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On two-part tariff competition in a homogeneous product duopoly☆

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ABSTRACT

We explore aspects of two-part tariff competition between duopolists providing a homogeneous service when consumers differ with respect to their usage levels. Competition in only one price component (the fee or the rate) may allow both firms to enjoy positive profits if the other price component has been set at levels different enough between firms. Fixing one price component alters the nature of competition, indirectly introducing an element of product differentiation. Endogenous market segmentation emerges, with the heavier users choosing the lower rate firm and the lighter users choosing the lower fee firm. When no price component can be negative, competition becomes softer, profits tend to be higher but there is also a disadvantage for the firm that starts with a higher fee than that of its rival.

1. Introduction

A central feature of many markets is that consumers differ significantly with respect to their usage levels for a good or a service. The set of relevant examples is wide. When studying credit cards, telephone services, car rentals, club memberships, equipment leasing, amusement parks, tv subscriptions and in many other cases, some of the customers are heavier users while others are lighter users. Pricing in such cases is both of theoretical and of practical interest when oligopolists can price nonlinearly.

In this paper we set up a simple homogeneous product duopoly model that allows us to explore some aspects of the nature of competition when pricing takes the form of a two-part tariff. Indeed, in many markets, pricing involves the use of a fee and of a per unit rate. Further, in such markets we often observe segmentation, with some firms attracting the heavier users (by charging a low per unit rate) and other firms attracting the lighter users (by charging a low fee).[1] While the relevant literature is growing, important aspects of the problem are not fully understood. Here we explore the nature of two-part tariff competition under alternative assumptions about which price components can be chosen by the firms and we show how these may affect the firms' profits.

We study a simple duopoly model where all consumers view the products sold by the two firms as perfectly homogeneous. Importantly, consumers differ with respect to their usage levels. Naturally, if there are no restrictions on how pricing takes place, equilibrium can only be at zero profit.[2] We explore when, how and why certain restrictions may lead to positive equilibrium profits. The first restriction is when one of

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[1] When the British household retail electricity market was liberalized in 1998, each supplier offered a single menu of two-part tariffs. These menus were different across firms, with entrants having a higher fee and a lower rate compared to the incumbent. Without cost asymmetries or variation in brand royalty, the firms segmented the market by targeting consumers of different usage rates (see Davies et al., 2014). There are many other related examples. Some restaurants offer an "all you can eat buffet", while other price à la cart. Some hotels operate as "all inclusive" and other charge extra for every item of service required. Traditional airlines tend to include everything in the ticket price and others, positioning themselves as "low cost", charge extra for each additional service item requested. Some insurance programs have a low premium but charge extra when some hospital service is used, while others allow for essentially unlimited use.

[2] We abstract away from product differentiation, uncertainty, repeated interactions, capacity constraints, dynamic competition with switching costs and other considerations that may also imply the presence of some profits even when the products are homogeneous.

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the components of a two-part tariff can be taken as fixed and competition only takes place via the other component. This may lead to positive equilibrium profit, but only if there is enough differentiation between firms with respect to the component that is taken as given. Moreover, the nature of competition differs significantly when it is in fees or in rates. A second restriction that we study is how the problem is shaped when no price component can be set below zero. We find that, in this case, equilibrium behavior is significantly modified, implying a different level of industry profit and allocation between firms. Restricting attention to non-negative prices also allows us to endogenize the sequential choice of price components, with either the fees or the rates chosen first. In addition, this analysis allows us to directly compare our results to models of vertical product differentiation and to highlight not only similarities but also important differences.

We should note upfront that much of our analysis examines the consequences of restrictions on setting some price component. There may be a variety of reasons that make the restrictions that we study relevant. In particular, studying a problem where one of the components of a two-part tariff has to be viewed as given makes sense in different settings. First, it may be that in certain markets the rates (or the fees) represent longer term choices which are, therefore, made at different levels of a business hierarchy, while competition in the other component takes place as a different and essentially independent element of a firm's strategy, or such choices are sometimes discussed centrally in business associations or are even suggested or imposed by some large customers. Second, a price component may be considered fixed if it is part of an existing contract and cannot be easily changed even though the contract allows some flexibility regarding other parts of pricing.[3] Third, there may be regulatory restrictions that, for political or other noneconomic reasons, limit the choices with respect to one price component. In any such setting, it becomes important to understand the nature of competition in one of the components of a two-part tariff. Likewise, non-negativity restrictions on price components may also emerge for a variety of strategy or institutional reasons like the ones just mentioned and also when arbitrage possibilities emerge.

More specifically, in our analysis we characterize how, when the per-unit rates for the firms are set at levels that are not too close to each other, competition via fees leads to an equilibrium where both firms make positive profits. Also, within this range, both firms' profits increase as the difference between the rates increases. Essentially, even though the products are homogeneous, fixing one of the price components, along with differentiation in the usage levels across the consumers, implicitly introduces some differentiation in the market since consumers are no longer indifferent between the two products. This effect, in turn, may allow firms to segment the market and enjoy positive profits. We emphasize that for this result it is required not only that the rates are different, but also that their difference exceeds a certain threshold. When the rates are different enough, the high rate firm would have to lower its fee very significantly to capture the entire market. Instead (and as long as the rival fee is not too high), this firm finds it more profitable to lower its own fee by relatively less and to sell only to the low usage consumers, since this is the part of the demand that cares relatively less about the rates. A similar result is obtained when the fees are taken as given and firms compete via per-unit rates. Still, there are also significant differences between the two cases. These are due to the fact that not all consumers care equally about a difference in rates; in fact consumers with low usage levels make their product selection essentially only on the basis of the fee. This means that, when competing in rates, in equilibrium, the firm with the low fee can always guarantee for itself at least part of the demand. In general, when firms compete in rates competition is more intense than when firms compete in fees.

We also examine the case with only non-negative prices. When it is not possible for firms to set either price component below zero, competition becomes softer in general, but again, the result is different depending on how competition takes place. When the rates are given, the firm with the low rate captures a larger market share and makes a higher profit than that of its rival. When the fees are given, the firm with the low fee captures the entire market and makes a positive profit. When the rates are chosen first, there is no equilibrium in pure strategies (because one firm prefers maximum differentiation but the other minimum), while when the fees are chosen first we have an equilibrium at zero profit (since both firms have a strong undercutting incentive).

In our analysis, when one of the price components can be considered fixed, an element of vertical differentiation is indirectly introduced in a market where, otherwise, the consumers view the products as homogeneous. A comparison to models where the products differ with respect to their qualities is therefore in order. In particular, we show that there are important similarities, but also key differences, between our model and the classic analysis of Shaked and Sutton (1982), where vertical product differentiation enters directly. Like in their work, in our analysis when firms consider their rates (or fees) as given at different levels, all consumers would view one of the products as more attractive, but the intensity of this preference will be different (since the usage levels are different). Also, under certain conditions, we show that both firms' profits increase when the difference in rates increases, as would also be the case in Shaked and Sutton (1982) where profits increase as the quality difference increases. However, heterogeneity enters the two problems differently. A difference in qualities only affects the profit functions in Shaked and Sutton (1982) indirectly, through the demand and the consumers' choices. In our model a difference in rates also affects the profit functions directly, since the firms receive the relevant payment. As a result, in contrast to Shaked and Sutton (1982), we find that we do not have a pure strategy equilibrium unless the difference in rates is large enough. The two models become directly comparable when we restrict prices to be non-negative and we endogenize all choices. We then do not find a maximum differentiation result, contrary to what Shaked and Sutton (1982) find in qualities, again highlighting the differences between the models.

An implication of our analysis is that, in a setting where one of the two pricing components can be fixed and firms subsequently compete via the other component, they can obtain positive profits. Price competition in only one dimension may not be enough to guarantee the perfectly competitive (Bertrand) outcome. As mentioned above, this case may be relevant when one of the price components has been set for the competing firms by a regulator, by some industry committee or association, or via some other institutional procedure. Setting fees or rates at different levels across firms serves to indirectly introduce heterogeneity to an otherwise homogeneous product market. Regulators should therefore be aware that fixing one price component, or allowing that it is fixed, may in turn allow firms to make positive profits even though they compete in another component and the products are not otherwise differentiated. Likewise, a competition authority should not view competition (no matter how intense) in one price component as sufficient, if the firms have been able to coordinate and set another price component at some level for each firm.

There is growing literature on two-part tariffs following the classic work of Oi (1971) (see Armstrong, 2006; Stole, 2007; Vettas, 2011 for reviews and references). Much of this literature has focused on the monopoly case.[4] Despite its importance, the study of oligopoly

[3] For example, there is often a fee between gas stations and their suppliers, which is set over a relatively long period (of one year or even for a longer period, possibly signifying an exclusive contract). Then a rate per unit of product ordered is also charged and may vary daily. Similar relations exist in a number of franchise settings. In credit card markets there may be restrictions (designed to protect the users who already carry some debt) on how fast interest rates can be increased. Therefore, these may be considered to some extent fixed over a certain time period, or at least not fully flexible. Alternatively, some card issuers make to their clients annual fee offers with a guarantee that the fee will never be increased. Thus, in subsequent periods, such banks may be viewed as competing only in interest rates.

[4] In addition, two-part tariffs can be used for commitment reasons in vertical relations, see e.g., Rey and Tirole (1986) for a classic analysis. Saggi and Vettas (2002) study how the use of two-part tariffs is related with the number of downstream firms.