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A note on the Hotelling principle of minimum differentiation: Imitation and crowd

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Abstract

This paper investigates price competition in the Hotelling location model with linear transportation costs when consumer preferences are affected by the number of consumers shopping at the same store. A consumption externality permits us to consider the imitation and the congestion effects which are opposite forces at work. The coexistence of the two effects confers new validity to the principle of minimum differentiation as it was in the original Hotelling model. I show that firms do not need to set apart in order to earn higher profits. The results show firms endogenously choosing to locate in the center of the interval sharing the market with positive prices.

Keywords: Product differentiation; Hotelling; Externality; Imitation; Crowd

0. Introduction

The traditional consumer theory is based on the idea that the satisfaction from consuming a good derives only from its intrinsic utility. In many circumstances, however, the pleasure of consuming a good may also be affected either by the consumption choice of other consumers, or by the social status attainable through that choice. Social interactions among consumers may generate consumption externalities.

Since the seminal contribution of Veblen (1899), many authors have discussed the many dimensions along which externalities are important in social decisions. Focusing on consumption, Leibenstein (1950) suggested that the choices of other agents may generate either negative or positive externalities on individual utility. Moreover, these spillover effects may induce different patterns of consumers' behavior: with the term *bandwagon effect*, Leibenstein described the effect by which the demand for a good increases because others are buying it; with the term *snob effect*, he denoted situations in which the demand for a good decreases because others are purchasing the same good. In the same stream, Becker (1991) discusses a provocative example on the economic power of the original Veblen idea: in the presence of (positive) consumption externalities, it is possible that the popular restaurants face an upward sloping demand function. In this sense, the same existence of consumption externalities could be a main factor in explaining the attractiveness of firms (Karni and Levin, 1994). More recently, Akerlof (1997) operates a broad distinction between

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the so-called *status-seeking models* – which formalize the attempt of agents to differentiate their behavior – and the *conformist models* — which describe situations in which agents are willing to follow common patterns. Clearly, these notions are reminiscent of those of strategic substitutability and strategic complementarity, as discussed by Cooper and John (1988). The above contributions are examples of a rich literature which focused on the consumers' behavior under consumption externalities. But the existence of the latter, and its implications in terms of optimal consumers' choices, have also a bearing on firms' behavior in a strategic framework. The aim of this paper is to contribute to this line of research, namely in studying the firms' strategic choices when consumer preferences embody both imitation (or conformity) and congestion (or vanity) effects.

The starting point of our analysis is the set of results achieved in two papers, both devoted to the analysis of market implications of consumption externalities in a context of spatial competition. Navon et al. (1995) study a standard duopoly location model with linear transportation costs, in order to investigate price competition and the divergence from optimal product differentiation when consumer preferences are influenced by the number of consumers shopping at the same store. In the same line, Grilo et al. (2001) introduce a consumption externality in a spatial competition model with quadratic transportation costs. While in the former paper the externality considered in the (indirect) utility function can be alternatively positive or negative (individual utility depending linearly on the number of consumer patronizing a firm), in the latter both positive and negative spillover effects are allowed for, through a quadratic formulation of the externality function. The two papers suggest the same taxonomy of optimal consumers' behavior. If a negative externality prevails, consumers' preferences induce a vanity effect. When a positive externality prevails, but the externality is not too large, consumers' preferences induce what is called 'weak conformity effect'. Finally, when the prevailing externality is positive and large enough, the effect is that of 'strong conformity'. Which of the three different configurations arises depends on the comparison between two elements: the measure of the incentive to price competition in the absence of the externality on the one side, and the value of the externality function evaluated at the total population size on the other side. Specifically, Navon et al. (1995) compare the transportation cost per unit distance (transportation cost effect) with the externality value evaluated at the size of the total population; Grilo et al. compare the distance between the locations of the stores (product differentiation effect) with the externality evaluated at the total number of consumers in the market. Indeed, it is not surprising that the market equilibrium configuration depends on the balancing of these factors. The size of the unit transportation cost and the distance between firms are obviously the key factors determining the strength of price competition in location models; but also externalities may play the same role. A negative externality clearly relaxes price competition because of possible congestion effects; conversely, a positive externality makes competition fiercer. The different hypotheses of the two papers about the transportation costs and the shape of the externality function show up when the location stage of the game is dealt with. The Navon et al. paper faces the same difficulty as the standard Hotelling model with linear transportation costs. However, a key result is that for any initial couple of locations, if strong conformity (bandwagon) prevails, both firms perceive an incentive to move inward, but only one firm supplies a positive quantity at a positive price. In contrast, Grilo et al. confirm the general principle of maximum differentiation which holds in the Hotelling model with quadratic costs (d'Aspremont et al., 1979): if a location equilibrium in pure strategies exists, it must be such that firms are sufficiently far apart. This applies trivially to the negative externality case; but even in the case of a positive externality, firms perceive an incentive to differentiate their products. Therefore, in the absence of binding constraints on the choice of locations, this optimal location's choice induces weak conformity in equilibrium, with both firms serving the market.

In this paper the linear transportation cost hypothesis is adopted, but it is combined with a quadratic formulation of the externality function. The choice of exploring the behavior of the market within this set-up turns out to be particularly useful in a double perspective. First, though both negative and positive externalities are jointly allowed for, the *régime* prevailing at equilibrium can be identified through a simple (a priori) comparison between the transportation cost size and the sign of the externality evaluated at the total population size. Second, and more important, it turns out that in this framework the location stage of the Hotelling game can be meaningfully solved even in the presence of linear transportation costs. The principle of minimum differentiation is confirmed, in a situation in which agglomeration coexists with firms earning positive profits. In particular, we show that firms endogenously choose to locate in the center of the interval, sharing the market with positive prices. If both imitation and congestion effects influence consumers' behavior, market power can be consistent with full market coverage, price competition and homogeneous products. The intuition behind this result is that at equilibrium, the consumers of both firms enjoy a *positive* but *decreasing* externality. At the margin congestion is perceived, and this allows firms to push up their prices.