Published (with misprints) in: Thorsten Wichmann (Hrsg.): Economics and the Internet II. Proceedings from the 4th Berlin Internet Economics Workshop, Norderstedt 2002, S. 59-63; available also as http://www.berlecon.de/services/en/iew4/papers/paper21.pdf. 

# The Internet's Impact on the Market for Antiquarian Books: Some Unexpected Empirical Results

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*Abstract*--**The Internet has changed the market for rare books dramatically: The introduction of digital marketplaces allows buyers to search very easily and simultaneously in hundreds of antiquarians' catalogues. The market has therefore become much more transparent - but what has happened to the level of prices? Although it is too early for a time series study, we can provide some empirical evidence by making use of the fact that antiquarians currently have very different channels of distribution. Some are pure Internet traders, others also have a second-hand bookshop or send catalogues. The difference in pricing strategies between, say, pure Internet traders and those who have a shop should give us an idea about what to expect when the share of Internet trade increases further.**

**Our sample includes 674 books, each of which was offered at least four times in equally good condition; this allows us to calculate the deviation of an antiquarian's price from the other sellers' average price. This measure is regressed on various sellers' characteristics, partly making use of own survey data. Our clearest and most important result is the following: Though there is a considerable variance in most books' prices, we do not observe the expected negative correlation between price and share of Internet sales (in relation to a seller's total sales).**

*Keywords*--**antiquarian books, digital marketplaces, Internet, price effects of electronic commerce**

## I. Introduction

E-business and digital marketplaces have been introduced for various goods, and in some of these markets the Internet's success and effects have been empirically investigated. Internet trade with antiquarian books, however, has not been studied so far; this paper is a first attempt. Our motivation is the fact that one can hardly imagine buyers and sellers to which the Internet has brought more radical changes than to antiquarians and rare book collectors.

In the pre-Internet era, buyers had to rely on antiquarians' catalogues and shop visits[1]. In any case, sellers were in a nearly monopolistic position because for most books which they offered, finding the same one again involved search costs that were prohibitive to most buyers. This still remained true when a few pioneering antiquarians began to offer second-hand books on their own homepages. The real breakthrough occurred in 1998 when a German digital marketplace started up[2]. This allows buyers to make a search very easily and simultaneously in hundreds of antiquarians' catalogues. The market has therefore become much more transparent. But what has happened to prices and antiquarians' pricing strategies?

In section II, we review some studies on the Internet's impact in other markets. In section III we describe our own empirical research strategy in more detail, along with our ex ante expectations. Some of the results presented in section IV are quite surprising, but we might be observing temporary phenomena. Hence section V outlines some directions for future research.

## II. Related Studies

There are a couple of empirical studies on the Internet's impact on market efficiency, the more recent ones including Bakos (2001), Brown/Goolsbee (2000), Brynjolfsson/Smith (2000), Clay et al. (2000) and Lee (2000). They review product categories as diverse as books, CDs, pharmaceutical products and term life insurance policies. Two approaches are being followed. While one compares online with offline prices, the other tries to gauge the impact web-based price comparison services have on real-world prices. The starting point for all research projects is the assumption that the use of the Internet increases transparency, thereby enhancing market efficiency. Whereas real world markets are characterized by various types of friction, virtual markets are assumed to come as close as possible to the textbook ideal of perfect competition. In particular, the following aspects of online markets are of special interest: price levels, price dispersion as well as the magnitude and frequency of price changes.

The *price level* of an online market is thought to be influenced by lower search costs for consumers[3]. If consumers

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[1] Not all antiquarians have shops; some only offer via catalogues or at book fairs. One further occasion to trade more valuable items are auctions.

[2] See http://www.zvab.com. Comparable marketplaces, mainly for English books and antiquarians, are www.abebooks.com and www.bibliofind.com, for French books www.chaPitre.com. Some antiquarian marketplaces can be searched simultaneously at www.sfb.at.

[3] There are other potential reasons for lower prices, especially lower operating costs for suppliers and lower barriers to entry for potential competitors. While these aspects may play an important role in explaining the changes in price, the reviewed empirical studies focus on the reduction of search costs.

are fully informed about all prices because they do not incur any costs searching for alternatives, the price level of any market will be reduced to marginal costs as no supplier will be able to demand higher prices. Hence the growing diffusion of the Internet should lead to a decrease of prices. This theoretical point of view seems to be confirmed by most of the empirical evidence mentioned above, even when taking into account such diverse supplementary factors like handling and shipping costs, sales taxes or the opportunity costs of travelling to a "normal" store. The differences in prices are statistically significant and remarkable in their extent, whether one compares prices between online shops and conventional retail outlets or one observes the development of real-word prices under the influence of Internet-based price brokers.

The result is quite different when one looks at *price diversion*. Here the empirical evidence seems to be inconclusive. Sometimes dispersion increases, sometimes it decreases as an effect of e-business. A good explanation is provided by Brown and Goolsbee (2000, p. 2 & 6). Initially, prices become more diverse, as only few people use the Internet to check for alternative offers. These people actually get their products cheaper. There is no longer a uniform monopoly price. As more and more people browse the web, the expected pro-competitive effect takes place. Prices begin to decrease on a wider basis so that price dispersion is reduced as well. This effect is felt even if the share of actual Internet users is smaller than 5% (ibid, p. 13).

Finally, *price changes* also play a vital role in the empirical research programme. In the theoretical literature, menu costs are generally believed to reduce market efficiency as retailers are prevented from adjusting their prices as often as necessary to render a market perfect. Menu costs even have macroeconomic repercussions, being cited as one of the reasons for cyclical fluctuations of the economy. For online retailers, it is easier to change prices as it is only necessary to change the entry in a software database. Therefore, one would expect that prices changes occur more frequently and in smaller steps with virtual shops. Once again, the empirical evidence does not support the theoretical hypothesis unequivocally. Whereas Brynjolfsson & Smith (2000, p. 16-19) confirm the expectations with their findings, Lee (2000, p.24f) found that, while price changes for pharmaceuticals are more frequent online, their magnitude tends to be greater rather than smaller. Note, however, that cost changes should lead to larger price increases the more competitive a market is - a mechanism which might more than outweigh the above mentioned reasons for expecting online price changes in smaller steps[4].

The general result of all research seems to correspond with the theoretical models. There are some exceptions which can partly be attributed to the fact that the use of the Internet has not yet diffused adequately. However, there remains one caveat: as Brynjolfsson & Smith (2000, p.26-29) show, even in the perfect world of the Internet, "branding" appears to play a vital role for online retailers. If one is able to build a reputation for good services and reliability, there is a good chance that the impact of the efficiency enhancing Internet might not be as "severe" as previously feared. Bakos (2001, p. 71-73) argues in a similar fashion: the Internet enables sellers to tailor their products more directly to customers' demand. This leads to product differentiation which makes it possible for retailers to charge higher prices. These effects may also partially offset the competitive effects of online markets. Empirical support for this hypothesis was found by Clay et al. (2000), but no such strategies are available for the type of online transactions which we will consider. Accordingly we did expect to observe clearer effects of increased price competition due to the Internet.

[4] We owe this point to Klaus Herdzina.

## III. Data and Hypotheses

Our approach is to make use of the fact that antiquarians currently have very different channels of distribution. In contrast to those businesses mentioned in section II above, many antiquarians do not rely exclusively on one mode of selling. Some are pure Internet traders, others also have a second-hand bookshop and/or send catalogues. The difference in pricing strategies between, say, pure Internet traders and those who have a shop should give us an idea of what to expect when the share of Internet trade increases further.

Our data consists of information an books' prices and sellers' characteristics collected in December 2000 and January 2001. Prices were taken from www.zvab.com, Germany's leading rare book digital marketplace. Our sample includes 674 books, each of which was offered at least four times in equally good condition; this allows us to calculate the deviation of an antiquarian's price from the other sellers' average price. This measure is regressed on various sellers' characteristics, partly making use of own survey data.

In November 2000, we sent our questionnaire to 568 antiquarians via email; 166 (29%) replied. However, we only used 125 of these, mainly because we restricted our sample to sellers who had at least six months' experience with e-business[5].

One thing we asked for was the share of Internet sales in relation to total sales (INTERNET), as well as the share of catalogue sales (CATALOGUE). An obvious hypothesis was that INTERNET correlates with a seller's prices, though the matter of causality is not quite clear: Mainly selling via the Internet (e.g., by giving up printing of catalogues) could require more competitive pricing. On the other hand, cheaper dealers will naturally sell relatively more via the digital

[5] Only three answers were omitted because they were incomplete, and a few sellers do not enter our sample because in their catalogues we did not find any books which at least four other sellers had. For example, one antiquarian specializes in esoterical works, which very few sellers bother to stock; another specializes in 19th century railway engineering - these books are very rare and, if nevertheless offered by competing sellers, usually not in equally good condition.

marketplace where prices are transparent than more expensive colleagues.

Other variables obtained through our survey are the years of business and e-business experience (the latter encoded as dummy variables INT1998, INT1999 and INT2000) and whether the seller uses the digital marketplace as an orientation when determining his own prices (encoded as dummy variables OFTEN, SOMETIMES, RARELY). Sellers who look up the digital marketplace often before making their own pricing decisions might be relatively cheaper due to a stronger sense of price competition. However, they might also be able to avoid "too low" prices, e.g., prices which allow arbitrage[6].

We also obtained some information on the antiquarians' characteristics directly from zvab's database, namely whether the seller runs a shop with regular opening hours (encoded as a dummy variable SHOP), and the location of the respective seller. We use dummy variables for east German, west German, Austrian and Swiss dealers (EAST, WEST, AUT and CH). Ex ante it seemed possible that it matters where the antiquarian book seller is situated. In personal communication, an antiquarian suggested that Swiss second-hand books might be a little cheaper, as collections have not been destroyed by war in this century. However, this shift of the supply curve might be offset by a strong Swiss Franc and a high per capita income.

A further variable which might have an impact on prices is the number of inhabitants in the respective city. If antiquarian book shops have some kind of market power, they will set higher prices when confronted with a larger demand.

## IV. Results

Our regression results are presented in tables 1 and 2. Except where otherwise noticed, the dependent variable $P_{REL,i}$ is a book's price charged by seller i in relation to the average price of all other sellers (j = 1, ..., n without i) who offer the respective book in an equally good condition; more formally:

$$P_{REL,i} = \frac{P_i}{(\sum_{j=1}^{n} P_j - P_i)/(n-1)} \cdot 100$$

E.g., for a seller whose price is exactly the average price, $P_{REL,i}$ would be 100. If $P_{REL,i}$ is 120, the book's price is 20 percent higher than the other sellers' average price. The coefficient of a dummy variable can be interpreted as a percentage change.

Column 1 of table 1 shows the OLS regression results, with standard error estimates being adjusted for heteroskedasticity using White's (1980) procedure. However, potential problems still prevailing in that regression are due to the fact that our sample is susceptible to outliers. For example, if a seller wants to clear his stock of a particular book outside his field of specialization and thus offers it very cheaply, then the second cheapest seller might be charging a price above the average[7]. Hence we employ different methods correcting for outliers. First, we redefine the dependent variable as a sellers price relative to median, rather than average price of the other sellers (column 2 of table 1). Regression method is still OLS, however, whereas column 3 of table 1 shows what happens when median regression is applied to the same set of variables. Median regression is a method to estimate the conditional median, rather than the mean, of the dependent variable. The main advantage of median regression, compared to OLS, is that the results are much less sensitive to y outliers (e.g., Rousseeuw and Leroy, 1987). The final column shows results of robust regression.

Table 1
OLS Regression Results and Methods Taking Account of Outliers

| | OLS | OLS; $P_i$/median as dep. variable | median regression | robust regression |
|---|---|---|---|---|
| INTERNET | 0.09472 (1.21) | 0.04084 (0.59) | 0.08245 (1.50) | 0.04003 (0.68) |
| CATALOGUE | 0.32381*** (3.72) | 0.31211*** (3.38) | 0.32627*** (5.00) | 0.24305*** (3.48) |
| SHOP | -8.16012** (-1.99) | -7.30161* (-1.96) | -0.58551 (-0.20) | -4.42869 (-1.43) |
| CH[a] | -9.58676 (-1.31) | -4.76824 (-0.72) | -4.98188 (-0.75) | -9.80486 (-1.35) |
| AUT[a] | 32.9339*** (2.59) | 35.91913 (1.64) | 21.24582*** (2.66) | 26.10182*** (2.98) |
| EAST[a] | -2.65688 (-0.39) | 1.93929 (0.33) | -0.06198 (-0.01) | 2.33952 (0.41) |
| INT1998[b] | 9.89909** (2.52) | 9.61983** (2.53) | 10.5282*** (3.55) | 8.79628*** (2.773) |
| INT2000[b] | 4.90796 (0.90) | -0.76492 (-0.19) | 5.02554 (1.50) | 3.26035 (0.90) |
| OFTEN[c] | 5.58117 (1.06) | 7.03942 (1.36) | 2.20152 (0.48) | 2.80077 (0.57) |
| SOMETIMES[c] | 4.07301 (0.88) | 2.96463 (0.70) | -2.75289 (-0.69) | -1.89644 (-0.44) |
| CONSTANT | 87.154 (11.82) | 96.23453 (13.85) | 82.31291 (13.88) | 88.89654 (13.85) |
| | $R^2$ = 0.0653 N = 674 | $R^2$ = 0.0806 N = 674 | Pseudo $R^2$ = 0.0372 N = 674 | N = 674 |

(t-statistics in parentheses, based on robust standard errors for the OLS regressions; the level of significance is denoted: ***:1%, **: 5%, *: 10%)
[a]: Reference group WEST; [b]: Reference group INT1999; [c]: Reference group RARELY

The most surprising and important thing we learn from table 1 is that the coefficient for INTERNET is not significant (and has the "wrong" sign in all specifications), though there is a considerable variance in most books' prices[8]. Increased importance of the Internet for a seller (higher share of Internet sales in relation to his total sales) is therefore not correlated with lower prices. We also obtain this result when we replace INTERNET by a dummy variable indicating a pure Internet antiquarian (i.e., INTERNET = 100).

CATALOGUE, however, is significant, and depending on the specification, we would predict a seller's price to be 2.4 to

[6] Business-to-business sales are not uncommon among antiquarians who might have a different area of specialization.

[7] One of the authors bought, via zvab, a very good copy of the authoritative catalogue of Lovis Corinth's paintings (Berend-Corinth, 1958) for 50 German marks; of 9 alternative offers, the lowest was 350 marks!

[8] Our rough estimate is that on average, the cheapest offer is 50% lower than the mean price.

3.3 percent higher if catalogue sales, in relation to total sales, increase by 10 percent. SHOP is only in two specifications significant, but with the wrong sign, thus we are on the safe side if we conclude that if a seller has a shop with regular opening hours, his prices are not systematically higher.

As for the regional dummies, the special determinants of rare book prices in Switzerland mentioned above seem to outweigh each other more or less; CH is not significant, nor is EAST, the dummy variable for east German antiquarians. AUT is highly significant in most specifications, indicating that Austrian sellers' prices are 21.2 to 35.9 percent higher than those of their west German colleagues - a finding for which we have no explanation.

The years of business experience, or corresponding dummy variables, were not significant (and are not reported in tables 1 and 2). However, the years of e-business experience matter in an interesting way. Those antiquarians who already entered zvab in its founding year, 1998, have significantly higher prices (the difference to sellers who started e-business in 1999 is 8.8 to 10.5 percent, depending on specification). This result can possibly be attributed to the "branding effect" mentioned in section II above: sellers who have been online for a relatively long period can extract a "confidence rent".

The $R^2$ which are reported in table 1 are not satisfactory, but in this respect we achieved dramatic improvements when we tried to account for possible measurement errors; see table 2. There are two possible sources for measurement errors in a broad sense. First, if the number *n* of comparable offers for a book is low (though it is under than 4 in our sample - other books were not included), then, by chance, we might happen to compare, for example, a seller who generally charges low prices to other cheap sellers rather than to a representative sample of sellers. A plausible reaction to this problem is to use *n* as a weight in the regression, but as column 1 of table 2 shows, the results, including the $R^2$, do not change much compared to table 1. Basically the same holds for our restriction of the sample to observations with $n \geq 10$ (column 2).

A second approach, however, is to restrict the sample to relatively more valuable books. The idea is that for books worth less than, say, 50 German marks, sellers do not spend much time and thought on pricing, which increases the unexplained variance. And indeed, for samples censored in this respect, the $R^2$ is remarkably higher. INTERNET in most cases keeps its counterintuitive sign and is still not significant. And compared to sellers starting e-business in 1999, it is now the less experienced sellers who charge higher prices when items are more valuable. This might be the result of a misjudgement of market conditions - or maybe newcomers want to keep the more valuable items a little longer in order to gain reputation for having them on stock. As in table 1, the dummy variable OFTEN (for the intensity of using zvab when making own prices) is never significant, but SOMETIMES is in some specifications. Other insignificant variables have been dropped and are not included in the final regression equations reported in tables 1 and 2: the number of inhabitants of the respective city has no discernable impact on prices of antiquarian books, even if they are sold in a regular shop. And the number of books which a seller offers online (ranging from 260 to 68,000 in our sample) also has no significant impact on his pricing strategy.

Though we finally end up with an $R^2$ which is quite

TABLE 2
REGRESSIONS TAKING ACCOUNT OF VARYING DATA QUALITY

| | weighted regression | OLS for at least 10 comparable offers | OLS for average price > 50 | OLS for average price > 75 | OLS for average price > 100 | OLS for average price > 125 | OLS for average price > 150 |
|---|---|---|---|---|---|---|---|
| INTERNET | -0.03808<br>(-0.51) | -0.15884<br>(-1.38) | 0.24806<br>(1.64) | 0.06418<br>(0.41) | 0.13134<br>(0.60) | 0.08285<br>(0.35) | -0.03864<br>(-0.14) |
| CATALOGUE | 0.2.9341***<br>(3.43) | 0.25653*<br>(1.86) | 0.39948***<br>(3.03) | 0.51853***<br>(2.87) | 0.75997***<br>(3.07) | 0.84783***<br>(3.14) | 0.72874**<br>(2.40) |
| SHOP | -8.28155**<br>(-2.220) | -6.57816<br>(-1.23) | -9.98808<br>(-1.25) | -12.42063<br>(-1.59) | -12.26169<br>(-1.19) | -12.11488<br>(-1.10) | -11.23673<br>(-0.77) |
| CH[a] | -9.26801<br>(-0.90) | -11.74849<br>(-1.09) | -25.27798***<br>(-3.45) | -8.75748<br>(-0.92) | -1.75441<br>(-0.14) | -6.51421<br>(-0.49) | -1.28311<br>(-0.12) |
| AUT[a] | 23.33858**<br>(2.05) | 16.93443<br>(1.33) | 51.46926**<br>(2.16) | 67.44978**<br>(2.27) | 68.35239*<br>(1.92) | 67.29002*<br>(1.88) | 141.086***<br>(7.63) |
| EAST[a] | -2.12295<br>(-0.32) | 5.98316<br>(0.56) | -5.15614<br>(-0.32) | -9.32054<br>(-0.71) | 8.40229<br>(0.84) | 12.88004<br>(1.20) | 14.06931<br>(0.93) |
| INT1998[b] | 14.50431***<br>(3.76) | 12.59846**<br>(2.09) | 5.10769<br>(0.78) | 9.16875<br>(1.25) | 12.70953<br>(1.36) | 8.81653<br>(0.86) | 2.4837<br>(0.20) |
| INT2000[b] | 2.48532<br>(0.58) | -1.76854<br>(-0.36) | 16.95872<br>(1.14) | 17.55889*<br>(1.75) | 27.9820**<br>(2.04) | 25.50839*<br>(1.67) | 28.5638**<br>(2.23) |
| OFTEN[c] | 7.5335<br>(1.30) | 8.51503<br>(1.02) | 0.94823<br>(0.10) | -3.12733<br>(-0.28) | -9.63293<br>(-0.65) | -9.9583<br>(-0.64) | 6.31717<br>(0.37) |
| SOMETIMES[c] | 2.67325<br>(0.52) | -1.50755<br>(-0.20) | 12.67046*<br>(1.69) | 5.58066<br>(0.60) | 1.09973<br>(0.09) | 4.33443<br>(0.33) | 23.85386**<br>(2.19) |
| CONSTANT | 94.02739<br>(11.61) | 102.0895<br>(8.96) | 73.88867<br>(6.29) | 81.32874<br>(5.59) | 75.87759<br>(3.42) | 76.75968<br>(3.25) | 73.63578<br>(2.90) |
| | $R^2 = 0.0921$<br>N = 674 | $R^2 = 0.1010$<br>N = 282 | $R^2 = 0.0791$<br>N = 275 | $R^2 = 0.1975$<br>N = 158 | $R^2 = 0.2796$<br>N = 99 | $R^2 = 0.3033$<br>N = 87 | $R^2 = 0.5422$<br>N = 53 |

(t-statistics in parentheses, based on robust standard errors for the OLS regressions; the level of significance is denoted: ***: 1%, **: 5%, *: 10%)
[a]: Reference group WEST; [b]: Reference group INT1999; [c]: Reference group RARELY

reasonable for a cross-section study, at least 46% of the variance remain unexplained so far. To a certain extent this is surely due to the fact that the antiquarians' characteristics which we can measure only partly determine their individual choice of the pricing strategy. Hence though our data are not suitable for estimating a fixed effects model, we did something very similar and introduced a dummy variable for every antiquarian (but one). The regression results single out some "inherently cheaper" sellers (which we cannot publish), and not surprisingly the $R^2$ increases by about 0.25 to 0.50, depending on specification. However, with this least squares dummy variable approach, we do again obtain the main results reported above; specifically, INTERNET and the price level are not correlated in the expected way.

## V. Directions for Further Research

Our results are not only of interest to antiquarians who we found were feeling insecure about the Internet's impact on their business. As the increase in transparency due to the Internet can hardly be greater than it has been in the rare book market, our findings can be seen as an upper limit to short-run effects that e-marketplaces can have in any industry. And these effects are much lower and less clear than expected. Long-run effects, of course, remain to be investigated.

A major drawback of our cross-section data set is that we do not know when the pricing decisions were made. As every antiquarian sells each item only once, pricing decisions are usually made once and for all, hence prices observed recently might not fully reflect the current market conditions. In any case, in this market it would be too early for a time series study which would most adequately capture dynamic effects. Hence the studies mentioned in section II above can investigate some phenomena on which we cannot comment, such as the dispersion of prices. We would expect that substituting the latter variable for the level of prices in our regressions would lead to similar results, as both variables are taken as indications for the effect which e-business has on competition and efficiency.

While very few antiquarians still refuse to put any catalogues online, the demand side is currently in the midst of adaptation. We conducted interviews with 53 potential and actual buyers at the "15th Antiquaria Bookfair" in Ludwigsburg in January 2001; 27 (51%) of these had already used the Internet for searching and ordering antiquarian books, most of them (n=24) via zvab, some with help of younger family members. 26 people (49%) had not used the Internet for this purpose so far, most of them (n=18) because they had no Internet access at all.[9] Though this sample might not be representative, the use of the Internet among buyers will surely become more common and price competition will become more severe. This might be outweighed by a fact which some antiquarians pointed out to us: many people never had the time or motivation to look for books in their shops; this group of buyers can now be reached.

A follow-up study after two years or so would most probably find a lower price dispersion, in accordance with long-run consequences of the Internet in other industries. With respect to the level of prices, the opposite effects of increased price competition on the one hand and new groups of buyers on the other hand do not lead to a clear prediction ex ante. However, according to our indirect empirical evidence, e-business currently contributes little or nothing to driving prices downwards.

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[9] The average age of Internet users and nonusers differed by only 3 years (53 vs. 56 years)