Magazines and their Companion Websites: Competing Outlet Channels?

1 Introduction

It is widely believed among industry participants that the internet is cannibalistic to print media. Despite that fear, many magazines have recently started to launch companion websites that make some, but not all, of the print version content available online. That led an analyst at J.P. Morgan, cited in "The New York Times" to claim that "Newspapers are cannibalizing themselves."[1] In April 2005 "Der Spiegel", Germany's leading news magazine, published a very sceptical article about the future of print media — ironically on its companion website — with the suggestive title "Too much to die, too little to survive". Pessimistic views on the relationship between magazines and the internet are quite time invariant. Already in 1997, Hickey (1997, p. 38) cites the Vice President of the media consultancy Jupiter Media Metrix who is reported to have said: "Seize the day! Either you are going to cannibalize yourself or somebody else is going to cannibalize you."

This paper analyzes whether such a "channel competition" or "channel conflict" between the virtual and the real product exists.[2] Going beyond existing research, I study to what extent companion websites matter in what particular readership segments. I use quarterly data on German women's magazines observed between 1995 and 2004 to try to draw a fairly accurate picture of the effects of companion websites on circulation that I make dependent on readership age, online penetration as well as on how long a companion

[1] Cited by Seelye (2005).

[2] See Alba et al. (1997), Brynjolfsson and Smith (2000) as well as Coughlan et al. (2001) for more detailed discussions of channel competition between the Internet and real markets.

website has been present.

Attention is restricted to German women's magazines because in Germany there exists particularly rich and externally audited media data and because the women's magazine market is the hardest fought market segment.[3] My data covers the entire German women's magazine market. German women's magazines have been front–runners in establishing magazine websites. The first German women's magazine went online as early as in spring 1996. Two directly competing magazines followed the same year. By the end of 2004, 15 women's magazines out of a total of 41 magazines active in the market provide an own website. The German womens's magazine market is also is quite relevant on a global scale: it is the second largest women's magazine in the world according to FIPP (2004). Five out of the 44 magazines I study are ranked in FIPP's worldwide Top 50 for women's magazines. The total German magazine market is the second largest worldwide, both in terms of circulation and advertising revenues (FIPP 2004).

My estimation results show that the effect of companion websites on circulation varies substantially across time, readership age and internet adoption by readers. Main trends are, however, that companion websites indeed had negative effects on circulation between 1996 and 2000. There were neutral effects in 2000, and 2002. Since then, the effect has become positive and economically sizeable. The estimated average companion website effect on circulation is 6.5 percent in II/2004. That this initially negative effect turned positive over time is consistent with magazine editors learning how to optimally position

[3]In 2004, 41 women's magazines titles were published, more than twice as many as in the second most densely populated segment, TV magazines. Market concentration, as measured by the Hirshman–Herfindahl index, is much lower in women's magazines than in any other segment, and this is true both in the magazine demand dimension and in the advertising demand dimension.

their websites relative to the print version over time and with the internet originally attracting readers that are particularly prone to switching from the print version to the internet.

A high share of readers that regularly use the internet goes along with larger and positive effects of companion websites on circulation. Given continuously rising internet penetration rates this implies that channel competition will be even less of an issue tomorrow than it is today. Even if all readers adopted the internet the average effect of companion websites on circulation would not go beyond 9.3 percent per quarter. Average internet adoption rates were 36 percent with a maximum of 70 percent and a minimum of 16 percent in 2004.

The effects of companion websites not only strongly depend on internet adoption by readers but also on readership age. Companion websites appear to be a means to attract readers between the age of 14 and 19 as well as between 20 to 29 who might use the companion website for sampling rather than as a substitute. Comparatively small but still positive effects are found for readers aged 30–39 and 50–59 while there is evidence for small and negative effects for readers aged 40–49 years.

Interestingly, my estimation results indicate that magazines act rationally in the sense that magazines that do not run websites would loose readers if they went online.

There also is evidence for positive spillover effects of companion websites maintained by other magazines from the own subsegment which again is consistent with consumers sampling existing products online.

2 Companion websites and magazine circulation

2.1 Discussion

Magazines are, at least in principle, ideal goods that can be distributed online. Their online distribution is associated with a low outlay and they are frequently purchased. Shapiro and Varian (1999) point out that channel competition might indeed be more imminent when information products are delivered online.

There are, however, at least three main ways in which companion websites could actually have a positive effect on magazine demand: (i) "awareness", (ii) online subscription and (iii) additional service.

(i) *Awareness:* Companion websites allow consumers to "sample", i.e. to get an idea about a magazine free of charge, and hence may generate consumer awareness. If the online and offline readership differ with respect to readership characteristics, then a magazine's companion website extends market reach (Nicholson 2001). Joukhadar (2004) for example points out that companion websites may attract a more technology savvy readership than the print version. Many magazines also offer a preview or at least a table of contents of the current or forthcoming print version, so that prospective consumers can learn about the printed magazine.[4] These sampling effects are at the core of an analysis of record sales and music downloads by Oberholzer–Gee and Strumpf (2004), whose empirical evidence suggests that music downloads act as appetizers for a later record purchase. An Internet presence might thus be seen as "a necessary step in the effort of a magazine to broaden and deepen its audience", as argued by Barsh et al. (2001, p. 91) and Matlin (2005).

(ii) *Online subscription:* All companion websites in my data offer an online subscription

[4]Today, in July 2005, all magazines publish table of contents.

possibility and, for this reason, a particularly cheap and cost-effective way of subscribing. Observers of the US publishing industry, such as Capell (2004) and Barsh et al. (2001), believe that online subscription is an important feature of companion websites. The importance of online subscription is also underscored by Bernd Ziesemer, editor–in–chief of "Handelsblatt", a German daily specialized on economics and business matters, who argues that "most websites are run at a loss. In certain areas, for example in online subscription, website provision actually pays off."[5]

(iii) *Additional service:* Existing studies, like Barsh et al. (1999) and Silk et al. (1999), point out that a key factor determining the relationship between "real" and "virtual" versions of a print medium is the relative positioning argument of the two outlet channels. This relative positioning argument is also emphasized in econometric work by Deleersnyder et al. (2002), Pauwels and Dans (2001) and Simon (2004). If the companion websites are just "shovelware", where contents of the print medium are moved to the website, substitution will be more likely. If the companion website offers additional service, it might well be a complement (Barsh et al. 1999).[6]

2.2 Existing studies

There are two groups of existing empirical studies. The first group uses time series econometric methods. The second group uses structural microeconometric models to evaluate the effects of websites on print media demand.

[5]Statement from a round table discussion hosted by the German Federal Ministry of Education and Research in Berlin on November 9, 2001.

[6]Note that I do not observe the companion websites' characteristics. There is no data archive in Germany that allows me to track websites back to their launching date. Even if I could, a definition of a companion website's relative positioning is largely arbitrary and thus subject to measurement error.

To start with the former type of approaches, Deleersnyder et al. (2002) test for structural breaks in monthly circulation time series of 67 daily newspapers from Great Britain, observed between January 1990 and June 2001. The authors find that few newspapers experience a drop in circulation due to the existence of a companion website. The effects are, however, disperse and economically fairly small.

Similarly, Pauwels and Dans (2001) analyze twelve Spanish newspapers using tests for unit roots and cointegration. Their main finding is that circulation increases digital visits, but they omit to analyze reverse causality.

In a study for the German magazine market using Granger non–causality tests, Kaiser and Kongsted (2005) find very robust evidence for positive effects from website visits to circulation but do not find evidence for causality running in the opposite direction.

Substantial differences exist between microeconometric studies, both with respect to methodology and results. Gentzkow (2003) uses consumer survey and media consumption data for 16,171 adults from Washington D.C. His main finding is that print and online editions of the same newspaper are weak substitutes.

Highly significant and negative effects of website presence on the demand for Italian national newspapers are found by Filistrucchi (2004). He uses a logit–type demand model and measures the effect of website provision by a simple dummy variable.

Evidence for the US magazine market is provided by Simon (2004) who applies a simple linear demand model to analyze the effects of website presence and content overlap between the print version and the companion website. His results suggest that a magazine's print circulation on average declines by about three per cent when it offers a website. This effect decreases with decreasing overlap between online content and print content.

3 Background information

3.1 Website launching

Visits to the companion websites in July 2001, March 2004 and July 2005, along with an inspection of the print versions, showed that there is at least superficially a large overlap between the magazine contents and the main website contents. Contents related to "Beauty and fashion", "Love and partnership", "Diets and nutrition", "Recipes" etc. play an equally important role in both the print versions and the online editions. It turns out, however, that articles appearing in the most recent print version are not accessible on the internet, which considerably limits the degree of substitution between online version and the print edition. There also is the general question whether the experience of reading a magazine on the sofa is the same as the experience from reading the online version sitting in front of a computer. Instead of placing full–text articles online, the magazine websites contain information that might be termed "time–independent", meaning that they allow to gather information that is not subject to very recent developments, for examples articles that appeared in earlier print versions.

Whatever their motives are to launch a website, many women's magazines are online today. Table 1 displays what magazines from what groups went online at what point in time. The grouping of the magazines follows industry convention, for example Jahreszeitenverlag (1996–2002).[7]

[7]The labelling of the magazine groups "monthly highly priced" and "monthly medium priced" is not very suggestive. "Monthly highly priced" magazines for example could more assertively termed "haute couture" magazines while "monthly medium priced" magazines should be labelled "fashion, style and partnership" magazines.

Insert Table 1 about here!

Table 1 indicates that there are two distinct entry cohorts: the first entry wave was around 1996/1997, the second one more recently around 2000/2001. There are two women's magazines companion websites, that of "Maxi" and "Woman" that I miss in this study since they were launched after the end of my observation period.

3.2 Reader characteristics

There are substantial differences between readers of magazines that maintain a companion website and those that do not. Magazines with a companion website tend to enjoy a statistically significant higher circulation as tests for identity of means and medians show — at least uncontrolled for magazine groups. Once the tests for differences in circulation are run group–specific, it turns out that there are no significant differences in circulation for biweekly classical and girl's magazines, that monthly high priced and weekly advise giving magazines magazines with a website sell more than competitors without a companion website and that the reverse is true for monthly medium priced magazines.

Magazines with and without companion websites also differ significantly with respect to age and online adoption of readers: magazines with companion websites have readers that are both younger and more internet–affine than magazines without an online companion. My econometric models explicitly takes such differences in reader characteristics into account.

3.3 Specific features of the German magazine market

There are two facts about the German magazine market in general and about women's magazines in particular that are important and that distinguish the German magazine market from for example the US magazine market. The first is that subscription rates and cover prices are almost identical. Comparisons of cover and subscription prices in October 2001, November 2003 and May 2005, which included all magazines considered in this study, shows that for 26 magazines subscription and cover prices are exactly the same. For 13 magazines the subscription price is *higher* than the cover price, with a mean price difference of 17.9 per cent. This is the case for the low–priced magazines which do not directly offer subscriptions. Instead, consumers turn to retailers who charge fees for their services to have the magazines delivered. For twelve magazines consumers save when they subscribe (with the mean saving being 10.5 per cent). I therefore consider the differences between cover and subscription prices as sufficiently small to be neglected. This might of course introduce measurement error, so that there is the danger of obtaining biased coefficients on cover prices in the econometric analysis, but the instrumentation of prices I apply will take care of this.

A second issue is that access to the websites of women's magazines is free of charge. Nor are website visitors required to reveal any information about themselves.

4 Empirical specification

4.1 Basic model

Discrete–choice models of product differentiation (Anderson et al. 1990; Berry 1994) provide my framework for studying the determinants of demand for women's magazines. Internet provision is considered as a quality characteristic in a 'Nested Logit' model of product differentiation.

The nested logit model is a popular choice among empirical researchers since it is computationally simple. Its simplicity comes at a cost, however: it places restrictive assumptions on own and cross–price elasticities, so that recent research uses the more flexible random coefficient model to estimate models for differentiated product demand (Berry et al. 1995; Davis 2000; Nevo 2001; Petrin, 1998).

Apart from the fact that own and cross–price elasticities are not of interest here, the nested logit model may well be appropriate for the market studied here. My magazines are very much alike *within groups* if one compares, for example, content pages, advertising pages and magazine content shares (the share of e.g. beauty, fashion, wellness pages etc.). By contrast, for example a fashion page of a magazine from the 'monthly high priced' magazine category looks very different from a fashion page of a magazine from the 'monthly medium priced' magazine category. This suggests that being a member of one of the six magazine groups is an important quality characteristic of a magazine. It hence seems worthwhile to use the nested logit model based on this grouping in the econometric analysis since the nested logit model places random coefficients on dummy variables for the six magazine groups. I also introduce more flexibility into the estimation by estimating age–specific nested logit type demand functions, e.g. I estimate magazine demand by

readers in different age groups.

The nested logit model for differentiated product demand is well described in the existing literature so that there is no need to go into great detail here.[8]

The nested logit demand equation I estimate is

$$ln(s_{jt}/s_{0t}) = \boldsymbol{x_{jt}}\boldsymbol{\beta} + \alpha p_{jt} + \sigma ln(\bar{s}_{j|gt}) + \boldsymbol{\kappa}\boldsymbol{w_{jt}} + \tau_t + \xi_{jt}, \quad (1)$$

where the subscript jt corresponds to the jth magazine observed at time t. τ_t denotes demand shocks that are the same for all magazines (I use a full set of period dummies to take them into account) and ξ_{jt} is a time–specific quality characteristic of magazine j that is unobserved to the econometrician. Magazine j's market share at time t is denoted by s_{jt}. The market share of the 'outside good', which is needed in order to identify the model, is defined as total market size at time t, M_t, minus the circulation sum of of the N 'inside goods', q_{jt}, relative to total market size: $s_{0t} = (M_t - \sum_{j=1}^{N} q_{jt})/M_t$ (likewise $s_{jt} = q_{jt}/M_t$).[9] In accordance to industry practice (AG.MA 2001), I define total market size as the the number of women aged 14 years and above that live in Germany. $\boldsymbol{x_{jt}}$ is a vector of magazine characteristics that is linked to relative market shares; $\boldsymbol{\beta}$ is a parameter vector. Elements of $\boldsymbol{x_{jt}}$ are the natural logarithm of the number of content pages and its square, the ratio of advertising pages to the total number of pages and its square, 21 "content shares", i.e. the share for example of fashion pages in the total number of

[8]Note that the logit demand type framework allows consumers to purchase more than one magazine as long as the magazine purchase decision is uncorrelated with the number of magazines bought (Rysman 2004).

[9]Magazines come with different periodicity: weekly, biweekly and monthly. I adjust market size accordingly by defining market size for weekly (biweekly, monthly) magazines to be twelve (six, three) times the number of women aged 14 years and above.

pages,[10] the Hirschman–Herfindahl index of content concentration (the sum of the squared 21 content shares) and its square and dummy variables for weekly of biweekly periodicity (the comparison group is monthly magazines). My specifications also include the share of other magazines of the own magazine group that maintain a website to study if competing magazines' website presence increases own demand (for example due to sampling effects) or if it decreases it (for example due to substitution effects).

The parameter σ measures the degree of product substitution within product groups. If $\sigma = 1$, products within product groups are perfect substitutes and if $\sigma = 0$, products are symmetric and the 'simple logit' model without random coefficients is obtained. The substitution parameter maps the market share of magazine j in group g (i.e. in one of the six magazine groups) at time t, $\bar{s}_{j|gt}$, to total relative market shares.

The term $\boldsymbol{\kappa w_{jt}}$ represents my measures for website effects. I estimate three different specifications that are supposed to capture the effect of having a website. In the first and most simple specification, the website effect is represented by a dummy variable, denoted by $website_{jt}$. It is coded one for each period in time magazine j runs a website (and zero otherwise). This specification ignores readers' internet adoption rates which is why my second specification contains the website dummy and its interaction with the share of readers that regularly use the internet, $onlineshare_{jt}$, and its square. It is my third specification where I include a variable that measures for how long a website has

[10] These 21 content shares are fashion for purchase, self–crafted fashion, cosmetics, cooking, interior design, handicraft, children, partnership, society, vacation, counselling, hobby, cars, politics, science, the arts, sensational journalism, TV, fiction, sexuality, VIPs and service pages of the editors (Table of Contents etc.) with health being the comparison content share that is dropped to avoid perfect collinearity with the constant term.

been present, $onlineduration_{jt}$. This variable captures both learning effects on behalf of the magazines — magazines learn how to position the website relative to the print version — and on behalf of the readers — readers learn about the presence and contents of the website. The latter learning effect is likely to be affected by readers' internet adoption which is why I also include an interaction of $onlineduration_{jt}$ and readers' internet adoption.

My specifications of the website effect on magazine demand are hence the following:

$$\begin{aligned}
\boldsymbol{\kappa w_{jt}} &= \kappa_0 \text{ website}_{jt} \\
\boldsymbol{\kappa w_{jt}} &= \kappa_0 \text{ website}_{jt} + \kappa_1 \text{website}_{jt}\text{onlineshare}_{jt} + \kappa_2 \text{website}_{jt}\text{onlineshare}_{jt}^2 \\
\boldsymbol{\kappa w_{jt}} &= \kappa_0 \text{ website}_{jt} + \kappa_1 \text{website}_{jt}\text{onlineshare}_{jt} + \kappa_2 \text{website}_{jt}\text{onlineshare}_{jt}^2 \\
&+ \kappa_3 \text{onlineduration}_{jt} + \kappa_4 \text{onlineduration}_{jt}\text{onlineshare}_{jt}.
\end{aligned}$$

All specifications are static in the sense that they do not allow past website presence to affect current demand. Specification tests did not provide evidence for such lagged effects to be present. They neither provided evidence for non–quadratic effects of internet adoption.

4.2 Extended model

The model outlined above largely ignores, apart from internet penetration, observed consumer heterogeneity. My data does, however, for example contain information on the age structure of readers. It seems likely that consumers' valuation of companion websites is different for consumers of different age. While Equation (1) estimates the average effect of magazine characteristics across all consumer age groups, my model extensions estimate the effects of magazine characteristics on consumers of different age. I differentiate between six different age groups, readers aged 14–19, 20–29, 30–39, 40–49 and 50–59. Two additional age groups exists, consumers between 60 and 69 years of age as well as con-

sumers above 70 years of age. The estimation results for this age group appeared to be implausible so that I do not present estimation results for these age groups here.[11] My estimation equation hence is:

$$ln(s^a_{jt}/s^a_{0t}) = \boldsymbol{x_{jt}\beta} + \alpha p_{jt} + \sigma ln(\bar{s}^a_{j|gt}) + \boldsymbol{\kappa w_{jt}} + \tau_t + \xi_{jt}, \tag{2}$$

where the superscript a denotes the ath age group. Total market size now is the number of women in age group a with residence in Germany. The term s^a_{jt} hence measures circulation of magazine j at time t for consumers in age group a relative to all consumer in age group a. This is also why my the mean companion website effects across the age–specific estimates does not coincide with the mean effect estimated from the basic model. A practical problem in the estimation of companion website effects arises from the fact that my data does not contain information on website adoption by readership age. While this appears to be less of a problem for the younger age groups (there is a high and positive correlation between the share of readers in the below 50 years age groups), it might be a problem for the older age groups where the the correlation between age and online adoption is large and negative).

4.3 Identification

Equation (1) and Equation (2) could in principle be estimated by OLS. Since both consumers and producers know the unobserved (to the econometrician) magazine quality component, ξ_{jt}, producers take its value into account in its pricing decision which in turn

[11] For example, demand is increasing in price, a finding that is independent of my choice of price instruments. The implausible results could be due to particularly large consumer heterogeneity in the old age segment for example due to difference in health status or due to difference in occupational status (retired, on part–time leave, fully employed etc.)

induces a positively correlation between ξ_{jt} and magazine cover price p_{jt}. This leads to a downward bias in the parameter estimates that correspond to the price coefficients α, calling for an instrumentation of cover prices. By the same token, within group market shares need to be instrumented as well.

My construction of the cover price instruments is based on the idea is that cost shocks occurring to magazines other than magazine j will be correlated with cost shocks occurring to magazine j, and hence — to the extent that cost shocks are carried over to cover prices —, prices of magazines other than magazine j will be correlated with magazine j.[12] They will, however, be uncorrelated with unobserved quality characteristics ξ_{jt}. I construct three different instrument sets based on this idea: (1) the average cover price across all magazines published in Germany, (2) the average cover price across all women magazines and (3) the average cover price across magazines in the own publishing group. Instruments (2) and (3) were rejected by tests for overidentifying restrictions in almost all specifications so that only instrument set (1) is used in the empirical analysis. I will henceforth call it the "main cover price instrument" although I use additional variables as instruments for price.

It is well documented that (functions of) other products' (other magazines) characteristics are valid instruments for prices and within group market shares since the pricing equation associated with differentiated product demand models depend on the characteristics of the other products. Existing studies have used the means of the characteristics of other products as instrument for product prices and the means of the characteristics of products from the own product group as instruments for within group market shares (e.g.

[12]This assumption is related to Hausman (1996) and Nevo (2001), although our setups differ substantially.

Verboven, 1996). I follow this approach and use the following variables as instruments for cover prices and within group market shares: the ratio of own advertising pages to the total number of advertising pages in the women's magazine market, the ratio of own advertising pages to the total number of advertising pages in the own group, the ratio of own content pages to the total number of advertising pages in the women's magazine market, the ratio of own content pages to the total number of advertising pages in the own group, the ratio of own pages to the total number of advertising pages in the women's magazine market and the ratio of own pages to the total number of advertising pages in the own group. As additional cost–side instruments I consider the total number of pages produced by the own publisher in the respective quarter (cost may decline due to returns to scale in production), the total number of titles produced by the own publisher and total number of titles produced by the own publisher (cost may decline due to returns to scope in production). All three instruments exclude the respective own magazine in their calculations.

Tests of orthogonality of these instruments show that some of the instruments cannot be accepted for some specifications which is why I use different sets of instruments in the different estimations. Since contemporaneous orthogonality of some instruments cannot be accepted either, I lag the instruments by four periods. Note that this does not lead to a loss in the number of observations since my information on the instruments goes back to 1972.

For an instrument to be valid it has to have two properties: (i) there must be a high correlation between the instruments and the variable to be instrumented and (ii) the instruments and the residual of the estimation equation of interest must be uncorrelated. In order to check the first property I have run auxiliary OLS regressions of the instruments

and the exogenous variables on cover prices and within group market shares (a so–called 'first stage reduced form estimation'). The instruments were jointly highly significant in these auxiliary regression, indicating a high correlation between the instruments and the variables to be instrumented. Estimation results for the auxiliary regressions for my specification of main interest are presented in Appendix A. The second property, the non–correlation between the residuals and the instruments, is tested by J–tests as shown in the result tables. In addition, I test if individual instruments are truly exogenous using C–tests. These tests cannot reject that the instruments are also individually orthogonal. The magazine demand models are estimated using the GMM routine of the software package Stata/SE 8.2.

5 Data

My data set consists of quarterly information on all German women's magazines that existed between the first quarter of 1995 and the second quarter of 2004. The minimum number of magazines per period is 30, the maximum is 44. A total of 1,412 observations is used in the estimation. Data on circulation, cover prices, editorial pages and advertising pages were downloaded from the internet at http://medialine.focus.de. This data has been updated quarterly since 1972 and is continuously recorded. The original source of this information is "Information Association for the Determination of the Spread of Advertising Media" ("Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern e.V", IVW). IVW ascertains, monitors and publishes circulation and magazine dissemination information.

This data is supplemented by annual information on magazine contents that I received

from the publishing house Jahreszeitenverlag (Jahreszeitenverlag 1995–2004).

This information on magazine characteristics is supplemented by data on magazine reader characteristics that was provided to me by the "Arbeitsgemeinschaft Media–Analyse" (AG.MA), an association of the German advertising industry for research on mass communication. AG.MA is the German equivalent to the US Audit Bureau of Circulation. The purpose of the AG.MA is to gather and supply data for media audience measurement. The original source of the AG.MA data is a consumer survey that is annually collected by the "Institut für Demoskopie, Allensbach", Germany. Around 20,000 interviews are realized annually.[13] AG.MA also provided me with data on the share of readers in the seven different age groups and with data on the share of readers that regularly uses the internet. More detailed data on internet use is unfortunately not available.

A final piece of information is website presence. The date a magazine launched a website was assembled by my own by email and telephone inquiries at the editorial staff of the magazines.

Descriptive statistics of the variables involved in the estimations are shown in Appendix B.

6 Estimation results

6.1 Estimation results for model without age differentiation

Table 3 displays estimation results for the basic specification without age differentiation. Model (1) is the specification that includes website dummy only, Model (2) contains the website dummy and interactions with readers' online use and Model (3) combine the two

[13]For more information on this data, see http://www.awa-online.de/.

previous models.

Model (1): website dummy only

The coefficient on the website dummy is insignificantly different from zero indicating that website presence alone does not have an effect on relative market shares. This result also persists in the other three specifications shown in Table 3.

Model (2): website dummy and interactions with online use

It is the interaction with readers' internet use in combination with website presence that has jointly statistically highly significant effects. Both interactions between the website dummy and internet adoption are positive with the quadratic effect being much smaller than the linear one, indicating decreasing effects of readers' internet adoption to circulation. Since the website dummy alone is negative (and statistically highly significant), it also means that the effects of website presence have been negative in early years and have turned to be positive more recently. Figure 1 displays the estimated effects of maintaining a website for those magazines that run a website (the so–called "treatment on the treated" effect). Appendix C describes how these effects are calculated.

Insert Figure 1 about here!

There are two explanations for the phenomenon of initially negative and now positive effects of companion websites on magazine circulation: (i) editors have learned how to optimally position their websites relative to the printed version such that both products become complements or (ii) reader attitudes towards the companion websites have changed. It could be, for example, that companion websites initially drew in consumers who were particularly prone to substitute away from the print version. Now that internet

use is widespread, this effect might have been washed out. Unfortunately I am unable to explicitly discriminate between these two effects. The age distribution of readers is almost constant over time for each magazine, however; there is little "within" variation. Assuming that consumer age is an important observable determinant of the way the internet is used, this may give some indication in favor of an improved ability of editors to position companion websites.

The treatment–on–the–treated effect is most negative in 1996 where website presence is associated with a mean decrease in circulation by 6.4 percent. This is of course unreasonably high given 1996 internet adoption rates of 0.2 percent (maximum 3 percent). Note, however, that only two magazines were online in 1996 so that this effect might not be properly identified. The effect is largest in 2004 where it is estimated at to be 5.3 percent. Due to substantial differences in internet use across readers, these effects vary widely across magazines. For example, the largest website effect, 19 percent, is attributed to "Amica", a monthly medium priced magazine with a share of readers that regularly use the internet of 70 percent in 2004, the highest in the entire market. By contrast, the smallest effect, -2 percent, is measured for "Bild der Frau", a weekly advise giving magazine an internet adoption of readers of 26 percent.

Model (3): website dummy, interactions with online use and duration of website presence

My final specification tries to explore the issue of learning on behalf of the magazines a bit further. It includes a variable that measures how long a companion website has been online. This in principle is a good measure for changes in the relative positioning of the website. It it is, however, not clearly indistinguishable from learning on behalf of the consumers who get used to the companion website and find out to what extent the website is complementary or substitutive. I try to control for consumer learning by

interacting online duration with readers' online adoption. The estimation results for the interactions between the website dummy and online adoption and its square now indeed differ compared to model (2): the coefficient on the linear interaction is positive now while the coefficient on the quadratic interaction is negative, implying a concave impact of internet adoption on the effects of companion websites on circulation. This concavity is counteracted by the significantly positive interaction between online duration and internet adoption. As a consequence, the circulation–maximizing rate of internet adoption depends on how long magazines have been online. For a magazine that has been running a companion website for one year, it for example is 20 percent meaning that if internet adoption is above that rate a companion website might induce channel competition on the print version, at least in the short run.

Insert Table 3 about here!

The coefficient on online duration is significantly negative while that of the interaction between online duration and internet adoption is positive which means that with increasing internet adoption, the effect of online duration turns positive: online duration and internet adoption are complements. Figure 2 shows the relationship between treatment–on–the–treated effects and online duration.

Insert Figure 2 about here!

To analyze the relationship between internet adoption and the circulation effects of companion websites, Figure 3 plots both variables against one another. It shows that the website presence effects turn positive when internet penetration is above around 30 per-

cent. The plot also shows that the effects increase with increasing internet adoption rates.

Insert Figure 3 about here!

The overall effect of website presence is not clear from the estimation results displayed in Table 3. Figure 4 therefore displays the mean effect of website presence for the period 1996 to 2004 along with the point estimates for each magazine. The figure shows that companion websites initially had negative effects on circulation that were also economically sizeable until 1999 when a turning point was reached. In 2000 and 2001 the average effect became neutral and increased since then to a value of 6.5 percent in 2004. Figure 4 also shows that the effects of website presence vary widely across magazines which is because internet use by readers varies widely as well. The maximum effect is as high as 19 percent (again "Amica"), the minimum is -2 percent (again "Bild der Frau").
"Amica" and "Bild der Frau" are clearly very different magazines with completely different target audiences, not only with respect to internet use. More than half of the readers of "Amica" are between 20 and 39 years old while almost half of the readers of "Bild der Frau" is above 60 years old. It seems plausible that the effect of website presence depends on a combination of internet usage by readers and readers' age profile. In the next Subsection I therefore analyze the effects of companion websites on the demand for magazines by readers in specific age groups.

Insert Figure 4 about here!

Other results of Table 3 are that the coefficient on price is highly significantly negative as expected implying downward sloping demand curves and that there is high substitution

of products within group, as indicated by values of σ ranging between 0.6786 and 0.7240. Website presence by competitors is estimated to have a significant and positive effects on own demand. This provides evidence for positive sampling effects running from the website presence of competing magazines to the own magazine.

Readers either like magazines with few editorial pages per issue or with many (the minimum is reached at around 50 editorial pages which is a bit lower than the mean number of editorial pages). Consumers appear to like advertising. There are concave effects of the share of advertising pages with a maximum being reached at around 70 percent, almost three times as the mean share of advertising pages. Magazine readers appear to have a taste for content variety. The effect appears to be convex but the implied demand–minimizing concentration index is not observed in the data. Magazines that come out monthly are more popular than weekly or biweekly magazines.

6.2 Counter–factual evidence

The structural model adopted in this paper allows me to conduct counter–factual analyzes such as asking to what extent circulation changes if a particular magazine goes online (and vice versa). Figure 5 displays the inferred companion website effects for those magazines that are not online in a given year. It shows that magazines that do not run a website on average lose consumers to the internet if they went online, at least in the period from 2000 onwards. A turning point was, however, reached in 2003 so that the long–run effects of companion websites may well be positive.

Two magazines, "Woman" and "Maxi" launched companion websites after the end of my observation period. Both had particularly large effects (compared to the other non–online magazines) of website launching in II/2004: 2.8 percent and 0.85 percent respectively.

6.3 Estimation results for the model with age differentiation

Table 4 displays estimation results for the age group specific models. The models were initially run with the base model specification with all interaction, Model (3). Wald tests for joint significance along with tests for separate significance showed, however, that the base model is over–parameterized which is why I left out some variables in some specifications. The exception is the age group 14–19 years where the base model was statistically highly significant but produced unreasonably high estimates for the website effects, due to a particularly large coefficient on the online duration/internet adoption interaction variable. I therefore added a quadratic online adoption interaction which turned out to be statistically significant and also produced more reasonable website effect estimates. As for the base model, I again tested for the presence of higher order polynomial in the online adoption interactions and did not find any (except for the 14–19 years age group).

Insert Table 4 about here!

The parameter estimates differ quite substantially between the different age groups (and so do online durations and internet adoption rates) so that common patterns cannot be identified. Figure 6 therefore shows the mean effects of companion websites presence on magazine circulation. Companion websites started out having a negative effect for the three oldest age groups while they had a positive but steadily decreasing effect on the two youngest age groups. Companion website effects turned positive effect between 1999 and 2000 for all but the 40–49 years age group that never reached a positive predicted website effect. Since then, the effects of companion websites have been positive and particularly large for the two youngest age groups, 14–19 years and 20–29 years, followed by the groups

of the 30–39 and 50–50 years old.

Insert Figure 6 about here!

As in the base specification, website presence of competing magazines again have a significantly positive effect on magazine demand with the exception of the age group 30–39 years where it is insignificant.

The results for the other variables also widely differ across age groups so that my discussion focuses on the usual main demand parameters, price and within group market share. The estimates for the price parameter α indicate that price sensitivity is largest for younger consumers, possibly reflecting a high positive correlation between age and income. There are also substantial differences in the extent to which consumers of different ages find magazines to be substitutable within groups. It is largest for very young consumers and lowest for the 50–59 years old.

6.4 Caveats

This paper comes with (at least) six potential caveats. The first is that I do not have information on website traffic. If a magazine's website is of poor quality potential, magazine readers do not visit it and hence there is no relationship between the online version and the print version. One would, however, term the websites I study "high quality" websites since they are for example very well designed and daily updated, which is not surprising since the websites' technical maintenance is outsourced to professional website design firms.[14]

[14]The German website visits data used in Kaiser and Kongsted (2005) is only available for a small fraction of magazines.

The second potential caveat is that I also do not have information on what fraction of magazine consumers also visit the corresponding magazine website. The only evidence I have is for the biweekly classical magazine 'Brigitte'', for which the publisher claims that 95 per cent of the website visitors also purchase the print copy.[15]

The third potential caveat is that the results I find in this paper might not be generalizable for three reasons: (i) website access is free of charge in the market I consider, (ii) internet penetration is slightly lower in Germany than it is in the U.S. (but internet penetration rates are similar across most EU countries) and (iii) articles in the current print edition are not moved to the internet. Inversely, I do believe that my results are generalizable to other magazine markets that also offer free website access, do not make the articles of the current print version available online and for countries that have similar internet penetration rates. That is to say I believe that they are applicable to most other European magazine markets. I also do not think that focussing attention to women's magazines is a severe restriction. As mentioned earlier, women's magazines were the front–runners in launching websites so that it is *the* market to look if one ones to study website effects.

The fourth potential caveat is that I might not have included all relevant magazines in my analysis. I.e. there might be other magazines in the German magazine market that could be substitutes to the magazines I consider in this paper. My first line of defense is that my market definition is borrowed from industry professionals who I believe know their market well. My second line of defense builds on the very definition of women's magazines: they are primarily read by women. I use the 'Arbeitsgemeinschaft Media–Analyse' data I introduced in Section 5 to check if there are magazines around that have a primarily female

[15]This statement is made on the publisher's website at http://www.ems.guj.de/portfolio/index_fremd.html?http://www.ems.guj.de/portfolio /port.php?id=2&header=brigitte.

readership and that I did not include in my analysis. The first descriptive finding is that the mean (median) share of females readers is 86.7 (88.5) per cent for women's magazines and 48.8 (50) per cent for non–women's magazine. The second descriptive finding is that there are eleven non–women's magazines that have a female readership share of more than 80 per cent — these eleven magazines could indeed by substitutes to the magazines I consider in this paper. All eleven magazines, however, very narrowly focus on a single issue such as handicraft, cooking, children or fiction, with either of these content shares making more than 80 per cent of the magazine. This is in sharp contrast to the magazines I consider, where none of the magazines ever had a single content share of more than 20 per cent, suggesting that magazines with a narrow focus are not good substitutes for the magazines I include in my analysis.

The fifth potential caveat might lie in the fact that none of the magazines inside the "yellow" magazine group maintains a website, which could influence the estimation results. Leaving the magazines from this magazine group out in the estimation did not qualitatively change the estimation results at all.

Finally, I do not have information on the positioning of the companion website relative to the print version. Having objectively measured data on content overlap would of course be desirable. Apart from the practical problem that comparing both version means to compare all online and all print versions back to 1996 and that "Wayback" online archives as Simon (2004) uses do not exist in Germany, the way overlap is measured is questionable.

7 Summary and conclusions

Print media representatives and observers of the print media market often argue that magazine's companion websites execute "channel competition" between the online and offline outlet. This paper tests this assertion on fairly detailed data on magazine and consumer characteristics for the German women's magazine market that spans the period I/1995 to II/2004.

The results indicate that there is no evidence for channel competition for the years since 2001 while there indeed is evidence for channel competition for the previous years. The effects of companion websites on magazine demand are estimated to depend strongly on consumer age and internet adoption by magazine readers. Comparison websites tend to have positive and larger effects for magazines with a more internet–affluent readership. This provides evidence for the dominance of sampling rather than substitution effects of companion websites. Magazines with a young readership structure tend to benefit more from companion websites than magazine with older readers.

As magazine websites age, the effects of maintaining a companion website become larger and positive. This could be attributable to editors learning how to optimally position their magazine website. There also is a positive relationship between online adoption and website effects.

This study hence offers a quite differentiated look — differentiated by readers' internet adoption and reader age — on the effects of companion websites on magazine demand. It finds that the pessimistic views of industry participants are exaggerated and that the positive effects of companion websites on demand can be economically sizeable, in particular for young readerships with high internet adoption rates.

Table 1: Magazines' online history

	Online since
Group 1: biweekly classical magazines	
Freundin	I/1996
Brigitte	IV/1997
Journal für die Frau	I/2001
Für Sie	I/2001
Group 2: girl's magazines	
Joy	IV/2000
Bravo Girl	II/2001
Mädchen	I/2001
Brigitte Young Miss	II/1999
Group 3: monthly high priced magazines	
Elle	I/1996
Madame	I/2003
MarieClaire	II/2002
Vogue	III/2000
Group 4: monthly medium priced magazines	
Petra	III/2000
Allegra	I/1997
Cosmopolita	I/1998
Amica	I/1998
Group 5: "yellow" magazines	
no companion websites	
Group 6: weekly advise giving magazines	
Bild der Frau	II/2002

Table 2: Differences in circulation and reader characteristics between magazines with and without companion website

	W/o companion website	**W/ companion website**
Circulation	58,842	88,161
Onlineshare	8.1	30.4
Share 14–19	7.9	17.1
Share 20–29	12.3	21.3
Share 30–39	15.8	21.2
Share 40–49	15.0	16.2
Share 50–59	15.8	11.7
Share 60–69	15.9	7.0
Share > 70	17.3	5.5

Note: The table displays mean circulation, the mean share of readers that regularly uses the internet and the mean share of readers from seven different age groups of magazines with and without a companion website. Both t–tests for identity of means and ranksum tests for identity of medians cannot reject that the respective figures are significantly different from one another.

Table 3: Estimation results for base model

	Model (1)		Model (2)		Model (3)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
α, cover price	-0.1687***	0.0172	-0.1754***	0.0169	-0.1749***	.0167296 -
σ within group market share	0.6786***	0.0521	0.7065***	0.0446	0.7240***	0.0417
Website effects						
Website	0.0007	0.0203	-0.0637**	0.0287	0.0011	0.0303
Website · onlineshare			0.2122	0.2068	0.2271	0.2227
Website · onlineshare^2			0.0390	0.3084	-0.5665*	0.3347
Onlineduration					-0.0138***	0.0033
Onlineduration · onlineshare					0.0390***	0.0091
Effect from companion websites of competing magazines						
Share others online	0.2249***	0.0385	0.17200.00	0.0420	0.1796***	0.0409
Other magazine characteristics						
log(# editorial pages)	-1.6279***	0.3039	-1.7721***	0.3102	-1.8549***	0.3021
log(# editorial pages)^2	0.2105***	0.0355	0.2292***	0.0366	0.2383***	0.0357
Share advertising pages	1.8769***	0.2887	1.7941***	0.2570	1.7210***	0.2430
Share advertising pages^2	-1.3838***	0.4384	-1.2559***	0.3968	-1.1579***	0.3750
Content concentration	-2.8439***	0.9205	-3.0194***	0.8825	-3.0808***	0.8404
Content concentration^2	-0.6520	2.9429	0.1932	2.7727	0.7369	2.5840
Weekly	-0.3676***	0.0619	-0.3574***	0.0587	-0.3463***	0.0568
Biweekly	-0.1857***	0.0231	-0.1773***	0.0225	-0.1766***	0.0224
Wald tests for joint significance						
	χ^2	p–val.	χ^2	p–val.	χ^2	p–val.
Website effects	0.00	0.97	4.91	0.03	28.11	0.00
Editorial pages	66.01	0.00	70.67	0.00	74.20	0.00
Advertising pages	85.40	0.00	95.68	0.00	97.30	0.00
Content concentration	62.86	0.00	62.66	0.00	64.49	0.00
Periodicity	71.57	0.00	71.41	0.00	70.26	0.00
Content shares	1038.58	0.00	1001.20	0.00	1081.37	0.00
Period dummies	221.61	0.00	226.58	0.00	233.95	0.00
Test for orthogonality of instruments and adj. R^2						
J test	3.8310	0.2803	6.5270	0.1631	6.7320	0.1507
Adj. R^2	0.9510		0.9543		0.9569	

Note: the table display GMM estimation results for Equation (1) and three different specifications of the effect of website presence on magazine demand. A total of 1,412 observations on 44 magazines is used in the estimations. The asteriks "***", "**" and "*" denote statistical significance at the one, five and ten percent marginal significance level respectively. The set of instruments is different for different specifications.

Figure 1: Predicted effect of companion websites on circulation for magazines that maintain a companion website (in %)

Figure 1 displays the predicted effects of companion websites on the circulation of those magazines that maintain a companion website. The dots represent predictions for each magazine while the straight line denotes the average effect.

Figure 2: Relationship between online durations and companion website effects

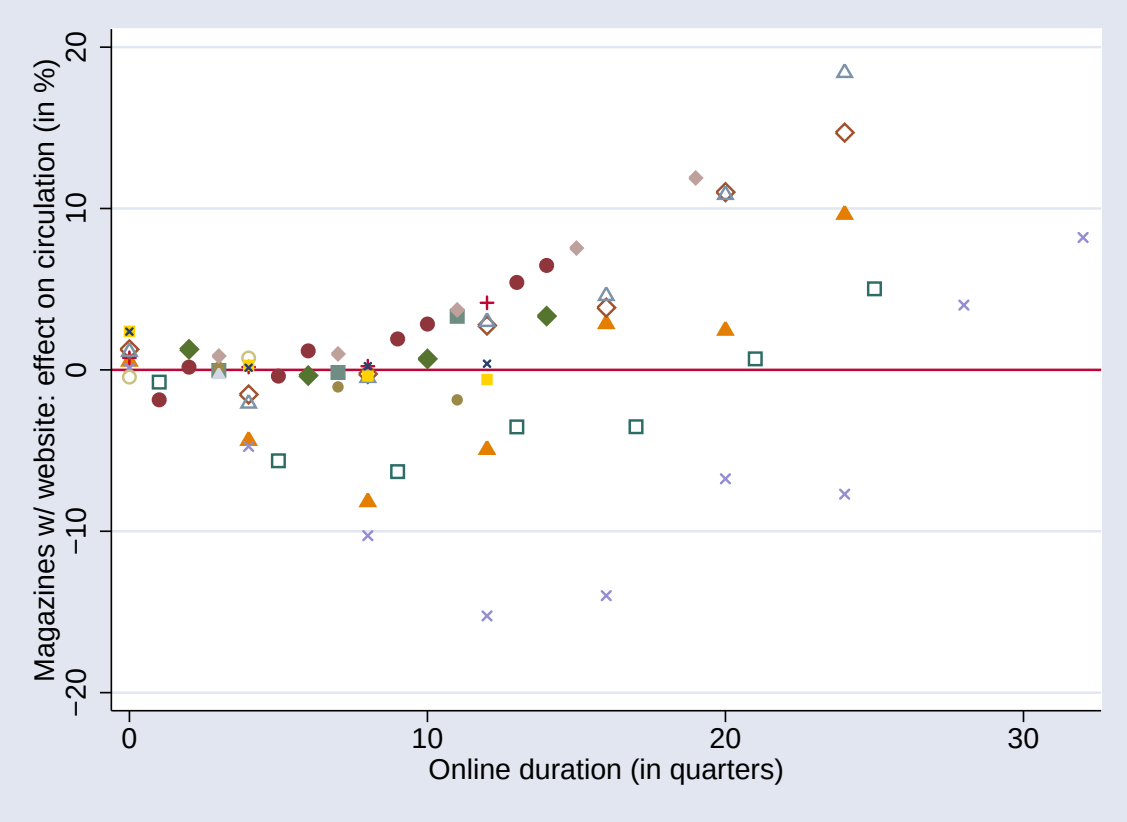

Figure 2 plots the the predicted effects of companion websites on the circulation of those magazines that maintain a companion website against the time a magazine website has been online ("online duration"). The dots represent predictions for each magazine. Online duration is measured in quarters since website launch.

Figure 3: Relationship between internet adoption rates and companion website effects

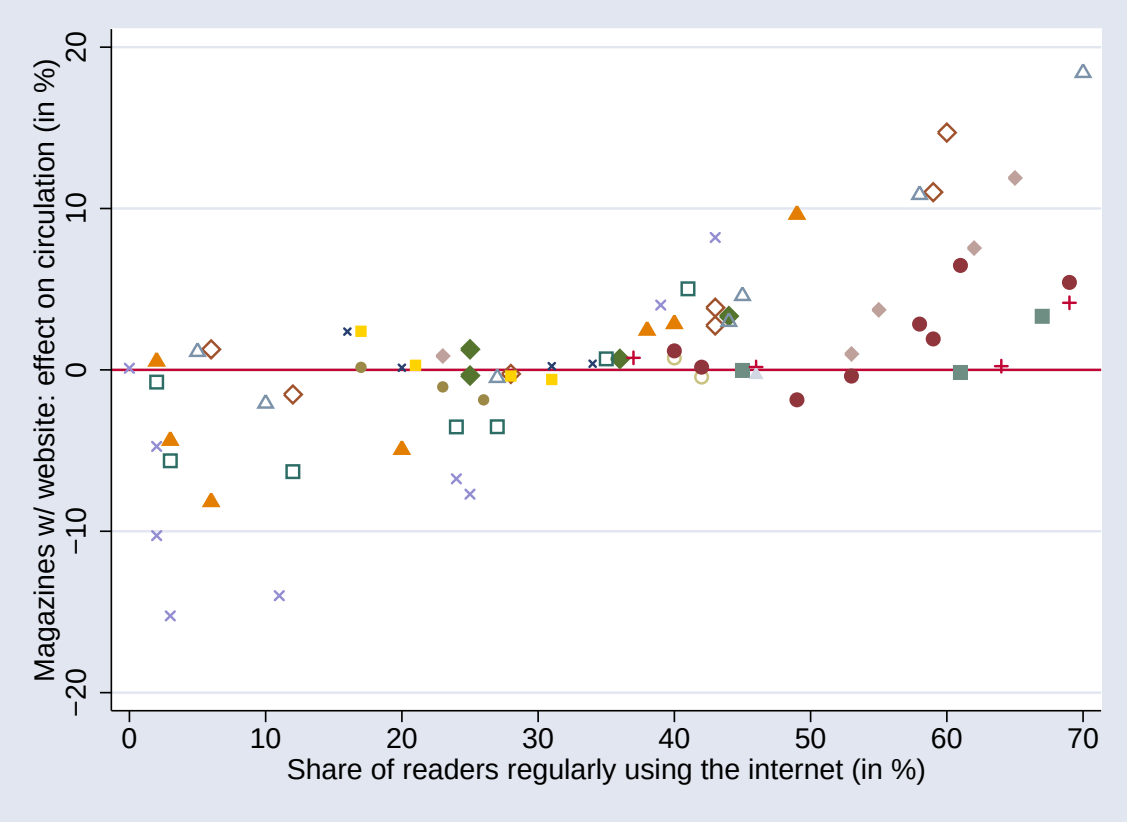

Figure 3 plots the predicted effects of companion websites on the circulation of those magazines that maintain a companion website against to internet adoption rates by magazine readers. The dots represent predictions for each magazine.

Figure 4: Predicted effect of companion websites on circulation for magazines that maintain a companion website (in %)

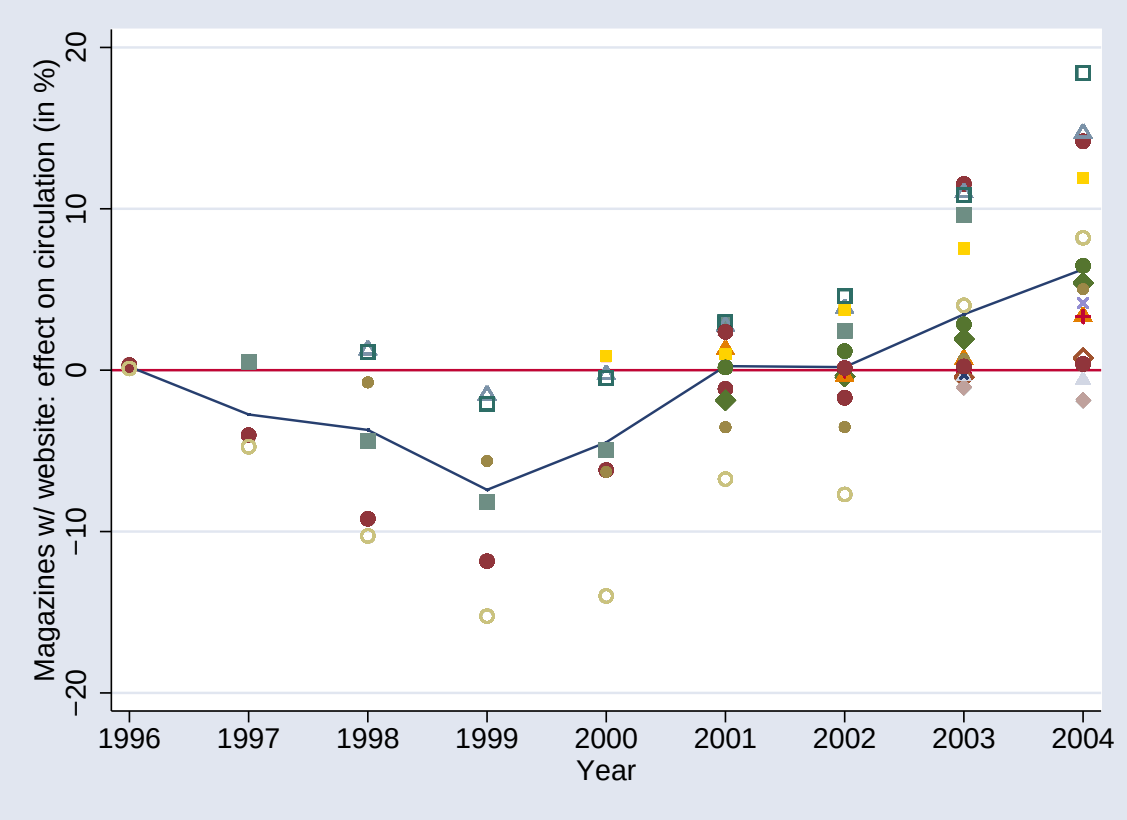

Figure 4 plots the predicted effects of companion websites on the circulation of those magazines that maintain a companion website against to internet adoption rates by magazine readers. The dots represent predictions for each magazine.

Figure 5: Predicted effect of launching a companion website on circulation for magazines that do not maintain a companion website (in %)

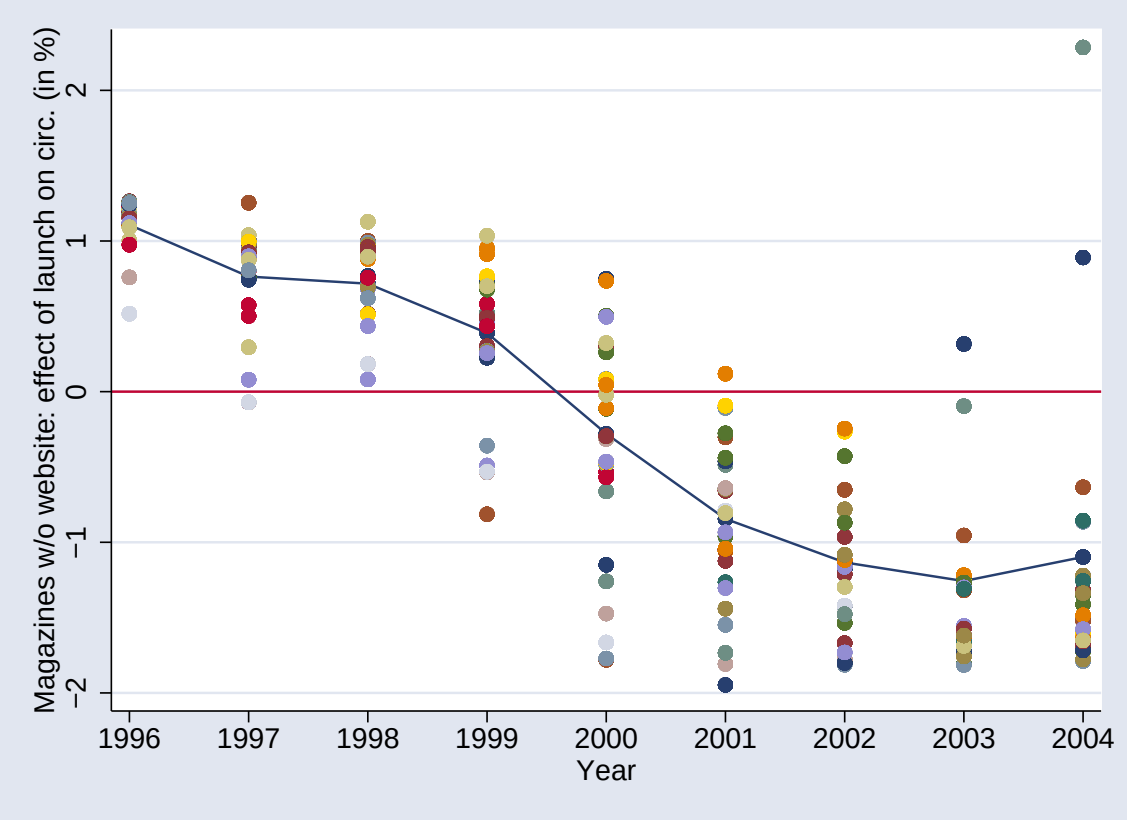

Figure 5 displays the predicted effects of launching companion websites on the circulation of those magazines that do not maintain a companion website. The dots represent predictions for each magazine while the straight line denotes the average effect.

Table 4: Estimation results for age–specific models

	Age 14–19		**Age 20–29**		**Age 30–39**		**Age 40–49**		**Age 50–59**	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
α, cover price	-0.3607***	0.0328	-0.2657***	0.0408	-0.2462***	0.0429	-0.1440***	0.0239	-0.1401***	0.0349
σ within group market share	0.8111***	0.0994	0.4461***	0.1234	0.2722**	0.1135	0.4620***	0.0840	0.0959	0.1119
Website effects										
Website	0.4304***	0.0800	0.0625	0.0462	-0.1545***	0.0575	-0.0499	0.0467	-0.2233***	0.0880
Website · onlineshare	-2.6027***	0.7696	0.3671*	0.2074	1.3413***	0.5318	1.2733***	0.3536	1.6286***	0.5609
Website · onlineshare^2	5.0043***	1.2222			-1.5782**	0.7248	-2.8116***	0.5357	-2.8981***	0.8637
Onlineduration	-0.0461***	0.0086	-0.0134**	0.0061			-0.0248***	0.0050	-0.0058	0.0091
Onlineduration · onlineshare	0.2079***	0.0556	0.0224	0.0147			0.0656***	0.0128	0.0428*	0.0230
Onlineduration · onlineshare^2	-0.2665***	0.0854								
Effect from companion websites of competing magazines										
Share others online	0.3524***	0.0850	0.3494***	0.0895	0.0257	0.1052	0.1671***	0.0685	0.2720***	0.1099
Other magazine characteristics										
log(# editorial pages)	-1.8783***	0.7665	-4.8367***	0.7310	-3.7856***	0.5918	-3.5690***	0.4837	-2.5117***	0.8174
log(# editorial pages)^2	0.1863**	0.0905	0.5904***	0.0897	0.4993***	0.0709	0.4488***	0.0561	0.3614***	0.0922
Share advertising pages	1.2901***	0.4723	0.1133	0.3667	1.4147***	0.4689	1.6041***	0.4047	4.9954***	0.7347
Share advertising pages^2	-3.2384***	0.8217	1.4634**	0.6295	0.9980	0.7054	0.9013	0.5948	-2.8187***	1.0687
Content concentration	-21.9099***	1.7761	-9.9797***	1.8381	-7.6109***	1.6099	-4.1298***	1.3600	9.7034***	2.1981
Content concentration^2	46.4749***	4.2623	10.2343*	6.2699	5.4689	4.9510	0.9970	3.9153	-42.2324***	6.9630
Weekly	-1.1719***	0.0875	-0.7846***	0.0855	-0.6554***	0.1108	-0.4062***	0.1066	-0.4186***	0.1696
Biweekly	-0.7060***	0.0414	-0.5782***	0.0383	-0.2886***	0.0417	-0.1628***	0.0368	-0.2362***	0.0614
Wald tests for joint significance										
	χ^2	p–val.	χ^2	p–val.	χ^2	p–val.	χ^2	p–val.	χ^2	p–val.
Website effects	82.67	0.00	33.69	0.00	7.85	0.05	40.82	0.00	26.21	0.00
Editorial pages	24.32	0.00	43.78	0.00	61.79	0.00	87.50	0.00	67.21	0.00
Advertising pages	19.76	0.00	39.48	0.00	84.52	0.00	157.14	0.00	153.93	0.00
Content concentration	152.67	0.00	131.10	0.00	68.00	0.00	32.24	0.00	41.29	0.00
Periodicity	344.86	0.00	228.96	0.00	57.90	0.00	22.51	0.00	15.02	0.00
Content shares	1,382.67	0.00	364.83	0.00	429.74	0.00	1,045.44	0.00	1,682.06	0.00
Period dummies	1,166.31	0.00	350.64	0.00	130.77	0.00	136.34	0.00	160.58	0.00
Test for orthogonality of instruments and adj. R^2										
J test	1.9080	0.1672	0.5320	0.9119	5.3340	0.1489	2.0140	0.3653	4.9530	0.2921
Adj. R^2	0.9686		0.9483		0.8834		0.9021		0.7561	

Note: the table display GMM estimation results for Equation (2). A total of 1,412 observations on 44 magazines is used in the estimations. The asteriks "***", "**" and "*" denote statistical significance at the one, five and ten percent marginal significance level respectively. The set of instruments is different for different age groups.

Figure 6: Mean predicted effect of companion websites on circulation for magazines that maintain a companion website (in %), by age groups

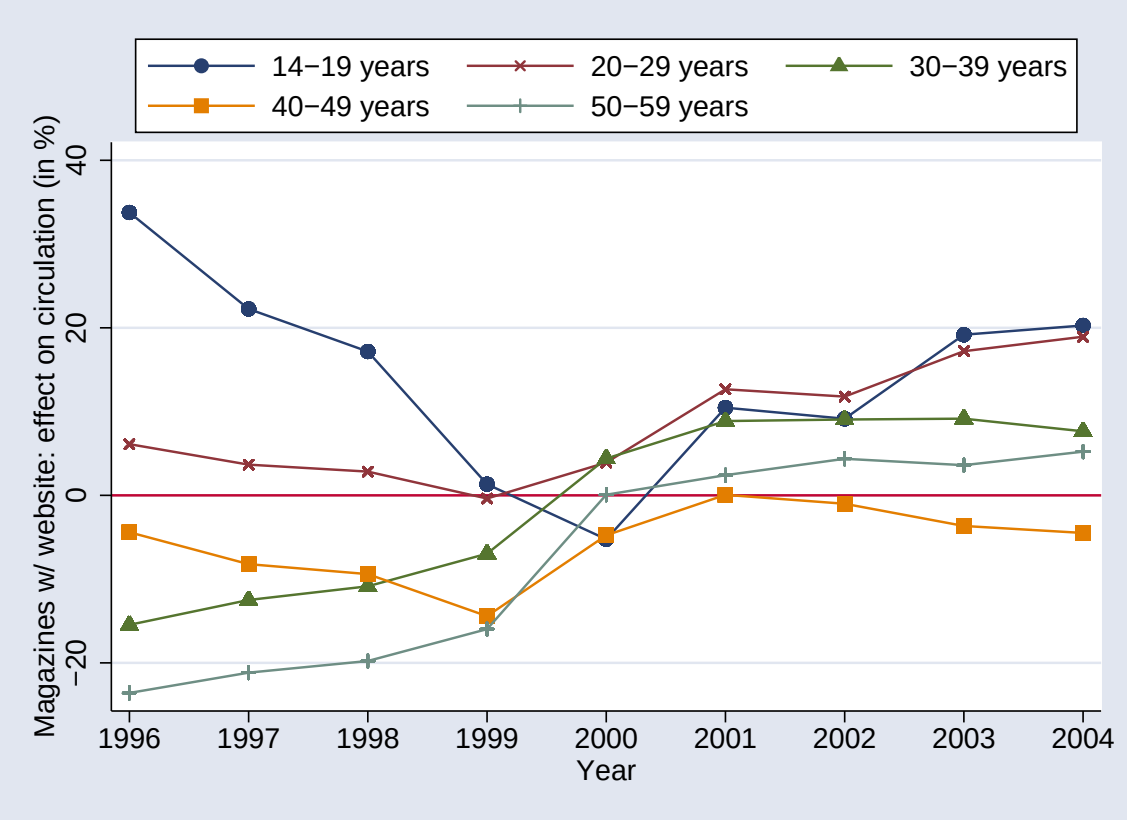

Figure 6 plots the predicted effects of companion websites on magazine sales to consumers in five different age groups of those magazines that maintain a companion website against to internet adoption rates by magazine readers. The dots represent predictions for each magazine.

Appendix A: "First stage" estimation results

	p_{jt}		$ln(\bar{s}_{j\|gt})$	
	Coeff.	Std. Err.	Coeff.	Std. Err.
Website effects				
Website	0.1355*	0.0777	-0.2249***	0.0750
Website · onlineshare	0.9147*	0.4886	2.4192***	0.4717
Website · onlineshare^2	-0.7792	0.7580	-3.0038***	0.7318
Onlineduration	-0.0270***	0.0083	-0.0037	0.0081
Onlineduration · onlineshare	0.0756***	0.0208	0.0001	0.0201
Effect from companion websites of competing magazines				
Share others online	-0.0099	0.1026	-0.3496***	0.0990
Other magazine characteristics				
log(# editorial pages)	-0.9443	0.8367	-2.7286***	0.8078
log(# editorial pages)^2	0.1078	0.0967	0.3330***	0.0934
Share advertising pages	1.7267***	0.5602	3.1290***	0.5408
Share advertising pages^2	-3.7701***	1.0079	-2.0814**	0.9731
Content concentration	-4.9473**	2.2250	6.1537***	2.1480
Content concentration^2	22.0337***	5.5826	-33.6648***	5.3895
Weekly	0.0592	0.0952	-1.0696***	0.0919
Biweekly	0.0530	0.0551	0.0036	0.0532
Instruments				
Main price instr.	-122.5511***	4.6866	2.3207	4.5245
Rel. ad. pages	0.2157***	0.0746	-0.0242	0.0720
Rel. total pages	-0.1224	0.1527	-0.2239	0.1474
Rel. total pages within group	-0.0025	0.0852	0.5333***	0.0823
ln(# of titles) by own publ.	0.0385*	0.0201	0.1494***	0.0194
ln(# of pages) by own publ.	-0.0439***	0.0066	-0.0062	0.0064
Wald test for joint significance				
	χ^2	p–val.	χ^2	p–val.
Instruments	214.70	0.00	21.27	0.00

Note: the table displays "first stage" OLS regression results of the instruments (as described in the body text) on the endogenous variables. The regression additionally includes a full set of period dummies and content shares. The adjusted R^2 of the price equation is 0.9323, that of the within group market share equation is 0.805. A total of 1,412 observations on 44 magazines is used in the estimations. The asteriks "***", "**" and "*" denote statistical significance at the one, five and ten percent marginal significance level respectively.

Appendix B: descriptive statistics

	Mean	Std. Err.
Endogenous variables		
$ln(s_{jt}/s_{0t})$	-6.4056	0.7142
$ln(s_{jt}/s_{0t}^{14-19})$	-6.8779	1.6390
$ln(s_{jt}/s_{0t}^{20-29})$	-6.5459	1.1379
$ln(s_{jt}/s_{0t}^{30-39})$	-6.0634	0.9033
$ln(s_{jt}/s_{0t}^{40-49})$	-6.5985	0.8321
$ln(s_{jt}/s_{0t}^{50-59})$	-6.5199	0.8370
p_{jt}	2.1105	1.3941
$ln(\bar{s}_{j\|gt})$	-2.1041	0.8163
Instruments		
Main price instr.	2.5324	0.3575
Rel. ad. pages	1.0488	1.0694
Rel. total pages	1.0136	0.6134
Rel. total pages within group	1.0203	0.2633
ln(# of titles) by own publ.	2.4184	1.1319
ln(# of pages) by own publ.	8.0146	4.2833
Website effects		
Website	0.2288	0.4202
Website · onlineshare	0.0697	0.1584
Website · onlineshare^2	0.0299	0.0824
Onlineduration	2.4894	5.9956
Onlineduration · onlineshare	0.9061	2.5959
Effect from companion websites of competing magazines		
Share others online	0.1755	0.2633
Other magazine characteristics		
log(# editorial pages)	4.4430	0.3904
log(# editorial pages)^2	19.8922	3.5243
Share advertising pages	0.2613	0.1267
Share advertising pages^2	0.0843	0.0750
Content concentration	0.1504	0.0492
Content concentration^2	0.0250	0.0160
Weekly	0.5198	0.4998
Biweekly	0.1622	0.3687
Content shares		
Fashion for purchase	0.0093	0.0278
Cosmetics	0.0551	0.0346
Cooking	0.0811	0.0586
Interior design	0.0357	0.0242
Do–it–yourself	0.0166	0.0180
Children	0.0109	0.0120
Health	0.0718	0.0286
Partnership	0.0415	0.0386
Vacation	0.0535	0.0231
Counselling	0.0220	0.0157
Hobby	0.0075	0.0063
Cars	0.0039	0.0045
Politics	0.0060	0.0083
Science	0.0285	0.0226
Art	0.0289	0.0300
Sensation	0.0094	0.0106
VIPs	0.1937	0.1357
Fiction	0.1205	0.0903
Sex	0.0016	0.0049
TV	0.0089	0.0190
Service	0.0539	0.0181

Appendix C: calculation of website effects

This appendix shows how I calculate the effect of website presence on circulation. It closely follows Berry (1996, p. 253).
The market share of magazine j at time t is

$$s_{jt} = \frac{exp(\delta_{jt}/(1-\sigma))}{D_{gt}^{\sigma} \sum_g D_{gt}^{(1-\sigma)}} \tag{3}$$

where δ_{jt} denotes "mean utility" and $\delta_{jt} = \boldsymbol{x_{jt}\beta} + \alpha p_{jt} + \boldsymbol{\kappa w_{jt}} + \tau_t + \xi_{jt}$ and $D_{gt} \equiv \sum_{j \in g} exp(\delta_{jt}/(1-\sigma))$.
The effect of a companion webites on mean utility is measured by $\boldsymbol{\kappa w_{jt}}$ so that the counterfactual effect of switching off a website given that magazine j maintains a website at time t is $\boldsymbol{\hat{\kappa} w_{jt}} = 0$ ($\Delta\delta_{jt} = -\boldsymbol{\hat{\kappa} w_{jt}}$), where "$\hat{}$" denotes estimated coefficients. Likewise, the counterfactual effect of switching on a website for those magazines that do not maintain a website is $\boldsymbol{\hat{\kappa} w_{jt}}$ ($\Delta\delta_{jt} = \boldsymbol{\hat{\kappa} w_{jt}}$).
This directly translates into changes in market shares:

$$\Delta\hat{s}_{jt} = \frac{exp(\Delta\hat{\delta}_{jt}/(1-\hat{\sigma}))}{\Delta\hat{D}_{gt}^{\hat{\sigma}} \sum_g \Delta\hat{D}_{gt}^{(1-\hat{\sigma})}}. \tag{4}$$

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