Abstract

This paper questions the widely held view that B2C e-commerce markets are characterized by a high intensity of competition, using a combination of theoretical arguments and empirical evidence. We discuss two hypotheses and survey empirical studies that test them. We argue that the goods sold in B2C e-commerce have to be interpreted as heterogeneous ‘composite goods’, that market transparency in B2C e-commerce is lower than widely assumed, and that high endogenous sunk costs limit the intensity of competition in B2C e-commerce.

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INTRODUCTION

‘One of the major features of the Internet revolution is its potential to make the whole economic system, nationally and internationally, more competitive by bringing markets closer to the economists’ textbook model of perfect competition, characterized by large numbers of buyers and sellers bidding in a market with perfect information.’ (Litan and Rivlin 2001: 315).

‘Lower search costs in digital markets will make it easier for buyers to find low-cost sellers, and thus will promote price competition among sellers.’ (Bakos 2001: 71).

The diffusion of the Internet and of B2C e-commerce in particular has been accompanied by expectations of a high intensity of competition. Our research results challenge these expectations.

The paper provides a review of the growing number of empirical studies on the intensity of competition in B2C e-commerce. Furthermore it summarizes the set of analytical explanations of a lower than expected intensity of competition in B2C e-commerce and expands it by emphasizing the role of endogenous sunk costs, the heterogeneity of composite goods and positive feedback loops. The explanations offered in the literature so far were mostly discussed in isolation of each other. We highlight the implications of the reinforcing interactions between endogenous sunk costs and the heterogeneity of composite goods, lock-in effects and positive feedback loops for market structure and minimum efficient scale.

The paper starts with a short summary of common arguments for a high intensity of competition. In the following section, we formulate testable hypotheses about the competitiveness of B2C e-commerce and discuss three limitations of these tests. Next we present, interpret and analyse the results of a large number of empirical studies on price levels and price dispersion in B2C e-commerce. We then discuss the explanations for the findings of these empirical studies offered in the literature. In the next section we emphasize additional arguments against a high intensity of competition and in the final section we draw our conclusions.

ARGUMENTS FOR A HIGH INTENSITY OF COMPETITION IN B2C E-COMMERCE

The widely held view that the degree of competition in B2C e-commerce markets is, or at least tends to be high, rests – explicitly and often implicitly – upon the following arguments in essence:

- Goods sold in B2C e-commerce are essentially homogenous. Hence transaction costs are low and market transparency is high.

Keywords: B2C e-commerce, competition, market transparency, endogenous sunk costs, network effects
The ease of access to information results in low search and information costs, so that the price can be compared virtually at no cost. The rising use of search engines and electronic price comparisons further decreases transaction costs and increases market transparency.

High transparency of B2C e-commerce markets and low technological barriers to entry – a high contestability of markets – lead to a high intensity of competition of B2C e-commerce markets.

HYPOTHESIS TO EVALUATE THESE ARGUMENTS

In order to analyse and challenge the arguments listed above, we formulate and discuss two testable hypotheses. The literature focuses on two criteria to test the high intensity of competition in B2C e-commerce: price level and price dispersion.

Hypothesis (A) regards the argument that the intensity of competition is higher in B2C e-commerce and costs are equal or lower than in traditional retailing so that prices should be lower in B2C e-commerce. It is a joint hypothesis so that a rejection cannot be interpreted as a rejection of a high intensity of competition alone, but only as a rejection of the joint hypothesis of a high intensity of competition and lower or equal marginal costs.

(A) If the intensity of competition in B2C e-commerce is higher than in traditional retailing and marginal costs are equal or lower at the relevant level of output, then prices must be lower in B2C e-commerce.

Hypothesis (B) is based on the ‘Law of one price’ and regards the argument that the price dispersion should be low in B2C e-commerce:

(B) If B2C e-commerce markets approach the ideal of a frictionless market (high market transparency, low transaction costs, homogenous goods), then the dispersion of prices is low in B2C e-commerce.

A rejection of this hypothesis is consistent with a number of potential explanations, e.g. lack of market transparency, high transaction costs and heterogeneity of goods.

Three major limitations have to be considered when testing these hypotheses empirically:

1. The ‘disequilibrium critique’ stresses that the hypotheses are theoretically valid in market equilibrium only. B2C e-commerce markets are not in equilibrium. The high losses of many B2C e-commerce companies cannot be sustained in a long-term equilibrium. Some of them might still struggle to reach the highest possible level of efficiency with respect to the optimal organizational, technological and economic business models and strategies. Brown and Goolsbee (2000: 16ff.) argue that B2C e-commerce tends to increase the price dispersion initially, as B2C e-commerce companies offer low prices to attract customers. But the low number of customers does not lead to pressure on prices in the offline market, initially. Tests of the hypotheses (A) and (B) can involve a type 1 (rejection of a true hypothesis) and a type 2 (failure to reject a false hypothesis) error. The ‘disequilibrium critique’ does not only entail arguments for type 1, but also for type 2 errors, e.g. prices might be lower in B2C e-commerce due to large temporary discounts to attract new online customers.

2. The hypotheses presuppose data sets which are very hard to collect – e.g. data on marginal costs – so that they have to be considered as ideal formulations. If the reduction of marginal costs exceeds that of prices, lower prices will be consistent with a lower intensity of competition (type 2 error). The hypotheses assume that the goods in the samples are homogenous. This depends on the subjective marginal rates of substitution of consumers, which are not directly observable. The interpretation of goods as homogenous when they are, in fact, not homogenous, might lead to a type 1 error, as higher prices might reflect the marginal costs of additional services (e.g. home delivery).

3. The interpretation of lower prices in B2C e-commerce (or equivalently of a low price dispersion) as evidence of a high intensity of competition is a logical fallacy – ‘fallacy of affirming the consequent’. Lower prices can be consistent with a lower intensity of competition, if companies do not cover costs, or if marginal costs are further reduced than the prices. A low price dispersion does not necessarily imply a high intensity of competition as it could result from collusion among B2C e-commerce companies.

EMPIRICAL TESTS OF THE TWO HYPOTHESES

A number of empirical studies analyse the intensity of competition in B2C e-commerce based on the criteria of price level and/or price dispersion. The studies cover different markets (books, CDs, antiquarian books etc.), mostly in the US, but also in Austria, Germany, Sweden and the UK. Table 1 offers an overview of their results with respect to price level and classifies the studies in three categories: higher or lower prices in B2C e-commerce (relative to the comparable offline market) or inconclusive results. The findings summarized in Table 1 justify a rejection of the joint hypothesis that the intensity of competition in B2C e-commerce is higher than in traditional retailing and marginal costs are equal or lower at the relevant level of output. That can be due to a rejection of one or both of its components. Six of the studies present evidence of higher, and six (two of them are based on the same data set) of lower prices in B2C e-commerce than in the comparable offline market.

Even if a hypothesis is rejected by one study only, it could only be sustained with qualifications with respect
Table 1. Empirical Studies on Price Comparisons Between B2C E-commerce and the Comparable Offline Market

<table>
<thead>
<tr>
<th>Higher Prices in B2C E-commerce</th>
<th>Inconclusive Results</th>
<th>Lower Prices in B2C E-commerce</th>
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</table>

* Data reprinted in Bailey 1998, Appendix 2. **Classification refers to findings with respect to pure B2C e-commerce suppliers (offline and multichannel suppliers which do not price in significantly different ways). ***The study finds higher prices in B2C e-commerce in 66% of the cases. ****Classification refers to total price on baskets of goods (online prices are not lower than offline prices for single items due to fixed transport costs). *****Empirical results in the second study – using the same data set – refer to a subgroup of all consumers in the first one only, (African-Americans and Hispanics).

Table 2. Empirical Studies on Price Dispersion in B2C E-commerce

<table>
<thead>
<tr>
<th>Large Price Dispersion in B2C E-commerce</th>
<th>Inconclusive Results</th>
<th>Small Price Dispersion in B2C E-commerce</th>
</tr>
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</table>

Note: There is no clear cut-off point to classify price dispersion as large or low in the literature. We base our classification on the judgement of the authors as expressed in the papers cited. *Reported evidence of price dispersion is significantly higher for random titles and lower only for a subset of all titles (namely, popular ones).

to the domain of its validity. Such qualifications might be that B2C e-commerce is more competitive for search goods (compared to experience goods) and/or for expensive goods (compared to low price goods) and/or for information goods (compared to physical goods) only. Among the studies in Table 1, 10 (77%) focus on search goods, 9 (69%) on low price goods (e.g. CDs or books) and 11 (85%) on physical goods. We analysed whether these characteristics of the goods have any influence on the probability that the respective studies report findings of a lower price level in B2C e-commerce than in traditional retailing. This meta-analysis of the studies listed in Table 1 derives the following results. In both categories of Table 1 (i.e. higher/lower prices in B2C e-commerce) we found studies focusing on search as well as studies focusing on experience goods. There are no studies of expensive goods and no studies of information goods in the category ‘higher prices in B2C e-commerce’, but in the categories ‘inconclusive results’ and ‘lower prices in B2C e-commerce’. Hence there are some rudimentary indications that the hypothesis that B2C e-commerce markets for expensive goods and for information goods are more competitive than their offline equivalents cannot be rejected by the studies in the sample. Because of the small sample size the results of such a meta-analysis have to be interpreted with caution.11

Table 2 presents a summary of the findings of the studies focusing on price dispersion and classifies them in three categories: large or small price dispersion in B2C e-commerce or inconclusive results.

Of the 16 studies included in Table 2, 14 report findings of large price dispersion in B2C e-commerce, only one yields inconclusive results and one reports findings of low price dispersion. Consequently, the hypothesis that B2C e-commerce markets approach the ideal of a frictionless market (high market transparency, low transaction costs, homogenous goods) has to be rejected.12

Brown and Goolsbee (2000) analyse the effects of Internet-based price comparison sites on the prices of life insurance in the US. They estimate that the introduction of online price comparison sites reduced prices in the life insurance market by 8–15%. If the share of individuals in a certain market segment increased by 10%, the price in the segment dropped by 5%. But they also show that, initially, the dispersion of prices in each segment increases. The pressure on offline prices only increased, after about 5% of the individuals in a market segment used Internet-based price comparison sites. Beyond that threshold the price dispersion decreased relative to the one prevailing before Internet-based price comparison sites had become popular within the respective market segment.

Goolsbee (2000) analyses the price sensitivity of consumer choice with respect to the distribution channel (online or offline) in the US market for computer hardware. He finds that an increase in the retail price of computers relative to the online price by 1% increases the conditional probability of buying online by 1.45%. In a study of the German market for used cars, Fabel and Lehmann (2000) find that the prices for used cars are lower online, but that their quality is also lower online so that the results are not conclusive.
Baylis and Perloff (2001) show that the ranking of the B2C e-commerce companies in their sample, according to prices (for scanners and for digital cameras, respectively), is very stable over time. The probability that a company moves by only one rank or less within a week was 57% (for scanners) and 75% (for digital cameras) while that of a move of ten or more ranks (out of a possible 40 and 27, respectively) was only 4% and 1%, respectively. They conclude that companies are not attempting to undercut each other. In a recent survey of B2C e-commerce companies in Vienna, 92% of the multichannel companies reported that their prices were about the same offline and online (±1.5%) and 8% reported to have lower prices (< -1.5%) online than offline.13

ARGUMENTS AGAINST A HIGH INTENSITY OF COMPETITION

The majority of the literature, which argues that the intensity of competition is lower than expected, refers to (1) price discrimination, (2) lock-in effects and/or (3) bundling.14 We will shortly review their major arguments. Our main focus, however, is to draw attention to additional concepts that might explain the lower than expected intensity of competition: (4) heterogeneity of ‘composite goods’ in B2C e-commerce, (5) limited market transparency, (6) high endogenous costs, and (7) network effects, increasing returns to scale and positive feedback-loops.

Price Discrimination, Lock-in Effects and Bundling

Price discrimination. A number of studies argue that price discrimination is the explanation for the larger than expected price dispersion in B2C e-commerce, because the informational prerequisites can be obtained more easily in B2C e-commerce than in the traditional retail market. The argument is unsatisfactory, as it already presupposes that B2C e-commerce companies are not pure price takers – i.e. they must have some market power – and that arbitrage is not possible between different segments of the market. The segmentation of the market is achieved by product differentiation. It is inexpensive to produce multiple versions of a digital good.

Price discrimination effects the intensity of competition first by reducing the transparency of the market and second by reducing the number of buyers and sellers in each segment relative to the non-segmented relevant market. The diffusion of online price comparison sites and shopbots is assumed to increase the intensity of competition. But the use of shopbots and online price comparisons takes time and reveals particular time preferences of users. The information gathered can be used to discriminate between patient and impatient consumers. Varian (1999) shows that online price comparisons can also decrease the intensity of competition. It pays to undercut other market participants, if the lower price attracts new customers. If the other market participants react before consumers choose to switch, they have no more incentive to do so. Online price comparisons increase the transparency of the pricing strategies of the market participants. Thus they can contribute to the stability of tacit collusion among B2C e-commerce companies. Kauffman and Wood (2001) cannot reject the hypothesis of tacit collusion in their sample of B2C e-commerce companies. Since not all consumers engage in a costly search, B2C e-commerce may randomize prices to increase revenues without losing all the price sensitive customers.15

Lock-in effects and switching costs. Lock-in effects and switching costs are the result of a previous investment of the consumer that, if compatible with a current purchase, reduces the costs of (or increases the utility derived from) that purchase. The investment depreciates rapidly, if the consumer switches suppliers, unless it is perfectly compatible with the new supplier.

The B2C e-commerce market, however, is certainly not a mature market, but a market growing rapidly in terms of both volume and customers. In terms of the two-period model of Klemperer (1995),16 we are still in the first period, in which companies charge lower prices in markets with switching costs than in markets without them. Once market shares are determined and the profits generated from new customers are only of minor importance relative to that on existing customers, companies tend to charge higher prices in markets with switching costs than in markets without them.17 In the second period, companies with smaller market shares will charge lower prices than those with large ones. If consumers anticipate the negative effects of lock-in and switching costs, market demand will be less price elastic in the first period. Consumers will base their decision not only on current prices, but also on the expected consequences of potential lock-in (i.e. switching costs, their expected effects on future prices and the credibility of seller commitments not to increase prices in the future). Firms can develop commitment strategies in order to reassure consumers that the costs of lock-in and switching will not be excessive.

This has a number of interesting consequences for B2C e-commerce companies:

1. Marketing and advertising expenditures might be higher in B2C markets than in markets without switching costs. The existence of lock-in effects and switching costs makes market shares more valuable in the future. Furthermore, the effects of marketing and advertising expenditures are longer lived when customers face switching costs.

2. Many B2C e-commerce companies offer some of their goods at huge discounts relative to traditional retailers, despite losses. These discounts are interpreted as...
investments in market share that is particularly valuable in the B2C market characterized by lock-in effects and switching costs.

3. Theoretical models of lock-in effects do not yield conclusive results with respect to the level of prices in B2C e-commerce, as this market is in a very early stage of development.

4. Lock-in effects may have provided incentives for B2C e-commerce firms to expand their selection considerably in the past years (e.g. Amazon: books, CDs, DVDs, toys etc.).

5. B2C e-commerce companies attempt to create a number of artificial lock-in effects and switching costs.

Loyalty programmes, customization that allows easy repeat purchases, recommendations based on past shopping behaviour, and lower per item shipping costs are incentives for consumers to purchase a set of goods at a single B2C e-commerce company, even if some of the goods are cheaper at different other stores.18 Furthermore, buying each item of a basket separately at a different online store increases the time consumers would have to spend in online stores. Consumers might be more confident with entrusting personal information to companies when they can keep track of the data and its potential misuse so that in the future, they can demand it to be erased. Spreading personal data and payment transaction details over a large number of online shopping sites could result in considerable monitoring costs, too. In addition, sending the data via the Internet entails some risk of interception so that consumers might prefer to interact with those sites that have already stored (parts of) their relevant information in the database alongside other details of their personal profile. In short, bundling purchases at a single online store reduce non-pecuniary transaction costs associated with online shopping.

The composite good purchased in an online store is an experience good (and with respect to some complementary services even a reputation good, i.e. data protection). To find out about its quality is an informational investment under uncertainty. The subjective switching costs are equal to the maximum insurance premium the consumer is willing to pay, to be guaranteed a composite good that provides (at least) the same level of utility to him or her.19

Brynjolfsson and Smith (2000b) and Chen and Hitt (2001) present evidence of the significant role of lock-in effects and switching costs due to positive experience with the quality of composite goods. Johnson et al. (2000) find evidence for the role of cognitive switching costs in B2C e-commerce.

Bundling. Bakos (1997) and Bakos and Brynjolfsson (1999a, b) argue that bundling reduces the intensity of competition.20 Bundling is a strategy that focuses on aggregation of large numbers of information goods so that the entire set (or bundle) of goods can be sold at a single price.21 The list of examples comprises online newspaper articles, music and software downloads, photographs, and video clips.22

Bakos and Brynjolfsson (1999a, b) show that:

- The seller of the larger bundle will always be willing to spend more for an additional good to add to the bundle. Thus the larger bundler will grow larger relative to the smaller one.
- In a slightly adapted model the bundler can attract more consumers, charge a higher price and achieve higher revenues from a single, specific good than the seller distributing the good’s imperfect substitute on its own.
- A bundling strategy can make market entry unattractive for potential entrants, if their goods cannot be bundled.23

Heterogeneity, Asymmetric Information and Endogenous Sunk Costs

In addition to the points made above, we emphasize further explanations of a lower than expected intensity of competition in B2C e-commerce: heterogeneity of composite goods, limited market transparency, endogenous sunk costs, and network effects, increasing returns to scale and positive feedback-loops.

Heterogeneity of composite goods and asymmetric information. The utility derived from the purchase in B2C e-commerce depends on the quality attributes of the composite good, consisting of the product (e.g. book, CD) and of various complementary goods including:

- correct details of physical presence, contact address, relevant jurisdiction;
- convenience of navigating a web shop;
- transparency of information (on prices, taxes, handling and shipment, quality attributes), of the process of making and confirming a purchase;
- delivery services (safe and timely delivery, reliability of delivery service, expected costs of complaints over delivery problems, expected costs of enforcement in case of delivery problems);
- payment procedure (clear and safe payment procedure, expected costs of payment fraud and complaints);
- consumer rights and data protection; and
- after sales service (expected costs of returning goods after a cooling-off period and obtaining a refund, expected costs of complaints).

While quality attributes of a particular book and CD can be assumed to be homogenous across B2C e-commerce companies, there is considerable heterogeneity with respect to the quality attributes of the complementary goods.24 Furthermore, while the quality/price ratio of the underlying good purchased is usually contractible and enforceable, (albeit at high costs), the quality/price ratio of some of the complementary goods is hardly contractible.25
Even if the goods purchased in B2C e-commerce are standardized search goods (e.g., computer hardware), the complementary goods often are experience or reputation goods.

By reducing the degree of homogeneity of composite goods purchased in B2C e-commerce, the heterogeneity of complementary goods increases search and information costs. Asymmetric information prevails in the B2C e-commerce market. The lack of standardization renders comparisons expensive. A first-time purchase at a hitherto unknown online store can be interpreted as an investment under uncertainty. A positive shopping experience with regard to the price/quality ratio of the composite good will reduce the inclination of an individual to risk the investment of a first-time purchase at another store, unless the expected price/quality differential compensates at least for the additional uncertainty involved in the margin.

There are a number of options for the seller of an experience good to overcome the related informational problems. These include: previews, reviews and reputation. Establishing a reputation for selling high quality products can be interpreted as an investment decision and is, therefore, nonsensical, if there are no future customers, or if the discount factor of the seller is very low ($<1$).

B2C e-commerce companies transacting very frequently with the same customers have an incentive to establish a reputation. The incentive is even more pronounced, if negative experience can be communicated between buyers. If the market leaders conduct a higher number of transactions and have larger expected discounted future profits and higher marketing and advertising expenditures which are endogenous sunk costs, the amount at stake is higher for them than for smaller market players. Furthermore, the fact that they are larger is a signal that others have experienced a satisfactory quality/price ratio to return to their sites. Thus, the commitment to high quality of larger B2C e-commerce companies is more credible.

Based on the arguments presented above, we interpret asymmetric information as reducing the high intensity of competition vis-à-vis the ideal of a frictionless market.

**Market transparency.** In the following section we present evidence that the amount of information provided on the web is huge, while consumers’ resources to handle it are limited. Online consumers respond to abundance of information by restricting their attention to a very limited fraction of online shops. B2C e-commerce companies respond with high marketing and advertising expenditures and high customer acquisition costs.

Bergman (2000) estimates that there are 550 billion documents in the Deep Web, which includes traditional surface websites plus web pages in databases that are generated upon request. Furthermore, he reports that search engines have stored some 0.03% of these web sites. Lawrence and Gilles (1999) argue that, since conventional search engines crawl the web from one site to the next via links, old web sites and those with a high number of links connecting other sites to them, have a larger probability of being found. The costs of updating the database of a conventional search engine are increasing with the number of sites. While the marginal return from indexing a site is decreasing as the database grows, the sites since added are more likely to be less popular. Sullivan (2001) presents evidence that search engines offer banner ads, content deals, paid placement and/or inclusion and/or submission. Even though these features are separated from the editorial listings, they offer a way to be present on search result pages and consequently reduce the transparency of the market, and highlight the role of marketing and advertising expenditures in the customer acquisition processes.

Adamic and Huberman (1999) studied the distribution of users among different websites on 1 December 1997 based on data covering 60,000 users and 120,000 sites. According to their survey, the top 0.1% of all sites attracted 32.36% of volume, for the top 1% the corresponding value was 55.63% and for the top 10% it was 82.26%. The top 50% covered 94.92% of all visits.

The analysis of the top 100 US-based B2C e-commerce sites in the fourth quarter of the year 2000 yields interesting insights concerning the distribution of page views among B2C e-commerce sites. About 50% of the total page views on the sites of the top 100 are concentrated on the sites of 11 companies, about 75% of the page views on the sites of 38 companies. Amazon.com holds a share of 21%, the shares of all other companies are below 5%. In these calculations, we excluded auction sites as they also cover C2C e-commerce. Nevertheless, the biggest auction site ebay.com would have a share of 35% among the top 100 companies in the end of 2000. Altogether, these data indicate a low market transparency, as users spend most of their online time on a few leading online web shops.

Johnson et al. (2000) analyse the consumer shopping behaviour of a panel of 10,000 households over the period July 1997 to June 1998 in the categories books, CDs, and online travel agencies. The average number of CD shops searched by each household increased from 1.23 in the first month of online experience to 2.23 from the seventh month onwards. The average number of bookshops searched by each household increased from 1.1 to 1.34, and the average number of online travel agencies from 1.8 to 2.8. Over the entire period, 70% of CD and of book shoppers, and 36% of online travel shoppers were loyal to one online store. Furthermore, they find that the probability of a continuing search after the first visit of a site in a given month is quite low (21.2% CDs, 12.8% books, 46.8% travel). Most individuals in the sample had some inclination to search, but rarely did so.

In a consumer survey conducted in January and February 2000 in Austria the most important criterion for consumer choice, however, was the brand name of the seller (B2C e-commerce retailer), (very important/important for 49%), followed by the trade mark of the good under consideration, (very important/important for 40%). Classical
Internet-based sources of information were ranked on places 3 to 5: search engines, (very important/important for 33%), portals, (very important/important for 31%), and recommendations on the Internet, (very important/important for 30%). Finally, also advertising and recommendations in traditional media, (very important/important for 25%), had some influence on consumer choice.

Brynjolfsson and Smith (2000b) analyse shopbot data on 1,513,439 book offerings generated by 39,654 searches conducted between August and November 1999. A total of 20,227 distinct consumers used the shopbot in this period including 7,478 repeat visitors. The data set does not include data of actual purchases, but approximates them by ‘last-click’ data. Instead of observing an actual purchase at one of the stores, the analysis of final decisions is based on the final choice of online shop among the shops in the listing. They report that 51% of consumers choose an offer that is not the lowest priced one. While the branded retailers (amazon.com, barnesandnoble.com, borders.com) offer the lowest price in 15% of all searches, they are the final choice in 27% of them. The three largest unbranded retailers (A1books, Kingsbooks, 1Bookstreet.com) have the lowest price in 36%, and they are considered as final choice in 26% of all searches. The results are confirmed by the analysis of the price premium – between the lowest price offered and the one actually chosen – consumers are willing to pay when choosing an offer other than the lowest priced one. For branded retailers that premium is 10.8%, while for unbranded ones it is only 7% (relative to the average total price of the books chosen in the sample). Furthermore, Brynjolfsson and Smith (2000b) estimated that consumers are indifferent to an offer from an unbranded and from a branded retailer, if the unbranded one offered a discount of 3.1–6.8% (of the average total price of the books chosen in the sample). Smith (2001) presents evidence for higher prices of dominant e-retailers due to higher awareness they enjoy among consumers, which reduces consumers search costs and enables the e-retailers to collude. In his model the number of dominant firms interacting is quite low so that they can get involved in collusion more easily. In his empirical analysis, the three dominant e-retailers in the sample offer exactly the same prices of 42% and similar prices (US$ 0.05) of another 49.8% of titles in the sample. On the other hand the number of fringe suppliers is large and there is no evidence of collusion.

According to Clay et al. (2000), amazon.com charges significantly more than other B2C e-commerce companies with a brand name (+5% vis-à-vis barnesandnoble.com and +11% vis-à-vis Borders.com). Ward and Lee (1999) report results of a survey of consumers in B2C e-commerce that emphasize the importance of brand names as a determinant of consumer choice. Degeratu et al. (1999) present evidence based on consumer choice data of online and offline retailers. They conclude that product brand names are more important in B2C e-commerce when information on fewer quality attributes is available online.

**Endogenous sunk costs.** To some extent sunk costs associated with market entry in B2C e-commerce are lower than in conventional retail markets. The demand for the inputs of personnel and outlet space is lower in online than in offline retail operations so that hiring and firing costs as well as real estate commissions are lower. The evidence presented above shows that brand names play a crucial role in B2C e-commerce so that marketing and advertising expenditures are expected to be high. These endogenous sunk costs affect market structure. The concentration ratio in markets characterized by sunk costs does not converge to zero as the market size grows. By limiting the number of competitors and the intensity of competition in the market, even in the presence of free entry, the long-term average prices can be sustained above marginal costs to recoup sunk costs.

Due to the asymmetric information with respect to the price/quality attributes and limited market transparency, i.e. in particular with respect to non-contractible characteristics of the composite goods, and due to the prominent role of reputation, marketing and advertising expenditures play a crucial role in B2C e-commerce. B2C e-commerce is characterized by lock-in and network effects, increasing returns to scale and positive feedback loops. Consequently, history matters in industries that are characterized by network effects, increasing returns to scale, and positive feedback-loops. Therefore, marketing and advertising expenditures have a longer lasting impact on these industries. Endogenous sunk costs are barriers to entry, eventually prices have to be above marginal costs to recoup endogenous sunk costs, and the intensity of competition is lower than in the absence of endogenous sunk costs, ceteris paribus. Furthermore, even if the B2C e-commerce market expands, there exists a positive lower limit for the concentration ratio even under free entry.

**Network effects, increasing returns to scale and positive feedback-loops.** B2C e-commerce is often interpreted as exhibiting network effects, suggesting that the individual pay-off for buying online depends on the number of other online shoppers. The literature on networks distinguishes between direct and indirect network effects.

Direct network effects arise as the marginal participant increases the value of the network for all other current and prospective participants as the number of individuals to transact or communicate with increases. They play a significant role for e-commerce companies that provide transaction or communication services or platforms for consumers to interact with each other (e.g. eBay) but a less significant role in other B2C e-commerce markets. A larger number of fellow shoppers does not enhance the shopping experience, apart from a larger selection of online reviews and the social aspect of chat rooms and discussion fora that are sometimes incorporated in shopping sites.

Indirect network effects are the result of market interaction. The more individuals buy online, the more information is available about B2C e-commerce in general and
about the most popular sites, specifically. Individuals feel more confident about shopping at a site they know more about, especially concerning the quality of the complementary goods.

The social experience of visiting a certain shopping site, e.g. chat rooms, is often positively correlated to the size of the B2C e-commerce company. Finally, network effects are important in the distribution of physical goods. In sum these arguments hint at non-negligible network effects in B2C e-commerce but, so far, there are no empirical studies focusing on network effects in B2C e-commerce.

Increasing returns play a major role in inventory management and in procurement of the goods and services offered, as producers grant bulk discounts to large retailers with substantial bargaining power. The technological infrastructure might require lower fixed costs than the infrastructure of a brick and mortar store, but it still requires a non-negligible investment (sophisticated web site and fulfilment technology and organization, order tracking, product design and bundling, customization, timely information about inventory positions etc.). The investment in reputation and brand name capital are fixed costs, too. These fixed costs are an additional source of increasing returns to scale.

Does that imply that the B2C e-commerce has a tendency towards natural monopoly? No, because of the heterogeneity of consumer preferences it is unlikely that network size is the only relevant factor in network choice. Particularly with regard to the social aspect of B2C shopping it is likely that the characteristics of other participants are an important factor. The fact that increasing returns to scale play a prominent role in B2C e-commerce does not imply subadditivity at all relevant output levels at or below market volume, so that marginal costs will increase with network size after a certain threshold. If the production function of B2C e-commerce companies exhibits diminishing marginal productivity at output levels well below market volume, more than one network can exist in equilibrium. Limitation of organizational and informational capacity are of special importance in B2C e-commerce.

The existence of network effects, increasing returns to scale, and positive feedback loops would imply that larger B2C e-commerce companies would either sell at lower prices or have larger margins, which enable them to invest more in non-price competition or simply generate higher profits. Minimum efficient scale is larger in the presence of positive feedback-loops than in their absence so that the intensity of competition is likely to be lower in the long-term. In the initial phase of market evolution, competition will be more intense as current market share is more valuable in the presence of positive feedback loops (see section on sunk costs).

CONCLUSIONS

This paper highlights potential problems related to hypotheses testing the intensity of competition in B2C e-commerce and warns of premature conclusions. Type 1 (rejection of a true hypothesis) and type 2 (failure to reject a false hypothesis) errors in testing the hypotheses can occur due to the ‘disequilibrium critique’. The hypotheses are ideal-type formulations and one has to be aware of the ‘fallacy of affirming the consequent’.

In general the empirical studies on prices in B2C e-commerce relative to traditional retail suggest a rejection of the joint hypothesis of higher intensity of competition in B2C e-commerce and lower or equal marginal costs. However, our metaanalysis provides some indication that the joint hypothesis cannot be rejected for B2C e-commerce markets for expensive goods and for information goods based on price level comparisons alone. Because of the small sample size, the results have to be viewed with caution though. A larger sample would be needed to draw more reliable conclusions. Nevertheless, the empirical studies focusing on the dispersion of prices in B2C e-commerce lead to the rejection of the hypothesis of high intensity of competition in B2C e-commerce.

The literature concentrates on the following explanations of these findings: price discrimination, lock-in effects and bundling. Our analysis suggests additional explanations that have to be considered as well: heterogeneity of composite goods, limitations to market transparency, high endogenous sunk costs and network effects combined with increasing returns to scale (positive feedback loops). Furthermore, we emphasize the reinforcing interactions between endogenous sunk costs and the heterogeneity of composite goods, lock-in effects and positive feedback loops.

The consideration of our additional explanations might change the net-effect of the arguments for and against a high intensity of competition in B2C e-commerce and is intended to lead to a more realistic assessment of market structure in B2C e-commerce.

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Notes

4. ‘The internet lowers search cost, reduces barriers to entry and helps shorten the supply chain.’ (Wadhwani 2000: 1). Especially ‘boundary crossing’ for large companies contributes to a high contestability of B2C e-commerce markets. Some of the conditions for high contestability are rarely discussed explicitly (i.e. absence of legal barriers to entry, market entry and exit possible
without sunk costs, and access to production and distribution capacities is fast and inexpensive) and are more likely to be met by information goods than by physical goods. See also OECD (1999); Bakos (2001); Mai and Oelmann (2001); Ward (2001) and for an exposition of the contestability of markets inter alia George et al. (1991).

5. The entire discussion in the literature implicitly assumes rational individual agents. Baye and Morgan (2001) are the exception to the rule and present empirical evidence that bounded rationality among sellers might explain equilibrium price dispersion.

6. The assumption that marginal costs are equal or lower in B2C e-commerce is only made implicitly in most empirical papers that compare price levels of physical goods in online and offline channels. Because in theory, a higher intensity of price competition only reduces the mark-up of prices over marginal costs. The effects on prices depend on the underlying marginal costs. Without assumptions concerning marginal costs one could not draw valid conclusions with respect to the intensity of competition from price level comparisons. Borenstein and Saloner (2001: 5) suggest potentially large cost savings on distribution even for physical goods. For a discussion on the retailing cost structures in online and offline channels see Ward (2001: 6).

7. See Borenstein and Saloner (2001: 9).

8. Only evidence of equal or higher prices in B2C e-commerce (negating the consequent) would allow one to draw the conclusion that the joint hypothesis – of a high intensity of competition and lower or equal marginal costs in B2C e-commerce – is rejected. See Barker (1989: 69).


10. An empirical example is reported in Ward (2002) who suggests that marginal costs and the intensity of competition are higher online (i.e. pure Internet grocery markets vs. hybrid and offline markets) than offline. The study is a fine example of the powerful combination of tests of price levels and price dispersion.

11. For example, there are only two studies in the sample focusing on information goods of which one reports inconclusive results.

12. Among the studies in Table 2, 12 (80%) focus on search goods, 10 (67%) on low price goods (e.g. CDs or books) and 13 (87%) on physical goods.


14. See literature cited in Tables 1 and 2.


16. Two period models are appropriate to model lock-in effects and switching costs, if companies can discriminate between old and new customers, or if the market has an ‘early’ and a ‘later’ period due to patterns of growth exogenous to the model (see Klemperer (1995)).

17. See Klemperer (1987). Klemperer (1995) expects the incentives to increase prices for old customers, to outweigh the incentives offering attractive prices to new customers. Some B2C e-commerce companies attempt to solve the problem by price discriminating between old and new customers.


20. However, one has to bear in mind that the problem is structured as bundling versus selling all goods separately, i.e. mixed bundling is ruled out. Consequently, Bakos and Brynjolfsson cannot derive marginal conditions for the optimality of including an additional good in a bundle or selling it separately.

21. Bundling has similar effects as price discrimination. As compared to first degree price discrimination, the bundling strategy reduces the number of different prices to a uniform price for all consumers and greatly reduces the information requirements and transaction costs while maximizing a seller’s profits.

22. See Bakos et al. (2000) for different bundling strategies in the online brokerage market.

23. See also Nalebuff (2000).


25. We borrow the terminology from Brynjolfsson and Smith (2000).


27. Pan et al. (2001) present empirical evidence that characteristics of B2C e-commerce suppliers explain price dispersion partly (about one third). Lucking-Reiley et al. (2000) report evidence that a seller’s positive/negative feedback ratings affect the auction price positively/negatively.


29. Noisy variables and fixed, finite horizons can complicate matters (see Kreps (1990: 531), but are not discussed here any further.


33. For details see Latzer and Schmitz (2000).

34. Similar results are reported in Smith and Brynjolfsson (2001).

35. Pure player in B2C e-commerce reported advertising and marketing costs of 76% of revenues in 1999 (Shop.org 1999). In the Austrian retail market SME spend less than 2% of revenues on marketing and advertising activities on average in the same year (Austrian Chamber of Commerce).

37. The conjunction between credible commitments and irreversible specialized investments (i.e. in the current context these would be predominantly endogenous sunk costs associated with marketing and advertising expenditures) is discussed in Williamson (1983).


40. See, e.g., Katz and Shapiro (1985), Liebowitz and Margolis (1994, 1998). The distinction serves analytical purposes and does not imply that network sponsors prefer a larger installed base because of direct network effects only.

41. Wolfinbarger and Gilly (2000) report findings that online shoppers enjoy online sociality.

42. Brynjolfsson and Smith (2000b) report evidence based on a Lexis-Nexis press research that the three largest B2C e-commerce companies in their sample account for 93% of the press references of the entire sample as well as 97% of the links of an AltaVista.com search to e-retailers in the sample.

43. See section on ‘Heterogeneity of composite goods and asymmetric information’.

44. See Borenstein and Saloner (2001).


References


