



Market share dynamics in a duopoly model with word-of-mouth communication [☆]



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ABSTRACT

We analyze dynamic price competition in a homogeneous goods duopoly, where consumers exchange information via word-of-mouth communication. A fraction of consumers, who do not learn any new information, remain locked-in at their previous supplier in each period. We analyze Markov perfect equilibria in which firms use mixed pricing strategies. Market share dynamics are driven by the endogenous price dispersion. Depending on the parameters, we obtain different ‘classes’ of dynamics. When firms are impatient, there is a tendency towards equal market shares. When firms are patient, there are extended intervals of market dominance, interrupted by sudden changes in the leadership position.

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1. Introduction

Consider a market in which consumers can learn about the available products and their prices in two ways: via own experiences from previous purchases and by asking fellow consumers about products or suppliers. Such gathering of information via word-of-mouth communication is often a costless byproduct of social interaction, but is unlikely to reveal all decision-relevant information to all consumers in any market. The lack of information may then lead to stickiness in the demand. In this paper we study the dynamics of prices and market shares in a homogeneous-goods duopoly with sticky demand stemming from imperfect word-of-mouth communication. While firms act as perfectly rational forward-looking profit maximizers, consumers behave in a simple fashion. Whenever they learn about the prices charged by both suppliers, they purchase the good from the firm that charges the lower price in that period. If a consumer does not discover the price charged by the alternative supplier via word-of-mouth, then she remains locked-in and returns to the supplier visited in the previous period.¹ As a result of the sticky demand, the firm’s strategic decisions become dependent on its customer base.

A central question in the analysis of dynamic oligopoly games is whether market shares tend to equalize over time, or whether a firm may be able to build up and subsequently defend a dominant market position persistently. Two basic effects determine whether persistent dominance is likely to occur. On the one hand, having a large customer base implies more

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¹ Such behavior may arise, for instance, due to imperfect recall.

monopoly power over locked-in consumers, which firms tend to exploit by charging higher prices (*anti-competitive effect*). This leads to a tendency towards equal market shares. On the other hand, charging a low price today increases the future customer base. If this incentive is sufficiently strong, then a firm that already has a dominant position in the market, may price very aggressively whenever it is threatened, in order to defend its dominant position (*pro-competitive effect*). This, in turn, leads to a tendency towards extreme market shares.

The main contribution of this paper is that it provides a simple framework that does not rely on external shocks but is still able to explain surprisingly rich dynamics, including a tendency towards equal market shares, as well as persistence of dominance and changes in the role of the dominant firm. The prevalence of word-of-mouth communication plays a key role in the determination of firms' incentives to build up and subsequently to defend a dominant market position. We thus identify different 'types' of dynamics, and relate them to the basic parameters of the model, in particular the discount rate, and parameters that determine the effectiveness of word-of-mouth communication. Our model helps to explain why a firm that has dominated a market for a long period of time, may lose this position again, in which case the competitor takes over the dominant position.

In our model, dynamics never 'die out', even though we do not assume any exogenous source of uncertainty. As pointed out by Sutton (2007, p. 223), Markovian models "...are often thought of as being unsatisfactory, on the grounds that they do not treat changes in firms' shares as an outcome of strategic interactions (maximizing behavior) in marketing, R&D, etc., but rather as the outcome of 'stochastic shocks'." Nevertheless, in this paper we provide a framework, where the dynamics are driven only by strategic interaction between the firms, namely via the use of mixed pricing strategies in the Markov perfect equilibria. The endogenous price dispersion then determines the probability of each firm to gain or lose markets shares, depending on the current state represented by the customer base. Similarly as in Varian (1980), firms adopt randomized pricing strategies in order to be unpredictable to the competitor. As Varian (1980) argues, randomized pricing can be interpreted as limited-time sales that do not exhibit any systematic patterns. Such behavior can be observed for grocery stores or supermarkets, that frequently offer a few selected products at discounted prices. Empirical evidence for price dispersion is provided, for instance, by Lach (2002), who uses a dataset involving homogeneous products sold by different sellers. Lach (2002, p. 444) also argues that the identified price dispersion is consistent with randomized prices (or sales) as studied by Varian (1980).

In this paper, we extend the idea of sales to dynamic pricing games, and demonstrate how mixed-strategy equilibria can generate plausible dynamics. We also relate the dynamic properties to the primitives of the model, namely the information exchange technology and the discount factor. In particular, we identify a tendency towards skewed market share splits when future profits are important. This tendency becomes more pronounced when many consumers rely on word-of-mouth communication. As a distinctive consequence of word-of-mouth communication, a firm with a smaller customer base can attract less additional demand when charging a lower price in the market, because there are fewer consumers who can share this information. As a result, market shares are more sticky near the extremes of the market share space than in the center, where information spreads more efficiently. A firm that has reached a dominant position in the market can then easily *defend* this position against the smaller competitor whenever it is at stake (*pro-competitive effect*). This is indeed the case when future profits are sufficiently important and market shares are skewed but not extreme. The firm with a larger customer base then starts to price aggressively and tends to gain market shares. On the other hand, when market shares are close to one of the extremes, the opposite (*anti-competitive*) effect dominates: the firm with the larger customer base now prefers to exploit the locked-in consumers in its customer base by charging higher prices. The combination of these two effects often induces a zig-zag pattern near one of the extremes of the market share space, with one firm dominating the market for many consecutive periods. This persistence of dominance, however, can be interrupted by sudden changes in the leadership position. In contrast, when few consumers rely on word-of-mouth and most consumers are fully informed, market shares are very volatile and the role of the leader changes frequently. In this case, the size of the discount factor has little impact upon the dynamics.

From the technical point of view, we offer a new treatment of Markov perfect equilibria in mixed strategies. Via a discretization of the state space, we are able to approximate the evolution of market shares, allowing us to derive analytical results. For a certain range of parameter values where word-of-mouth communication plays a major role in consumers' information acquisition, we show that a particularly simple market share grid represents market share dynamics sufficiently well.

1.1. Related literature

The model introduced in this paper builds on a strand of literature that was initiated by Salop and Stiglitz (1977) and Varian's (1980) 'Model of Sales'. Similarly as in Varian (1980), we also assume that some consumers learn only one supplier's price, while others are fully informed and purchase from the supplier that currently offers the lower price. Whereas Varian's model is static, in our model an intertemporal link (inertia) in demand arises because consumers always learn their previous supplier's current price (e.g., because they remember this supplier's location), but do not always discover the other firm's offer. Varian (1980), in contrast, considers only markets that are *ex-ante* symmetric. From the technical point of view, our paper is related to later contributions, for example, Baye et al. (1992 and 1996), Baye and Morgan (2004), and others that offer a more rigorous treatment of mixed-strategy equilibria and give additional explanations for their occurrence. Our main

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