Information and quality with an increasing number of brands ☆

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ABSTRACT

We analyze the potential trade-off between product variety and consumer information and the implications this trade-off has for product quality. We introduce a simple information accumulation process in a horizontal differentiation model with unobservable quality. As the number of brands increases, per-brand consumer information decreases, which leads to lower average quality. Eventually, the reduction in quality can outweigh the marginal welfare benefits of greater product variety. Thus, the continuous increase in the number of brands requires a parallel improvement in consumer information mechanisms. It remains to be answered how efficiently new information mechanisms respond to this requirement in each market.

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1. Introduction

Globalization and Internet retailing, among other developments, have produced a vast increase in the number of brands and models available to consumers. For instance, Broda and Weinstein (2006) estimate that imported product varieties in the US tripled between 1972 and 2001. According to a 2003 report from the consulting firm McKinsey, the number of brands on US grocery store shelves also tripled in the 1990s, from 15,000 to 45,000. In most markets, we find a soaring number of varieties and suppliers for most goods and services, from electronics and cookware to financial services and health insurance plans.

While the rise in the number of products is good news for consumers in terms of lower prices and greater variety, it also increases the information challenges they face. This, in turn, can lead to a reduction in average quality. For example, it is unclear how face-to-face word of mouth, a crucial information mechanism in small markets, responds to an increase in the number of suppliers. Producers of low-quality experience goods who have difficulty surviving in smaller markets

with fewer suppliers (where news of bad experiences spreads rapidly to other buyers) may have better chances in larger, more anonymous markets.[1] New communication technologies have certainly broadened consumers' information opportunities. However, as we argue below, they also have important shortcomings, and there is no guarantee that the market will efficiently develop new information tools in all the areas where more consumer information may be needed. Large global markets provide countless new consumption options, but all too often consumers end up buying, for example, Bluetooth speakers that do not connect well to the computer, non-stick pans whose coating falls off after a few uses, or health care plans that turn claims for reimbursements into endless hassles.

The question of how an increase in the number of suppliers affects consumer learning about brand quality or reputation has been largely overlooked in the literature. This paper is a first step in exploring this question. It analyzes the potential trade-off between product variety and consumer information in markets of experience goods and the resulting trade-off between product variety and average quality.

[1] In fact, reconsidering the classical example in Akerlof (1970), it is difficult to imagine how there could be a significant *lemon* asymmetric information problem in the case of, for example, a small, isolated village in which there were only two cars. Every inhabitant of the village would likely know about the potential problems of each car in the case of them being resold second-hand. The fact that markets for second-hand cars are large and have many potential suppliers is important to explain the deficiencies in consumers' information. McDevitt (2011) provides evidence showing that reputations are more valuable in small markets than they are in large markets.

The paper's main message is intuitive: in some markets, the increase in the number of brands and suppliers can have a negative effect on per-product consumer information and, therefore, on average product quality and welfare. Making this point requires a model with vertical as well as horizontal differentiation and incomplete information in which consumers accumulate information over time. Such an environment tends to lead to difficult-to-select multiple and cumbersome equilibria. To keep the algebra and the mathematical complexity to a minimum and to concentrate on the economic message, we build a very stylized model. Thus, rather than being taken literally, the model should be interpreted as the simplest one we are able to build in which the mechanism is at work. It is our belief that the mechanism should be robust to more realistic environments.

We extend Salop's (1979) model of horizontal differentiation in which each firm produces a different variety to introduce unobservable quality, two periods, and a simple consumer information accumulation process on firm types (the type of firm determines the probability that any of the units of the variety it produces turns out to be a *lemon*). We simplify in every other respect, e.g., marginal costs are zero, the number of consumers and firms is large, and consumers do not know their tastes regarding the horizontal characteristics of the products until after the first round of consumption.[2] In this model, we show that as the number of firms increases, the information accumulation process becomes less effective. Reputations among firms spread based on less information. As a result, a larger fraction of low-quality producers are able to stay in the market for a longer period (a second period in our model), thereby lowering the average product quality. We also find that if the value of quality is sufficiently high with respect to the value of variety, then, as the number of firms increases, the (marginal) negative effect of diminishing expected quality can outweigh the (marginal) benefit of greater diversity. Thus, social welfare may not increase monotonically with the number of firms. Although the potential non-monotonicity between welfare and the number of firms is not new, the mechanism, i.e., decreasing consumer information and average quality, is.

In the second part of the paper, we endogenize the initial number of firms and explore the consequences of lower entry cost and larger *global* markets. This latter issue is analyzed in a simple extension of the model that considers a world market comprising many identical cities or countries that are served by the same set of firms. Each agent's past consumption experience is transmitted to all the other consumers within the same city but is not necessarily transmitted to the consumers in other cities. This assumption is meant to capture the fact that consumer information disseminates more efficiently within each local market than across geographically and culturally separated markets. Market expansions are modeled as increases in the number of cities that become integrated in the global market, with the number of consumers in each city remaining constant. In this setting, we show that the effect of a market expansion on average quality can be positive or negative depending on how efficiently the information on consumer experiences is transmitted across cities.

It should be clear that the findings in this paper do not suggest that, as a result of the increase in the number of suppliers, average quality and social welfare tend now to be lower than they were previously. The model proposed in this paper abstracts from the continuous process of technological progress that in recent decades has brought a significant increase in the average quality of most products. Our point is that the large increase in the number of suppliers is likely to exacerbate information problems related to product quality, which in turn may slow down the market selection of the best brands. This negative effect

may offset to some extent, but not eliminate, the positive effects of technological progress. The bottom line of this paper is that the expansion of markets and the ensuing increase in the number of suppliers require a parallel development of consumer information mechanisms.

Certainly, markets respond with new mechanisms to the increasing need for information on product quality. However, consumer information has public good characteristics. It cannot be taken for granted that information mechanisms are always efficiently developed. In recent years, new information sources such as consumer reviews on the Internet have grown at an extraordinary pace. Nonetheless, these sources have their own problems and are an imperfect substitute for face-to-face word of mouth. Product quality reviews on the Internet can be manipulated by sellers,[3] are difficult to assess (reviewers have to be reviewed themselves), do not have zero cost (e.g., reading reviews is time-consuming) and have been found to be systematically biased in directions and to degrees that are difficult to ascertain even using sophisticated statistical tools.[4] Consequently, direct contact with friends, family and co-workers still appears to be the primary source of reliable information on quality for many products.[5] Regardless, this paper is only a first step in investigating the wider information challenges posed to consumers by the expansion of the number of brands and the globalization of markets. The goal is to present the basic problem in a simple setting. Studying how efficiently new information mechanisms respond to these challenges in each particular market will require specific work in future analyses.

Our work is related to the literature on experience goods (Nelson, 1970) and reputation (see Bar-Isaac and Tadelis (2008), for a survey). A long string of papers analyze the effects of entry and different degrees of competition on providing incentives for producing quality and building a reputation.[6] In contrast to these papers, we ignore the moral hazard problem[7] and focus on how the number of firms in the market affects consumer information, thereby affecting the probability that low-quality producers prosper in the market. To our knowledge, this paper is the first to analyze a potential trade-off between product diversity and average quality arising from effects on consumer information.

The paper is also related to the industrial organization literature on word of mouth, information diffusion and the interaction between consumer information externalities and firm quality decisions (see Kennedy, 1994; Caminal and Vives, 1996, 1999; Vettas, 1997; Bar-Isaac et al., 2010, 2012; Navarro, 2012; Fishman and Levy, 2014). Notwithstanding, this literature assumes a constant number of firms (in most cases, either a monopoly or a duopoly). Therefore, it does not explore how the precision of consumer information depends on the

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[2] We are not particularly interested in exploring the implications of the fact that consumers may need to learn and develop their own (horizontal) tastes. However, the assumption that consumers only learn them after the first round of consumption simplifies the equilibrium of the model.

[3] For example, New York State Attorney General Andrew M. Cuomo announced on July 14, 2009, a $300,000 penalty and cost settlement with the cosmetic surgery outfit Lifestyle Lift over the publishing of fake consumer reviews on the Internet. Other strategies include offering a refund to customers in exchange for a review (see the New York Times front page on January 26, 2012). See Hu et al. (2012) and Mayzlin et al. (2014) for systematic empirical investigations of review manipulation on the Internet.

[4] For example, Hu et al. (2006) find that Internet reviews have bimodal distributions. Apparently, reviews are biased because people are much more prone to write a review when they are very satisfied or very unsatisfied with the product. See also Armstrong (2008) for a discussion of the so-called *market for market information*.

[5] According to Keller and Fay (2012, p.14), 90% of word-of-mouth communication still occurs face to face, while only 8% occurs online. Moreover, research from Nielsen (2009), a well-known consulting firm that studies consumers' media and marketplace behavior, reveals that 90% of consumers consider recommendations from people they know to be trustworthy, much more so than information from any other source. In the health care field, for instance, personal recommendations and familiarity outweigh more formal indications of quality, such as information from Internet sites that post quality information (Kaiser Family Foundation et al., 2004). See also Dellarocas (2003) for a survey of the role new information technologies play in word-of-mouth communication.

[6] See Gal-Or (1983), Hörner (2002), Kranton (2003), Bar-Isaac (2005), Rob and Fishman (2005), Rob and Sekiguchi (2006), and Dana and Fong (2011), among others.

[7] We assume that each firm's type is the result of a random draw that follows the payment of a fixed entry cost (see Section 3, where we endogenize entry).