



Collusion at the extensive margin [☆]

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ABSTRACT

We augment the multi-market collusion model of Bernheim and Whinston (1990) by allowing for firm entry into, and exit from, individual markets. We show that this gives rise to a new mechanism by which a cartel can sustain a collusive agreement: Collusion at the extensive margin whereby firms collude by avoiding entry into each other's markets or territories. We characterise parameter values that sustain this type of collusion and identify the assumptions where this collusion is more likely to hold than its intensive margin counterpart. Specifically, it is demonstrated that where duopoly competition is fierce collusion at the extensive margin is always sustainable. Finally, we provide a theoretic foundation for the use of a "proportional response" enforcement mechanism.

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1. Introduction

It has long been understood that the existence of multiple markets creates the potential for *market sharing*; a collusive agreement in which each member of a cartel is assigned monopoly rights over a territory (see for example Edwards, 1955; Stigler, 1964). A common feature of market sharing models is that, when a firm deviates, it captures a share of its rival's market *before* its rival has the opportunity to respond (see for example Bernheim and Whinston, 1990; Gross and Holahan, 2003; Belleflamme and Bloch, 2008; Bond and Syropoulos, 2008). This may be a reasonable assumption for industries in which products are manufactured in a firm's home market prior to being transported for sale in foreign markets. If, as is the case for many commodities, transportation is shorter than production, a firm's arrival in a market could catch incumbents off guard.

There are, however, many industries in which a firm cannot contest a market without first establishing a presence in that market. If the process of entry is observable and takes a sufficiently long time, incumbents will have the opportunity to adjust their behaviour within the market in

anticipation of the entrant's arrival. This fundamentally alters both the incentives for a firm to deviate from a cartel agreement, and the mechanisms by which the cartel can punish deviations.

In this paper, we augment the multi-market collusion model of Bernheim and Whinston (1990) (henceforth BW) by incorporating an explicit mechanism for firm entry into, and exit from, individual markets. In each period, firms decide which markets to contest before selecting their behaviour within each market. While a firm can surprise its rivals by its decision to enter a market, this action is observable. From the perspective of collusion, participation in a market, rather than simply actions within markets, can form the basis of histories that enforce collusive outcomes in repeated non-cooperative games. Cartels can assign different markets to different firms with a deviation being entry by a firm into a market not assigned to it. That such entry could trigger counter-entry by rivals is what disciplines cartel behaviour. We term such outcomes *collusion at the extensive margin* to distinguish it from *collusion at the intensive margin*, based on firms' behaviour within markets (in terms of price setting and quantity restrictions) that has been the focus of most of the formal literature to date.

Our model is relevant to a number of industries that are subject to ongoing regulatory scrutiny. As an example, consider the antitrust case against Rural Press and Waikerie that was adjudicated by the High Court of Australia. Rural Press marketed a newspaper, *The Murray River Standard*, in the towns of Murray Bridge and Mannum (amongst others) while Waikerie operated another newspaper, *The River News* in Waikerie; all along the Murray River in South Australia. When

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Waikerie started selling and marketing (to advertisers), *The River News* in Mannum, Rural Press responded with a (draft) letter:

The attached copies of pages from *The River News* were sent to me last week. The Mannum advertising was again evident, which suggests your Waikerie operator, John Pick, is still not focussing on the traditional area of operations.

I wanted to formally record my desire to reach an understanding with your family in terms of where each of us focuses our publishing efforts. If you continue to attack in Mannum, a prime readership area of the Murray Valley Standard, it may be we will have to look at expanding our operations into areas that we have not traditionally services [sic]. I thought I would write to you so there could be no misunderstanding our position. I will not bother you again on this subject.¹

Waikerie promptly exited Mannum. The Australian courts found that this was an anti-competitive agreement and fined both parties (see Gans et al., 2004). Note that this did not involve attempted collusion within the Mannum area but instead a division of geographic markets along the Murray River. Note also that the antitrust violation resulted from the enforcement of a deviation from an implied 'agreement' and, indeed, the newspapers exist in their separate markets today.

Interestingly, Stigler (1964) briefly considered this type of collusion but dismissed it, writing:

... the conditions appropriate to the assignment of customers will exist in certain industries, and in particular the geographical division of the market has often been employed. Since an allocation of buyers is an obvious and easily detectable violation of the Sherman Act, we may again infer that an efficient method of enforcing a price agreement is excluded by the antitrust laws (p.47).

However, today, it is more likely that, absent evidence of an explicit agreement or a 'smoking gun' letter, such as existed in the Australian case, collusion at the extensive margin would be difficult to prosecute. Specifically, the successful prosecution in the Australian case is likely an exception rather than the rule with the investigation being triggered by off the equilibrium path behaviour rather than the collusive outcome itself. Indeed, in 2007, in *Bell Atlantic v. Twombly*² the US Supreme Court examined the complaint that Baby Bell telephone companies violated Section 1 of the Sherman Act by refraining from entering each other's geographic markets. The Court recognized that "sparse competition amongst large firms dominating separate geographical segments of the market could very well signify illegal agreement." However, they did not consider that an unwillingness on the part of Baby Bells to break with past behaviour and compete head to head was necessarily a conspiracy. The Court concluded that the implicit refraining of competition was a natural business practice; placing an evidentiary burden on off the equilibrium path behaviour.³

The paper proceeds as follows. The model is detailed in Section 2. There we add an explicit participation stage (where firms choose which markets to enter and/or exit) to the stage game in BW. We also state conditions under which a maximal competitive outcome can arise in equilibrium. Collusion utilising a grim-trigger strategy is considered in Section 3. Significantly, we show that mutual avoidance outperforms multi-market contact if duopoly profits are sufficiently small. That is, a

more intense baseline level of market competition makes collusion at the extensive margin stable at discount factors where collusion at the intensive margin cannot be sustained. In addition, we discuss the role of entry costs and also asymmetries between markets in terms of their value to the cartel. Uncertainty is introduced into the model in Section 4. We show that reducing the length of the punishment phase increases expected profits at the expense of cartel stability. Moreover, expected profits may be further improved if cartel punishments are target at the deviating firm and scale with the size of the initial deviation. A final section concludes.

2. The multi-market model

The seminal paper on multi-market collusion is Bernheim and Whinston (1990). In their model, firms tacitly collude over the levels of 'within market' actions such as price and quantity. Here we preserve that possibility but add another dimension for collusion based on 'market participation.' Specifically, rather than taking the choice of market presence as a costless one for firms, we assume that entry involves costs and takes some time. Consequently, while it may be that those deviating from a collusive agreement on 'within market' actions can profit prior to a reaction by others, when it comes to collusion based on participation, others can react fully if a deviation is observed.⁴

While our model allows for collusion over market actions and market participation, it will be useful to distinguish between two distinct types of collusive agreement. When multiple firms coordinate their behaviour within a single market, we say that they are colluding at the *intensive margin* of that market. If instead, the firms coordinate their participation across a set of markets, each acting as a monopolist in a subset of markets, we say that they are colluding at the *extensive margin*.

2.1. Preliminaries

Consider an infinite-horizon game in which a set I of identical firms interact repeatedly over a set N of discrete markets. It is assumed that $\|I\| \geq 2$ while $\|N\| \geq \|I\|$.⁵ All firms discount the future by the common discount factor $\delta \in (0, 1)$.

The timing of the game is set out in Fig. 1. Any given period, t , begins with the *participation stage* in which firms decide which markets they will contest. Formally, firm i 's participation stage action is a subset $a_i^t \subseteq N$. The inclusion of a market $n \in a_i^t$ indicates that firm i will contest market n in period t , while $n \notin a_i^t$ indicates that i will be absent from n .

Entry and/or exit occur when a firm's participation stage action differs across consecutive periods. Specifically, firm i is said to *enter* (resp. *exit*) market n in period t if $n \in a_i^t$ and $n \notin a_i^{t-1}$ (resp. $n \in a_i^{t-1}$ and $n \notin a_i^t$). Entry by firm i into market n costs an amount $c_{i,n} \geq 0$. The entry cost is only incurred in the period in which the entry occurs. As in BW, the cost of maintaining a presence in a market following entry is assumed to be accounted for in the market's profit function outlined below. If a firm exits and subsequently reenters a market, the entry cost must be paid again. Importantly, this entry cost means that firms must commit to be present in a market, and can also commit to be absent.

Following the participation stage, the profile of firm participation $a^t = \{a_i^t\}_{i \in I}$ is revealed to the market. Thus, all firms know the number and identities of their rivals in each market, when they compete in the subsequent market stage.

In the *market stage* firms choose actions for each of the markets they are contesting. Formally, firm i selects an action $x_{i,n}^t$ for each market $n \in a_i^t$. The nature of the action $x_{i,n}^t$ depends on the competitive

¹ *Rural Press Ltd v Australian Competition and Consumer Commission; Australian Competition and Consumer Commission v Rural Press* (2003) 203 ALR 217; 78 ALJR 274; [2003] ATPR 41-965; [2003] HCA 75 (Rural Press decision).

² *Bell Atlc v. Twombly* 550 U.S. 544 (2007).

³ Our model also shows how a system of mutual forbearance can be sustained when each firm operates in a different product market. For instance, accounts of Apple and Google's recent falling out have indicated that this arose when Google entered into the mobile phone industry (with hardware as well as software) challenging Apple's iPhone (Stone and Helft, 2010). It was reported that Apple's response (possibly restricting Google applications on the iPhone as well as acquiring a mobile advertising start-up) was the result of Google's violation of a 'gentleman's agreement.'

⁴ Bernheim and Whinston (1990) (see also Belleflamme and Bloch, 2008) have a variant of their model where the costs of producing in a given market involve some fixed costs for the firm. However, they assume that if a firm is merely present in a market but does not produce, its costs are zero. By contrast, we assume that being present in a market requires an observable step and investment even though once a firm is present in a market, collusion over the precise level of output is possible.

⁵ The notation $\|N\|$ refers to the cardinality of the set N .

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