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Market structure and market performance in E-commerce

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ABSTRACT

We analyze the interaction between market structure and market performance and how it varies over the product cycle. To account for the potential endogeneity in this relation, we use an instrumental variable approach. We combine data from the largest Austrian online market for price comparisons with retail data on wholesale prices provided by a major hardware producer for consumer electronics. Our results show that instrumenting is important for estimating the empirical effect of competition on the markup of the price leader. One more firm in the market is associated with a reduction of the price leader's markup which is equivalent to competition between existing firms for an additional 3 weeks in the product life cycle. Our results support search theoretic models and contradict models of monopolistic competition. Moreover our results support the existence of price dynamics over the product cycle. They also highlight the substitutability between newly innovated and old expiring technologies and how it varies with respect to competitors' and own brand innovations.

1. Introduction

Under reasonably general conditions, the consequences of an increase in the number of market participants are lower prices and lower markups. The empirical assessment of this relation is, however, not an easy task. Markups are not readily available, and prices and market structure are endogenous: firms may enter in response to perceived profit opportunities or may exit in response to realized losses.[1,2]

In this paper, we use a novel instrumental variables strategy to investigate the interaction between market structure and market performance in e-commerce. We use data for digital cameras from an Austrian online price-comparison site (price

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[1] One way to account for endogeneity is developing a structural model of market structure, entry, and exit. The pioneering study on entry into local markets by Bresnahan and Reiss (1991) shows that the first two or three entrants have the largest impact on market price, and that later entrants do not significantly reduce market price any further.

[2] Experimental evidence of this relation goes back to Selten (1973), who coined the statement "four are few and six are many."

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search engine). We observe the firms' retail and input prices as well as all their moves in the entry and the pricing game. When we measure the rate at which markups decline towards zero, we account for the endogenous timing decision to list a specific product by using previous listing decisions as instruments. In addition, we include product fixed effects to capture unobserved quality and design features of the specific cameras as these might be correlated with both markups and firms' entry. To obtain a full picture of the underlying model of competition, we then follow Baye et al. (2004) and Haynes and Thompson (2008a) and analyze measures of price dispersion as well.[3]

We further analyze the relation of the number of firms and markups across the product life cycle. Products in e-commerce are very often only listed for a short time, which allows us to observe products from birth to death.[4] This is important for three reasons: (i) Entry in such a market is particularly easy because an existing firm only has to decide whether to list a new camera or not. This low entry cost makes the number of firms volatile and provides an optimal testing field.[5](ii) Several researchers have claimed that competition or the absence thereof is particularly important at the beginning of a product life cycle, while later on, competition may matter less.[6] In particular, when a new product emerges on the market and consumers are uncertain about their tastes, they may postpone their purchasing decision. Firms react to this uncertainty of demand and various price dynamics might be the consequence.[7] (iii) Finally, we investigate the effect of substitutes on the markup over the product life cycle and are interested in differences between newly innovated and old expiring technologies as well as between own brand and rivals' brand products.[8]

We are not the first to investigate the relation of market structure and market performance in e-commerce. Previous studies such as Brynjolfsson and Smith (2000), Baye et al. (2009, 2003) and Haynes and Thompson (2008a), however, do not take the endogeneity of the number of sellers and product life cycle effects into account.[9] Baye et al. (2003, 2004) look at price dispersion using various metrics. Baye et al. (2004), for example, analyze price dispersion measured by the relative price gap (the difference in the first and second price) and show that it decreases as a function of the number of firms, but not over time. Haynes and Thompson (2008a) use data on 400 digital cameras in the US and show that with more firms in the market prices go down and dispersion increases. Ellison and Ellison (2005, 2009) examine the competition of internet retailers and identify different strategies that are applied in online markets to cope with the increased price sensitivity.

The empirical literature investigating the market structure along the life cycle of a consumer product is rather small. Haynes and Thompson (2008b) take a first step to explain entry and exit behavior in a shopbot. To do so, they estimate an error-correction model and show that entry into and exit from a market are correlated with a measure of lagged price-cost margins and the number of competitors. Barron et al. (2004) mention the life cycle, but use it only as a control variable. In the marketing literature, Moe and Yang (2009) analyze the product life cycle in e-tailing. However, their data did not allow them to consider the endogeneity of entry and exit. Hitsch (2006) considers the dynamic decision problem of a single firm that is uncertain about the demand for a new product and shows that in the ready-to-eat cereal industry the value of reducing uncertainty is large. This indicates that there are product cycle effects which should be accounted for.

For e-commerce in Austria, we find a highly significant results of the number of firms on markups. 10 additional competitors in the market are associated with a reduction of the median markups by 0.23 percentage points and the minimum markup by 0.55 percentage points. However, accounting for the potential endogeneity of markups and the number of firms in the market, we see a substantially higher negative outcome: 10 additional retailers tend to reduce the markup of the median firm by 0.95 percentage points and the markup of the cheapest firm by 1.24 percentage points. We also find that having one more firm in the market apparently reduces the markup of the price leader by the same amount as the competition between existing firms in a period of three additional weeks in the product life cycle. If we abstract from any dynamic or product life cycle effects, our results support the validity of search theoretic models such as Carlson and McAfee (1983) or Baye and Morgan (2001) and contradict models of monopolistic competition.

We use firms' past listings decisions as an instrument. We argue that this is a valid instrument as products offered in different markets some time ago should have no direct influence on prices and sales of current products. Potential threats to this identification strategy are the timing of past listing decisions and the similarity of products. We thus run robustness checks on the instrument by varying the timing of firms' past behavior and using markets farther away in terms of time or

[3] For example, monopolistic competition predicts markups and price dispersion to go down when the number of firms increases (Perloff and Salop, 1985), while in a model with heterogeneity in consumers' search cost and producers' marginal cost the latter would go up (Carlson and McAfee, 1983).

[4] The average span of the product life cycle of digital cameras amounts to 167 days in our data.

[5] In a recent survey, Martin (2012) argues that market structure may adapt only slowly to long-run equilibrium levels and many entering firms may be atypical fringe firms unable to influence market structure at the core. While this describes well-established markets with market leaders and high advertising requirements, market structure in e-commerce is different: due to the cheap and easy establishment of online shops, many such shops operate only online.

[6] Examples include Berry (1992), Campbell and Hopenhayn (2005), Carlton (1983), Davis (2006), Dunne et al. (1988), Geroski (1989), Mazzeo (2002), Seim (2006), and Toivanen and Waterson (2000, 2005). For a survey see Berry and Reiss (2007).

[7] See, for example, Bergemann and Välimäki (2006a, 2006b), who analyze dynamic price paths in monopolistic settings and find that in mass markets prices should decrease over the product cycle.

[8] Klepper (1996, 2002) describes the evolutionary pattern of birth and maturity of technologically progressive industries and we apply and extend the predictions of his model to the market of consumer electronics.

[9] Barron et al. (2004) analyze the relationship of markups and price dispersion and the number of firms using data from gasoline retail markets. They find that both markups and price dispersion decrease as the number of firms increases and interpret this as evidence in favor of models of monopolistic competition.