18) with $\prod_{12}$ (17), we have that

$$\prod_{12} > \prod_{13} \Leftrightarrow (a - c) > c_1 - \frac{c_2}{2}$$

$$\Leftrightarrow c + c_1 < a + \frac{c_2}{2}$$

(Condition 1)

This is the condition that defines whether the vertically integrated incumbent prefers to fix access price such that hypothesis 2 holds instead of hypothesis 3. But note that under hypothesis 2,

$$a + c_2 < c + c_1$$

a contradiction with condition (1), since c_2 is always non-negative. So, hypothesis 2 will never occur in this setting, since the vertically integrated incumbent will never prefer to pick a such that hypothesis 2 holds. So, he will never leave the entrant alone in the market.

Therefore, we are restricted to compare hypothesis 1 and 3. For this purpose, we have to find the optimal access price settled by the vertically integrated incumbent in hypothesis 1:

$$\prod_{11} = (a + c_2 - c)Q(a + c_2) =$$
$$(a + c_2 - c)(1 - a - c_2)$$

(15´)

$$\frac{\partial \prod_{11}}{\partial a} = 1 - a - c_2 - a - c_2 + c = 0$$
$$a^* = \frac{1 - 2c_2 + c}{2}$$

(19)

The profit of the vertically integrated incumbent under hypothesis 1 (just the downstream subsidiary of the vertically integrated incumbent operating) will be:

$$(\frac{1 - 2c_2 + c}{2} + c_2 - c)(1 - \frac{(1 - 2c_2 + c)}{2} - c_2) = \frac{(1-c)}{2}\frac{(1-c)}{2} = \frac{(1-c)^2}{4}$$

(20)

The profit of the vertically integrated incumbent under hypothesis 3 with both producing will be:

$$\prod_{13} = (c_1 - \frac{c_2}{2})(1 - c - c_1)$$

(18´)

Next, we have to address what will be the optimal access price settled by the vertically integrated incumbent, given the profit functions described above under hypothesis 1 and 3. So, if

$$\frac{(1-c)^2}{4} > (1 - c - c_1)(c_1 - \frac{c_2}{2})$$

(Condition 2)

the vertically integrated incumbent prefers to produce alone and does not even offer access to the entrant. Note that as $1 > c + c_1$, this will not occur only if the downstream incumbent is sufficiently more inefficient than the downstream entrant (or c_1 is sufficiently greater than $c_2/2$).

Next, we address the problem of the independent access provider. He settles access price a_1 to downstream firm 1 and a_2 to downstream firm 2. There are also three hypothesis. First,

$$a_1 + c_1 < a_2 + c_2$$

(Hypothesis 4)

In this case, given Bertrand competition, only firm 1 produces at price a_2+c_2. Analogously, if

$$a_1 + c_1 > a_2 + c_2$$

(Hypothesis 5)

Then, only firm 2 produces at a_1+c_1. And if

$$a_1 + c_1 = a_2 + c_2$$

(Hypothesis 6)

both downstream companies produce. We would like to argue that the single equilibrium for the independent access provider will be that established by hypothesis 6. Intuitively, the independent access provider will always wish to curb the downstream market power and avoid losing profits in a typical double marginalization problem. For instance, suppose that the fourth hypothesis holds ($a_1+c_1<a_2+c_2$). Then, firm 1 is the single operator in the Bertrand game and will settle its price at a_2+c_2. Given the negative slope of the demand curve, if the independent access provider reduces a_2 to something infinitely close to $a_1+c_1-c_2$, the price settled by firm 1 has to reduce, the quantity sold increases and the profit of the former increases. Formally, the problem of the independent access provider, under the fourth hypothesis, is

$$\prod_{1i} = (a_1 - c)(1 - a_2 - c_2)$$

Such that

$$a_1 + c_1 \leq a_2 + c_2 \qquad (21)$$

Then, the function to be maximized is

$$\prod_{1ik} = (a_1 - c)(1 - a_2 - c_2) + \lambda(a_2 + c_2 - a_1 - c_1) \qquad (21')$$

Kuhn-tucker conditions are:

$$\frac{\partial \prod_{1ik}}{\partial a_1} a_1 = (1 - a_2 - c_2 - \lambda) a_1 = 0$$

$$\frac{\partial \prod_{1ik}}{\partial a_2} a_2 = (-a_1 + c + \lambda) a_2 = 0$$

$$\frac{\partial \prod_{1ik}}{\partial \lambda} \lambda = (a_2 + c_2 - a_1 - c_1) \lambda$$

If we focus exclusively in interior (non-zero) solutions for a_1 and a_2, we have that:

$$\lambda = 1 - a_2 - c_2 = a_1 - c \tag{22}$$

Note that it would be non-sense for the independent access provider to settle $a_1 = c$ and gives up all the profits from the access business. So, $\lambda > 0$ and from the third first-order condition:

$$a_1 * + c_1 = a_2 * + c_2 \tag{23}$$

and then, we show that the constraint of problem (20) is binding and hypothesis (6) holds.

So, we assume that the independent access supplier provides access to both companies and chooses simultaneously the optimal access prices to both under a constraint given by hypothesis (6):

$$\prod_u = (a_1 - c)\frac{(1 - a_1 - c_1)}{2} + (a_1 + c_1 - c_2 - c)\frac{(1 - a_1 - c_1 + c_2 - c_2)}{2} =$$

$$(2a_1 + c_1 - 2c - c_2)\frac{(1 - a_1 - c_1)}{2} \tag{24}$$

A first-order condition is:

$$\frac{\partial \prod_u}{\partial a_1} = \frac{2(1 - a_1 - c_1)}{2} \frac{-2a_1 - c_1 + c_2 + 2c}{2} = 0$$

$$a_1 * = \frac{2 - 3c_1 + c_2 + 2c}{4} \tag{25}$$

and by analogy

$$a_2 * = \frac{2 + c_1 - 3c_2 + 2c}{4} \tag{26}$$

Since, there is no likelihood of the vertically integrated incumbent leaving the whole downstream market to the entrant in a Bertrand setting as we saw before, we address two

scenarios. The comparison of the access price of firm 2, 1) when just firm 1 produces in the context of a vertically integrated incumbent and an independent access provider and 2) when both produce.

In the first case (just firm 1 produces), there will be vertical foreclosure if:

$$\frac{2+c_1-3c_2+2c}{4} < \frac{1-2c_2+c}{2} \Rightarrow$$

$$c_1 + c_2 < 0$$

(condition 3)

which never holds since c_1 and c_2 are always non-negative.

So, in a Bertrand setting, we can also say that there is no vertical foreclosure through access pricing like in the Cournot setting.

In the second period, there will be vertical foreclosure if

$$c + c_1 - c_2 > \frac{2+c_1-3c_2+2c}{4}$$

$$c + \frac{3}{2}c_1 - c_2 > 1$$

for $c_1=c_2$

Condition 4

Making $c_1=c_2$, condition 4 becomes:

$$c + \frac{c_1}{2} > 1$$

But we know that for the production to be feasible, $1 > c+c_1$, which is not compatible with condition 4. So, there is also no vertical foreclosure in this second case. Now, we are able to change Proposition 1 in the following sense.

Proposition 1': Given a downstream duopoly playing a Cournot or a Bertrand game with the linear demand function (1) and variable linear cost functions in the downstream ($(a_1+c_1)q_1$ and $(a_2+c_2)q_2$) and upstream segments ($c(q_1+q_2)$), there will be <u>no</u> incentive for vertical foreclosure by the incumbent against an entrant through access pricing as defined in Definition 1 resulting from a vertical integration of one of the downstream firms and the upstream firm.

The proof about the non-existence of vertical foreclosure through prices in the case of Bertrand competition is not so simple as in the case of Cournot, but unambiguously points to the same direction: There is no vertical foreclosure through access prices in these models under the assumptions established above.

The non-foreclosure result under Bertrand competition is even stronger than in the Cournot case. The point is that Bertrand competition is tougher than Cournot. The price of the active player, even playing alone in the market, is, in average, more constrained than in the case of Cournot. So, the vertically integrated incumbent will earn relatively less in the downstream business playing Bertrand compared to a Cournot game. At the same time, lower prices mean higher quantities and more profits carried to the access business in the upstream segment. This makes the access business relatively more attractive than the final service business for the vertically integrated incumbent in the Bertrand case. On the other hand, the independent access provider does not have this choice of switching from the downstream to the upstream and vice-versa and disregards the fact that the downstream final service business is less profitable in a Bertrand setting. Then, once more and even representing a stronger result, there is no foreclosure in the case of a Bertrand oligopoly.

5) Conclusions

Though not quite general, both models sketched above show that under the main oligopoly models of the economic theory (Cournot and Bertrand) and under a suitable definition of what means vertical foreclosure, this phenomena does not happen. In this regard, it is possible that the concerns of vertical foreclosure through access prices can be overestimated at least when we consider the linear models adopted here.

The reason for this behaviour in the two models are distinct. In the case of Cournot competition, the result of non-foreclosure depends crucially on the hypothesis made in definition 1 above that comparisons must be made for players with equal efficiency. The vertically integrated incumbent is more sensitive to efficiency differences but does not have any bias against the entrant. This occurs because the vertically integrated incumbent loses twice if he departs from the rule picked by the independent access provider as explained in section 3 above. In the case of Bertrand oligopoly, this effect is even stronger since competition makes, even in the absence of the rival in the market, the downstream service market relatively less attractive than the access business.

There are two important disclaimers. First, the results do not mean that access price regulation is not required, but only that vertical foreclosure through access prices fails to occur. Thus, access price regulation will be justified on the grounds of monopoly theory, but not on the vertical integration of the incumbent. Second, if there is not vertical foreclosure in these two models, it does not mean that we cannot find some other oligopoly structure where vertical foreclosure through prices can occur. More than that, we restrained to address vertical foreclosure through prices. As we showed in another work[21], it is possible to find suitable economic models where vertical foreclosure is a rational response when the control variable is quality, mainly when the fear of the incumbent in being taken over in the local service in the long run is present.

Finally, the results of this paper indicate that vertical foreclosure through access prices do not look a suitable motivation to justify the strategy of breaking-up TELEBRAS

[21] See Mattos (2001).

into local and long distance services. Other rationales for vertical foreclosure have to be sought.

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