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journal homepage: [www.elsevier.com/locate/jfec](http://www.elsevier.com/locate/jfec)Strategic price complexity in retail financial markets<sup>☆</sup>

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## ABSTRACT

There is mounting empirical evidence to suggest that the law of one price is violated in retail financial markets: there is significant price dispersion even when products are homogeneous. Also, despite the large number of firms in the market, prices remain above marginal cost and may even rise as more firms enter. In a non-cooperative oligopoly pricing model, I show that these anomalies arise when firms add complexity to their price structures. Complexity increases the market power of the firms because it prevents some consumers from becoming knowledgeable about prices in the market. In the model, as competition increases, firms tend to add more complexity to their prices as a best response, rather than make their disclosures more transparent. Because this may substantially decrease consumer surplus in these markets, such practices have important welfare implications.

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## 1. Introduction

Price formation in retail financial markets deviates from the predictions of standard price theory in several important ways. The law of one price is violated: significant price dispersion is present when goods and services are homogeneous. Despite the large number of firms in each market, prices do not converge to marginal cost. Even when new firms enter the industry, prices often do not decrease and may in fact rise. These pricing

irregularities have been documented empirically in the markets for S&P Index funds (Hortacsu and Syverson, 2004), money market funds (Christoffersen and Musto, 2002), mutual funds (Bergstresser, Chalmers, and Tufano, 2007), retail municipal bonds (Green, Hollifield, and Schürhoff, 2007; Green, 2007), credit cards (Ausubel, 1991), conventional fixed-rate mortgages (Baye and Morgan, 2001), life annuities (Mitchell, Poterba, Warszawsky, and Brown, 1999), and term life insurance (Brown and Goolsbee, 2002).

What is responsible for this seeming departure from classic microeconomics? The answer that I explore builds on the fifty year-old observation by Scitovsky (1950) that ignorance is a source of oligopoly power. Producers of retail financial products create ignorance by making their prices more complex, thereby gaining market power and the ability to increase industry profits. Clearly, many of the households who purchase retail financial products do not understand what they are buying and how much they are paying for these goods (e.g. Capon, Fitzsimons, and Prince, 1996; Alexander, Jones, and Nigro, 1998; Barber, Odean, and Zheng, 2005; Agnew and Szykman, 2005) and access to financial advice does not appear to rectify this problem (Bergstresser, Chalmers, and Tufano, 2007). Importantly,

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however, there appears to be a significant gap between investor knowledge about the financial instruments themselves and their understanding of industry fees. For example, in the *NASD Investor Literacy Survey (2003)*, 84% of market participants understood the relative riskiness of various bonds, but only 21% knew what a “no-load mutual fund” is. In fact, approximately one-third of the participants surveyed believed that the term no-load implies that there are no fees charged whatsoever.

In this paper, I consider the following important questions: How does complexity affect price formation in the market? How do firms optimally add complexity to their price structures to maximize profits? How do these optimal pricing policies change as industry competition increases? What is the potential effect of these policies on consumer knowledge and prices in the market?

Financial institutions may add complexity to their prices in several ways. First, they can make it more difficult for households to become informed by partitioning prices into direct fees and indirect involuntary surcharges. This practice makes understanding prices more challenging as it places the responsibility on the consumer to appreciate all of the key price components and compute the actual price of the product. Second, complexity may be added when firms devise new technical language for their price disclosures. If firms in the industry use different methods of disclosure, this makes it more difficult for consumers to compare prices.

Complexity may also involve leaving out important information in a disclosure. This aspect makes it tougher for low-price firms to credibly signal their advantage because advertising is a mechanism for signal jamming. For example, suppose a low-price mutual fund makes a statement that they have low management fees and no loads. A higher-priced fund can advertise that they have no management fees and no loads, even though they charge high 12b-1 fees and other indirect costs. Used in this way, complexity makes it harder for consumers to identify the best deals in the market.

In the paper, I analyze a two-stage pricing complexity game in which homogeneous firms produce an identical financial product and compete on price for market share. In the first period, firms simultaneously choose their prices (mutual fund fees, interest rates, etc.) and the complexity of their price structures. The complexity that one particular firm adds may increase the difficulty in evaluating their own price disclosure and comparing prices in the market, but does not affect the ability for consumers to evaluate the disclosures of competing firms. Based on the complexity choices of the firms, a fraction of consumers become informed about prices (*experts*), whereas the remainder remain *uninformed*. In the second period, the experts purchase the good from the low-priced firm, whereas uninformed consumers choose randomly from all of the firms.

In equilibrium, price dispersion arises because the firms compete strategically for market share from both types of consumers. This feature is also present in other models of search (e.g. *Varian, 1980; Stahl, 1989*), but arises here based on each firm’s complexity decision (to be discussed shortly). The firm with the lowest price captures

the entire share of expert consumers. All of the firms, however, receive some demand from the uninformed. The firms never charge marginal cost because they gain positive expected profits from sales to uninformed consumers. Also, it is impossible to have a one-price equilibrium in which all firms charge the same prices for their products. If they did so, one firm could undercut their competitors by a small amount and gain the entire market share from the expert consumers. So, equilibrium prices are strictly higher than marginal cost and there is always a non-degenerate distribution of prices (price dispersion).

Price complexity in the industry is determined through strategic interaction between the firms. In equilibrium, all firms enjoy a positive rent from having some degree of price complexity in the industry and preventing some consumers from becoming informed. However, low-price firms desire less complexity than high-price firms. Since the low-price firms want consumers to know that they have the cheapest prices, they want pricing in the industry to be reasonably clear. Adding clarity allows them to undercut their rivals and gain market share. They do not want pricing in the industry to be too clear, however, as total clarity would erode industry rents altogether. In contrast, high-price firms desire more complexity. As pricing in the industry becomes more difficult to appreciate, the fraction of uninformed consumers rises, thereby increasing the market share that high-price firms receive. Decreasing industry price transparency is the way high-price firms gain market share.

After deriving the equilibrium of the game, I consider how increased competition affects the way in which complexity evolves in the market. I find that increased competition makes it more likely that firms make their price disclosures opaque. The intuition is as follows. When more firms compete for market share, the probability that they receive demand from the expert consumers decreases. As a best-response (i.e., to maximize expected profits), firms tend to increase complexity in order to maximize the revenues that they receive when they do not have the lowest price (when they lose the share of experts). Therefore, as competition rises, attempting to increase the fraction of uninformed consumers improves their expected profitability. The fact that more firms tend to add complexity when industry concentration decreases may induce a drop in the fraction of informed consumers, which in turn may increase producer surplus in the market. That is, unless there are other mechanisms present that make it easier for consumers to become knowledgeable as the industry grows (e.g., consumer organizations or government-sponsored education), then industry rents may rise as the market becomes more competitive. In this light, it is not surprising that *Hortacsu and Syverson (2004)* show that entry into the S&P index fund industry in 1995–1999 was associated with a rightward shift in the distribution of prices.

The analysis in this paper yields several novel empirical implications. For example, since the model implies that complexity is an important source of value for firms, changes in complexity should be positively correlated with firm profitability, *ceteris paribus*. Also, the

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