Why do magazines go online?[§]

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July 29, 2003

Abstract: The determinants of website–launching by German women's magazines are analyzed using a semi–parametric duration model. Main results are that online advertising and cross–selling opportunities have a significantly positive effect on website–launching (with the magnitude considerably varying over time) and that a low time–criticalness of the print issue contents, a low price elasticity of magazine demand and a more internet–affluent readership structure positively influence website–launching. Evidence for the presence of bandwagon effects is also found — the more direct competitors already maintain a website, the more likely it is that a magazine launches a website.

JEL classification: $L21, C41$

Keywords: website–launching, magazines, duration models

[§]Helpful comments from Hans–Christian Kongsted, Michael Svarer and the participants of the International Industrial Organization Conference in Boston — especially from my discussant Sara Fisher Ellison — are gratefully acknowledged. I wish to thank Christine Konrad and Laura Berndt of Gruner + Jahr, Carmen Basler of Burda Advertsing Center, Linda Knab of Arbeitsgemeinschaft Media–Analyse, Birgit Zöllner of Jahreszeitenverlag, Ulrike Haßlöcher of Michael Conrad & Leo Burnett and Jörg Hüner of Megalith–Software for kind data provision and advice.

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Target journal: *Journal of Economics and Management Strategy*

Things I need to fix here:

- write that this is an adoption exercise (comments from Manuel Trajtenberg)
- insert dummies for weekly, biweekly and monthly magazines
- share of readers that is online changes only ANNUALLY!
- bandwagon effect: interaction with market shares of those that are online
- check if competition matters (own market share/concentration index)
- cost of going online: dummy for international magazine (Vogue, Elle, Cosmo, Marie Claire, Madame)
- insert table with market share, market concentration and # of mags in groups
- say why effect of adpages is so huge
- say I don't observe website contents
- be careful with price ela interpretation
- say don't measure strategy
- Jack Triplett comment: worry about distribution cost
- say something about strategies (Rupert Gatti's comments):
  - reach new consumers (advertising, new mag. sales
  - protect market
  - market segmentation
  - product differentiation
  - cost
  - alternative revenue sources

1 Introduction

By launching a website, many magazines recently started to issue an at least potentially perfect substitute to their original product. Given the facts that (i) website access is, at least in Europe, for free in most cases, (ii) magazines put very similar information on the internet that is also contained in the print version (Kaiser 2001) and (iii) 74 % all German websites do not cover running cost acording to the German Publisher's Association (Deutsche Fachpresse, 2001), the question "why do magazines go online" deserves an answer.

This paper provides some answers to this question that are based on microeconometric analysis. A semiparametric duration model, an ordered logit model for duration data, is estimated on quarterly information on German women's magazines observed between I/1996 and IV/2001. By the end of 2001, 14 out of a total of 40 women's magazines run own websites. Duration models are used to not only analyze the determinants of the binary decision of going online but to also gain insights into the timing of website launching.

Main results are that the following variables have a significantly positive effect on early website launching: the number of advertising pages in the print version (a measure of a magazine's internet advertising and cross–selling opportunities), the share of entertaining pages in the print version (a measure of a low time–criticalness of the information contained in the print version), the number of magazines published by the own publisher (a measure of returns to scale from website launching seen from the publishing houses' perspective), the semi–own price elasticity of demand for the print version (a measure of magazines' risk of loosing customers to the online version), the share of magazines that are online in the own magazine group (a measure of 'narrow' bandwagon effects) and the share of own readers that is online (a measure of the extent to which magazine readers push magazines to launch a website).

The importance of advertising opportunities, of the bandwagon effect and of the

supply–push effect varies considerably across time. The economic significance of both the bandwagon effect and the supply–push effect has recently declined while advertising opportunities have recently re–gained in economic relevance.
Interestingly, two of the four magazines that have had the highest estimated hazard to launch a website by the end of the observation period have meanwhile actually gone online.

2 Determinants of going online

This section establishes the hypotheses that are tested empirically in Section 5. Each of the eight hypotheses is very intuitive so that there is no need for going into great detail here.

2.1 Factors that influence website launching: hypotheses

1. Risk of loosing consumers (a) — semi–own price elasticity: *The lower a magazine's price elasticity of demand is, the more likely it is that it launches a website early.* Intuition: magazines with a low price elasticity of demand are to a less extent at risk of lossing consumers to the internet than magazines with a high price elasticity.

2. Risk of loosing consumers (b) — number of subscribers: *The larger the number of subscribers is, the more likely it is that magazines launch a website early.* Intuition: subscribers are less likely to switch to the internet than casual buyers (non–subscribers) of the magazine.

3. Returns to scale in online publishing — number of titles published by own publisher: *The more titles a magazines' own publishing house publishes, the more likely it is that a magazine launches a website.* Intuition: publishers can use the same technology, the same frames and the same advertising distribu-

tion channels that are developed for one magazine for other website–launches as well. It also makes website–launching more attractive by opening up additional cross–selling opportunities in advertising.

4. Online advertising and cross–selling opportunities — advertising pages: *The more advertising pages a magazine comes with per issue, the more likely it is that it launches a website early.* Intuition: the number of advertising pages in the print edition should be highly correlated with online advertising opportunities. In the absence of information on online advertising, print advertising sales might hence be a good proxy variable for online advertising and cross–selling opportunities.

5. Bandwagon effect: *The more magazines from the own magazine group are online already, the more likely it is that a magazines launches a website early.* Intuition: Magazines are might be afraid of being the last to go online which would indicate 'old–fashionedness' relative to the competing magazines that have already launched a website.

6. Magazine age: *Older magazines are less likely to launch a website early that younger magazines.* Intuition: Older magazines might be more reluctant towards the adoption of new technologies than younger ones.

7. Time–criticalness of information in the print version: magazine content: *Magazines with a large content share of entertainment pages are more likely to launch a website early than magazines that come with a large share of information pages.* Intuition: If magazines that to a large extent provide current information go online, they are at larger risk of lossing consumers to the online version than those magazine that concentrate on entertainment.

8. Supply–push effects — consumer structure: *The larger the share of a magazines consumers is online, the more likely it is that a magazine launches a website early.* Intuition: If a magazine has a very internet–affluent readership, its readers are likely to demand that the magazine goes online.

Table 5 in Subsection 2.1 summarizes the eight hypotheses and contrasts them

to the empirical findings.

2.2 Who went online when?

Table 1 shows when the 14 magazines that launched a website went online. The table gives information about the subsegments the magazines are active in. Industry sources (Jahreszeitenverlag 1996–2002) classify the women's magazines market into six subgroups: (i) 'monthly high priced', (ii) 'monthly medium priced', (iii) 'biweekly classical', (iv) 'weekly advice–giving', (v) 'weekly entertaining' and (vi) 'girl's' magazines.

Insert Table 1 about here!

Table 1 suggests that there are distinct patterns of website entry exist. The first magazine that launched a website was 'Allegra' in January 1996. One year after, 'Amica', a cloose competitor of 'Allegra', also went online. Another year later, 'Cosmopolitan' launched a website. These magazines all belong to the same magazine group, 'Monthly medium–priced magazines'. Similar patterns are present for the other magazine groups as well, suggesting that once one competitor launched a website, this induces the other magazines to follow so that not wanting to be the last to go online (Hypothesis 8) in fact appears to be an important argument for website launching. The only group where no magazine has launched as website are the weekly entertaining magazines. Some of them have, however, have reserved domain names (URL addresses) so that it is to be expected that these magazines have a non–zero chance of launch a website in the near future.[1]

[1]None of those 'weekly entertaining' magazines was online in March 2003, however. 'neue Woche' (just like 'Madame') maintains a website for advertising clients only. The information on domain name reservations was obtained from www.denic.de, the primary nameserver for the top–level domain 'de'. The following magazines from the 'weekly entertaining' group

3 Data

Most of the information used in this study is publicly available and some of the data can even be downloaded from the internet.

The data spans the period I/1996 to IV/2001. Since the first magazines that went online, 'Allegra', 'Elle' and 'Freundin', launched their websites in I/1996, none of the observations is left–censored: I observe the entire online–history of each magazine until IV/2001.[2] All magazines that are still offline in IV/2001 are right–censored. The econometric model used in this paper adequately takes this into account. The accurateness with which the website–launching date was reported differs markedly across magazines. Only three magazine were able to report the exact website launching date while the rest of the magazines provided information ranging between "in early 1997" and "in the second quarter of 1998". These differences in reporting lead to the econometric problem of discrete durations (quarters in this case) since I treat the respective quarters of website launching as the relevant 'failure' date.

The date of website launching was assembled from email and telephone inquiries. Variables used to estimate magazines' own–price elasticity include magazine circulation, cover price, magazine age, the number of editorial pages, the share of advertising pages and content share variables (see Appendix A). Data on circulation, cover prices, the number of advertising pages and the number of editorial pages is downloaded from the internet at http://medialine.focus.de. This source

have reserved domain names (domain name and website update date in parentheses): 'Das Goldene Blatt' (www.dasgoldeneblatt.de, Aug. 10, 2001), 'Das Neue' (www.dasneue.de, October 05, 1999), 'DAS NEUE BLATT' (www.dasneueblatt.de, 14.02.2003), 'Frau im Spiegel' (www.frauimspiegel.de, May 04, 2000), 'Neue Post' (www.neuepost.de, Feb. 20, 2003), 'neue Woche' (www.neuewoche.de, July 14, 2000).

[2]There might be an issue of left–truncation here. However, given the fact that the internet was still in his baby shoes in Germany (for example the nameserver denic.de was founded in Dec. 1996 only), left–truncation does not seem to be a particularly important issue.

also provides information on the number of magazine subscribers, the identity of the publishing house and magazine age. This data is available on a quarterly basis and spans the period in I/1971 to today. 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.

Information on the share of readers that use the internet was provided to me from 'Burda Advertising Centre'. This data was originally collected by the 'Association Media Analysis' ('Arbeitsgemeinschaft Media–Analyse', AG.MA), an association of the German advertising industry for the research of mass communication. Data on internet use by magazine readers was first collected in 1996. The latest available information relates to 2001.

Magazine content information was obtained from Jahreszeitenverlag (1996–2001). Jahreszeitenverlag is a major German magazine publisher which made its annual publication 'Function–analysis: fact book of magazine contents and portraits' ('Funktions–Analyse: Factbook für Inhalte und Portraits von Zeitschriften') related to the period 1996–2001 available to me upon request. It contains content information taken from the respective year's first issue. Jahreszeitenverlag differentiates between 21 topics and provides data on the share of each of these topics in the total number of pages per issue. While the estimation of the semi–own price elasticities condenses this detailed information to sixteen topics (see Appendix A), my duration analysis only uses the share of entertainment pages as explanatory variable to save degrees of freedom. The definition of the share of entertainment pages follows industry convention and is defined as the sum of the following topic shares: politics and economics; science, nature and technology; the arts and cultural events; sensational entertainment; VIPS, artists and royals; fiction, riddles and humor; sex as entertainment; TV guide; service pages of the editors.

The number of magazines that were published by the magazines' publishing houses between 1996 and 2001 is also assembled by email and telephone inquiries. Descriptive statistics of the variables involved in the estimation are presented in Appendix B.

4 Econometrics

The facts that (i) the website–launching date is accurately observed only on a quarterly basis, (ii) that some magazines launch websites in the very same quarter (e.g. there are 'ties' as it is called in econometrics) and (iii) there are relatively few magazines that go online (e.g. there are few 'failures') make the Han and Hausman (1990) 'ordered logit' model an attractive econometric instrument for the present estimation problem. By contrast, the data features (ii) and (iii) make the Cox partial likelihood model particularly unattractive while fully parametric approaches such as the popular Weibull model a priori impose restrictions that the data might not meet so that following this path is not attractive either.

The ordered logit model for duration data is semi–parametric since the baseline hazard — the failure rate at time τ conditional upon survival to time t (in the present context: the probability of going online at time τ conditional on not being online at time $t < \tau$) — is nonparametric while the estimation of the model parameters requires the assumption of exponentially distributed error terms.

Another advantage of the ordered logit model is that unobserved heterogeneity of for example the popular Gamma–type can easily be introduced since the log–likelihood function takes on a closed form.[3]

The ordered logit model also conveniently allows for time–varying covariates since

[3]The ordered logit model with unobserved heterogeneity following a Gamma–distribution never converged, however. Iterations were aborted with an estimated value of the variance of the Gamma–distribution cloose to zero so that evidence is given that there is no unobserved heterogeneity of Gamma–form in the data.

it only requires them to interact them with time dummies.[4] The share of magazines that is running own websites in a magazine's own magazine group and the share of magazine j's readers that is online (note that this is a variable that is both time–varying and magazine–varying) are such time–varying covariates that are hence interacted with time dummy variables. The number of advertising pages per print issue is not a time–varying variable in the original sense because it does not follow a particular time pattern. It is nevertheless interacted with time since it is a proxy variable for a magazines' ability to attract advertising clients for the website. As it is widely known, the early high expectations regarding online advertising were not met by reality so that the advertising–incentive to launch a website might have changed over time. I therefore interact the natural number of advertising pages with time–period dummy variables.

The baseline idea of the ordered logit model is that the discrete dependent variable takes on a specific value if an unobserved 'latent' variable is in between two threshold parameters. In the present example, magazines go online in period t if the latent variable is in between the two threshold parameters δ_t and δ_{t-1}. The latent variable is a linear combination (a 'linear index') of a vector of factors that influence magazines j's website launching decision, $\boldsymbol{z_{jt}}$, a corresponding parameter vector, $\boldsymbol{\gamma}$, and an unobserved factor that is denoted by ε_{jt}. The econometric model is briefly described in Appendix C.

[4] I tested for time–dependency by regressing all explanatory variables involved in the estimation on a set of quarter dummies as well as on a linear and quadratic time trend.

5 Specification and results

5.1 Specification

The empirical specification of the model follows the hypotheses listed in Subsection 2.1 so that the list of explanatory variables includes (1.) the natural logarithm of magazines' semi–own price elasticity, calculated by a 'nested logit' model (see Appendix C), (2.) the natural logarithm of magazine total number of subscribers, (3.) the natural logarithm of the number of magazines published by the own publishing house, (4.) the natural logarithm of the number of advertising pages per issue — interacted with time dummies, (5.) the share of magazines in the own magazine group that is online at time t ('narrow' bandwagon effect) and the total number of women's magazines that is online ('general' bandwagon effect), (6.) three dummy variables for magazines below 12 years of age, between 12 and 22 years and between 23 and 49 years, with magazines older than 49 years as base category,[5] (7.) the share of entertainment pages per issue and (8.) the natural logarithm of the share of magazine readers that is online. The specification also includes a linear time trend to pick up shocks to the website launching decision that are common to all magazines.

The two variables representing the 'bandwagon effect' and the share of magazine readers that is online are time–variant covariates. The 'bandwagon effect' covariate vary whenever another magazine launches a website. There are nine distinct time period s(quarters) in which the number of websites differ: I/1996–IV/1996, I/1997–III/1997, IV/1997, I/1998–I/1999, II/1999–II/2000, III/2000, IV/2000, I/2001, II/2001–IV/2001 (compare Table 1). Consequently, both bandwagon effect variables are interacted with dummy variables for each of the nine time periods. The share of magazine readers that is online varies quarterly so that this variable is interacted by a full set of time period dummy variables.

[5]The thresholds represent 25 per cent quantiles of the magazine age distribution.

The ordered logit model estimates eight different threshold parameters, $\delta_{I/1997-III/1997}$ to $\delta_{II/2001-IV/2001}$ since there are nine distinct survival times. My ordered logit model includes a constant term so that one threshold parameter, I choose $\delta_{I/1996-IV/1996}$, is set to zero for identification.

5.2 Results

Ordered logit model estimation results are presented in Table 2. Corresponding Wald test statistics for joint significance of the coefficients are displayed in Table 3. The durations are ordered from shortest duration to longest duration so that a negative coefficient indicates negative effects on late website launching (it indicates positive effects on early website launching). Except for the number of magazine subscribers which has an insignificant effect on the timing of website launching, all time–invariant variables carry the expected sign and are highly significant.

Insert Table 2 about here!

Insert Table 3 about here!

The coefficient estimates presented in Table 2 do not directly translate to marginal effects as in the linear regression model so that the coefficients are not informative with respect to the magnitude of the economic effects. Although marginal effects and the associated standard errors can easily be calculated, presenting them is not particularly appealing here since they (i) differ between observations (which is why they are usually presented as evaluated at the means of the explanatory variables) and (ii) are different for different survival times (a table displaying marginal effects would have ten columns — one for each survival time). Table 4 therefore presents the percentage change in the estimated latent variable, $\boldsymbol{z_{jt}}\hat{\boldsymbol{\gamma}}$,

that is caused by a one–unit change in the explanatory variables. This semi–elasticity is given by

$$\psi_{\boldsymbol{z_{jt}}\hat{\boldsymbol{\gamma}},z_{jt}^k} = \frac{\partial \boldsymbol{z_{jt}}\hat{\boldsymbol{\gamma}}}{\partial z_{jt}^k}\frac{1}{\boldsymbol{z_{jt}}\hat{\boldsymbol{\gamma}}} = \hat{\gamma}_k \frac{1}{\boldsymbol{z_{jt}}\hat{\boldsymbol{\gamma}}}$$

where z_{jt}^k denotes the kth element of the vector of covariates of magazine j at time t and $\hat{\gamma}_k$ denotes the estimated coefficient corresponding to z_{jt}^k.

Insert Table 4 about here!

The semi–elasticities vary across observations so that Table 4 displays the 5, 10, 50, 90 and 95 percentiles along with means and standard deviations. Since the elasticities of those magazines that went online by construction carry the inverse sign of those magazines that are offline (the latent variable, $\boldsymbol{z_{jt}}$, is negative for the website launchers since the first threshold parameter is set to zero; see Appendix C), I display absolute elasticities.[6]

The interpretation of the semi–elasticities is simple: if for example the own publishing house starts editing an additional magazine, this causes a median decrease in the latent variable of 0.3014 per cent; if the share of entertaining pages increases by one per cent, the latent variable decreases by 0.4375 per cent. The median effect of the semi–own price elasticity is 3.5991 per cent which is large in absolute value but a one percent absolute change in the semi–price elasticity since the median semi–own price elasticity is 2.7899 per cent.

The time–variant variables that are interacted with the time dummy variables allow to compare the effects of these covariates over time. Indeed, Table 2 shows that some of the coefficients vary considerably across time (and so do the corresponding explanatory variables). One clear results is, however, that the total

[6]Not that the direction of an explanatory variables' effect on website launching is determined by the sign of the corresponding coefficient anyway.

number of women's magazines that is online, the 'general' bandwagon effect, does not have a significant effect on the timing of website launching — the coefficients are both separately and jointly insignificantly different from zero. Surprisingly, the coefficients related to the share of magazines from the own magazine group that is online are also jointly insignificant and only two out of the nine coefficients are individually significantly different from zero so that only weak evidence for the existence of bandwagon effects is given. All of these coefficients carry a negative sign, thus indicating that an increase in the share of magazines from the same group with a website increases the probability of early website launching. The coefficient related to the within group online–share variables are large quantitatively. The coefficient on the interaction between the within group online–share and period II/1999 — II/2000 is -4.9773 which implies that if all magazines in the own magazine group would have been online in this earliest time period, the latent variable had dropped by -4.9773, thereby inducing a huge increase in the probability of early website launching.

In order to visualize the extent to which the latent variable changes if the share of magazines that is online in the own magazine group increases by one per cent, Figure **??** displays a plot of these elasticities against a time axis.[7] The solid line in Figure **??** figure also contains a locally weighted scatterplot smoothing (a nonparametric estimator for the mean elasticity). Here, and in all the following figures, the bandwith — the share of variables that is considered for the estimation — is set to 80 per cent. Moreover, elasticity values below above the 90 per cent percentile were discarded.[8] The estimator of the mean elasticity of the 'narrow' bandwagon effect ranges between values of 0.2874 (IV/2001) and 0.6293 (I/2000).

Insert Figure **??** about here!

[7]Note that the share of magazines running a website changes nine times only. The smoothness of the figure is hence caused by the variation in the latent variable over time.

[8]Some elasticities became very large since the estimated latent variable was close to zero.

The figure shows an inverse U–shaped mean 'narrow' bandwagon effect that steadily lost in importance since I/2000.

The share of magazines' readers that is online plays an important role in the website launching decision. Although the coefficients corresponding to the share of readers that is online are jointly insignificant, highly significant individual effects are present especially for the time period I/1998 to II/2000. Almost all of the coefficients related to the share of readers that is online carry the expected negative sign. Figure 2 shows the elasticities corresponding to the share of readers that is online over the time period under consideration.[9] The figure shows an inverse U–shaped effect of readership internet affluence on website launching. The mean effect of online affluence of readers on early website launching has been largest in III/1999 and has been steadily decreasing since then.

Insert Figure 2 about here!

As shown in Figure 3, the semi–elasticity of the latent variable with respect to the number of advertising pages has a concave effect of website launching with a through between I/1999 and IV/2000. The impact has been steadily increasing since IV/1999, indicating that online advertising and cross–selling oportunities have recently re–gained importance.

Insert Figure 3 about here!

(at least) two questions remain to be answered: (i) which variables do have the largest effect on magazines' website launching decision? and (ii) who is next to launch a magazine website?

[9]Insignificant positive coefficients are found, however, for III/1996, IV/1996 and III/2001 so that the corresponding elasticities carry negative signs in Figure 2.

To evaluate the first question, the elasticities of the latent variable with respect to the covariates for the last period, IV/2001 are calculated. Unsurprisingly given the magnitude of the coefficients, the number of advertising pages has the largest impact with a mean/median elasticity of 32.0258/17.4292,[10] followed by the share of entertaining pages (0.4631/0.2901), the share of magazines that are online in the own magazine group (0.3315/0.2211), the semi–own price elasticity of demand (0.1966/0.1231), the share of the own readers that is online (0.1548/0.0849), the number of magazines published by the own publisher (0.1073/0.0672) and the number of subscribers (0.0399/0.0250).

The second question regarding magazines that are next to launch a website is answered using hazard rates. The hazard rate emanating from the ordered logit model is the ratio of the probability to launch a website in a given period over the probability not to have launched a website until then. Two of the four magazines with the highest hazard rates (hazard rates in parenthesis) — 'Marie Claire' (0.9412) and 'Mädchen' (0.2201) — are actually only now (March 2003) online. 'Madame' (hazard rate 0.3960) still runs a website for advertising clients only. 'Maxi' (hazard rate 0.6201) has reserved an URL (www.maxi.de) that has been updated last in February 2003.

Specification checks

The estimation results appear to be robust in many dimensions. First, the qualitative results of the ordered logit model are replicated by a parametric Weibull model as shown in Appendix D. The Weibull model was also estimated allowing for unobserved heterogeneity of Gamma and inverse Gaussian form; the presence of either form of unobserved heterogeneity was rejected at conventional significance levels. Second, the predictive power of the model is high. 66 per cent of the outcomes are correctly predicted, and — even more importantly — the model also accurately predicts the probability of early website launching (by construc-

[10] With a one percent change in the number of advertising pages corresponding to a change of between 30.2 and 0.5 pages (mean: 2/median: 5).

tion, the ordered logit model predicts the most densely populated survival time, survival until at least II/2001, most precisely).

6 Conclusion

Magazines go online because they expect online advertising and cross–selling opportunities (as measured by the number of advertising in the print issue), because close competitors run websites already and because a large share of the magazines readers is online. The magnitude of these effects varies considerably over time. Other factors that significantly influence the decision to launch a website are a magazine's risk of loosing consumers to the internet version (having a negative effect on website launching), magazine age, the number of magazines titles published by own publisher (measuring returns to scale from the publishers perspective) and the share of entertainment pages (measuring low time–criticalness of information). The latter three factors have positive effects on website launching.

The most important determinants of going online are (in that order) the number of advertising pages, the share of entertaining pages, the number of magazines published by the own publisher, the semi–own price elasticity of demand, the share of magazines that are online in the own magazine group, the share of own readers that is online and the number of subscribers.

The empirical evidence is provided on the basis of quarterly data for the German womens' magazine market that spans the period I/1996 to IV/2001. An ordered logit model for duration data is used to study the determinants of website launching since they conveniently allow for discrete (quarterly) durations, time–varying covariates and durations of the same lengths ('ties').

Further research will be devoted to extent the current analysis to the entire German magazine market.

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Table 1: Timing of website launching

Group 1: monthly high priced magazines	
Elle	I/1996
Vogue	III/2000
Group 2: monthly medium priced magazines	
Allegra	I/1996
Amica	I/1997
Cosmopolitan	I/1998
Petra	III/2000
Group 3: biweekly classical magazines	
Brigitte	IV/1997
Freundin	I/1996
Für Sie	I/2001
Journal für die Frau	I/2001
Group 4: weekly advice–giving magazines	
Bild der Frau	II/2001
Group 6: girl's magazines	
Bravo Girl	II/2001
Brigitte Young Miss	II/1999
Joy	IV/2000

Note: None of the magazines in the 'weekly entertaining' group (Group 5) has been online in IV/2001.

Table 2: Ordered logit estimation results

	Coeff.	Std. err.
log(# of advertising pages) $_{I/1996}$	-5.2913***	1.2993
log(# of advertising pages) $_{II/1996}$	-5.3336***	1.3863
log(# of advertising pages) $_{III/1996}$	-5.8827***	1.7902
log(# of advertising pages) $_{IV/1996}$	-5.8998***	1.9811
log(# of advertising pages) $_{I/1997}$	-5.2082***	0.9995
log(# of advertising pages) $_{II/1997}$	-5.1134***	0.9199
log(# of advertising pages) $_{III/1997}$	-5.2701***	1.0109
log(# of advertising pages) $_{IV/1997}$	-4.5449***	1.8098
log(# of advertising pages) $_{I/1998}$	-3.7658***	0.8344
log(# of advertising pages) $_{II/1998}$	-3.6708***	0.7557
log(# of advertising pages) $_{III/1998}$	-3.5837***	0.9512
log(# of advertising pages) $_{IV/1998}$	-3.4261***	0.8900
log(# of advertising pages) $_{I/1999}$	-2.9322***	0.9317
log(# of advertising pages) $_{II/1999}$	-3.1189***	0.9349
log(# of advertising pages) $_{III/1999}$	-3.5273***	1.0921
log(# of advertising pages) $_{IV/1999}$	-3.2730***	0.8853
log(# of advertising pages) $_{I/2000}$	-2.7694***	0.7218
log(# of advertising pages) $_{II/2000}$	-3.0238***	0.7970
log(# of advertising pages) $_{III/2000}$	-3.1226***	1.1059
log(# of advertising pages) $_{IV/2000}$	-3.1646***	0.9955
log(# of advertising pages) $_{I/2001}$	-3.5382***	1.2664
log(# of advertising pages) $_{II/2001}$	-4.9257***	1.4650
log(# of advertising pages) $_{III/2001}$	-6.0618***	1.3872
log(# of advertising pages) $_{IV/2001}$	-4.9637***	1.9090
log(semi–own price elasticity)	1.2963***	0.2736
log(# of titles published by own publisher)	-0.7079***	0.1994
log(# of subscribers)	-0.2634	0.2118
log(share of entertaining pages)	-3.0544***	0.6205
Magazine less than 12 years old	-1.4817***	0.5861
Magazine between 11 and 22 years old	-0.4630	0.4636
Magazine between 23 and 49 years old	0.5767	0.4750

— over —

— continued —

	Coeff.	Std. err.
log(share of readers online) $_{I/1996}$	-0.0935	0.4080
log(share of readers online) $_{II/1996}$	-0.0627	0.4080
log(share of readers online) $_{III/1996}$	0.5095	0.8324
log(share of readers online) $_{IV/1996}$	0.9388	1.0317
log(share of readers online) $_{I/1997}$	-0.0918	0.7693
log(share of readers online) $_{II/1997}$	0.0686	0.8435
log(share of readers online) $_{III/1997}$	-0.2817	0.8461
log(share of readers online) $_{IV/1997}$	-0.2957	1.3495
log(share of readers online) $_{I/1998}$	-1.8795*	1.2018
log(share of readers online) $_{II/1998}$	-1.7960*	1.1616
log(share of readers online) $_{III/1998}$	-2.2619**	1.3867
log(share of readers online) $_{IV/1998}$	-2.2373**	1.3728
log(share of readers online) $_{I/1999}$	-3.7965***	1.7355
log(share of readers online) $_{II/1999}$	-2.8057*	1.8927
log(share of readers online) $_{III/1999}$	-2.0598	2.0054
log(share of readers online) $_{IV/1999}$	-2.1310	1.8043
log(share of readers online) $_{I/2000}$	-3.0472***	1.3310
log(share of readers online) $_{II/2000}$	-2.4302**	1.3833
log(share of readers online) $_{III/2000}$	-1.5836	1.3711
log(share of readers online) $_{IV/2000}$	-0.6522	1.7121
log(share of readers online) $_{I/2001}$	-1.9667	1.7666
log(share of readers online) $_{II/2001}$	-0.8552	2.0211
log(share of readers online) $_{III/2001}$	0.5429	1.8700
log(share of readers online) $_{IV/2001}$	-0.8923	2.8375
# of women's magazines online $_{I/1997-III/1997}$	-0.7859	2.1087
# of women's magazines online $_{IV/1997}$	-0.9655	2.0228
# of women's magazines online $_{I/1998-I/1999}$	-1.1539	1.7202
# of women's magazines online $_{II/1999-II/2000}$	-0.9616	1.7113
# of women's magazines online $_{III/2000}$	-0.9497	1.4765
# of women's magazines online $_{IV/2000}$	-0.8742	1.3413
# of women's magazines online $_{I/2001}$	-0.3843	1.1818
# of women's magazines online $_{II/2001-IV/2001}$	-0.1358	0.9926
Share of magazines online in own group $_{I/1996-IV/1996}$	-3.4268	7.1450
Share of magazines online in own group $_{I/1997-III/1997}$	-2.5882	4.1155
Share of magazines online in own group $_{IV/1997}$	-2.6442	6.6227
Share of magazines online in own group $_{I/1998-I/1999}$	-2.4971	2.2297
Share of magazines online in own group $_{II/1999-II/2000}$	-4.9773**	2.5672
Share of magazines online in own group $_{III/2000}$	-4.1086	6.7631
Share of magazines online in own group $_{IV/2000}$	-5.9918	6.9042
Share of magazines online in own group $_{I/2001}$	-4.2010*	2.7873
Share of magazines online in own group $_{II/2001-IV/2001}$	-2.6014	2.1461
ln(time trend)	1.5822	4.1444
Constant	39.1616***	5.9585
$\delta_{I/1997-III/1997}$	0.3854***	0.1345
$\delta_{IV/1997}$	1.1279***	0.1914
$\delta_{I/1998-I/1999}$	1.8263***	0.2411
$\delta_{II/1999-II/2000}$	2.3446***	0.2579
$\delta_{III/2000}$	3.4478***	0.2688
$\delta_{IV/2000}$	3.6795***	0.2766
$\delta_{I/2001}$	4.5233***	0.2999
$\delta_{II/2001-IV/2001}$	5.3213***	0.3327

Note: The asterisks' ***, ** and * denote significance at the one, five and ten per cent significance level respectively. 843 observations involved in the estimation; the pseudo R^2 is 0.3968.

Table 3: Wald tests for joint significance

	Wald stat.	p–value
log(# of advertising pages)	111.552	0
Magazine age	18.849	0
log(share of readers online)	17.699	0.817
log(share of readers online) in 1996	1.452	0.835
log(share of readers online) in 1997	0.179	0.996
log(share of readers online) in 1998	6.376	0.173
log(share of readers online) in 1999	7.793	0.099
log(share of readers online) in 2000	7.16	0.128
log(share of readers online) in 2001	1.723	0.787
# of women's magazines online	2.599	0.957
Share of magazines online in own group	8.775	0.458

Note: Table 3 displays Wald–tests for joint significance that correspond to the estimation results shown in Table 2.

Table 4: Semi–elasticties of the latent variable with respect to the time–invariant covariates

	Effect on early launching	5 %	10 %	50 %	90 %	95 %	Mean	Std. dev.
Semi own–price elasticity	—	0.0726	0.1212	3.5991	10.3053	15.7995	4.9111	6.0433
Magazine subscribers	+	0.0000	0.0000	0.0000	0.0004	0.0007	0.0002	0.0008
Titles published by own publ.	+	0.0249	0.0555	0.3014	2.1018	2.5244	0.7119	0.8892
Share entertaining pages	+	0.0563	0.1140	0.4375	1.0399	1.5155	0.5670	0.5237
Estimated latent variable		-0.1260	1.0120	7.5200	11.5560	12.6320	6.7342	4.0519

Note: Table 4 shows how much the latent variable changes due to a one–unit change in one of the explanatory variables.

Table 5: Hypotheses and empirical findings

#	Variable	Expected effect	Actual effect
1.	Semi own–price elasticity of demand	—	—
2.	Magazine subscribers	+	insignificant
3.	Titles published by own publisher	+	+
4.	Advertising pages	+	+
5.	Bandwagon effect	+	+
6.	Magazine age	—	—
7.	Share entertainment pages	+	+
8.	Share readers online	+	+

Note: Table 5 summarizes the hypotheses derived in Subsection 2.1. A '—' indicates a negative effect of the corresponding variable on early website launching, a '+' indicates positive impact.

Figure 1: Semi–elasticity of the latent variable with respect to the share of magazines from the own group that is online

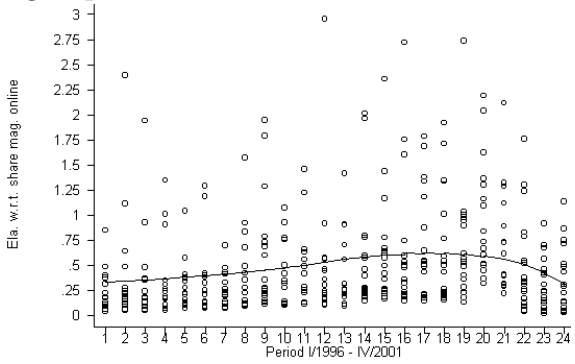


Figure 2: Elasticity of the latent variable with respect to the share of readers that are online

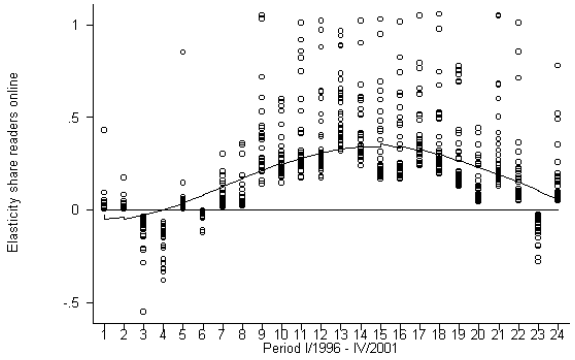
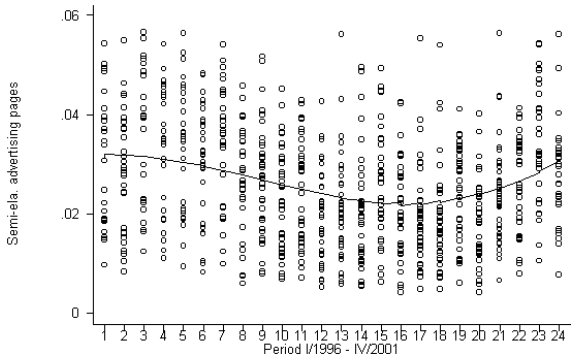


Figure 3: Semi–elasticity of the latent variable with respect to the number of advertising pages



Appendix A: The 'nested logit' model

The 'nested logit' demand estimation equation is given by (Berry 1992, p. 253):

$$ln(s_{jt}) \; - \; ln(s_{0t}) = \boldsymbol{x_{jt}\beta} + \alpha p_{jt} + \sigma ln(\bar{s}_{jt|g}) + \tau_t + \xi_{jt},$$

where $ln(s_{jt})$ denotes the natural logarithm of the market share of magazine j at time t, $ln(s_{0t})$ denotes the natural logarithm of the market share of the outside good, good 0 at time t, $\boldsymbol{x_{jt}}$ denotes the vector of quality characteristics of magazine j at time t, α relates magazine j's cover price at time t, p_{jt}, to market shares, $\bar{s}_{jt|g}$ denotes the market share of magazine j at time t in magazine group g, τ_t denotes demand shocks that are the same for all magazines and ξ_{jt} denotes unobserved (to the econometrician) product quality components. The market share of the outside good, s_{0t}, is $s_{0t} = 1 - \sum_j s_{jt}$. (Note that the framework chosen here allows consumers to purchase more than one magazine as long as the magazine purchase decision is uncorrelated with the number of magazines bought.) Market size, M_t, is defined as the number of women living in Germany aged 14 or older so that $s_{jt} = q_{jt}/M_t$, with q_{jt} denoting the number of sold copies of magazine j at time t.

My specification of $\boldsymbol{x_{jt}}$ includes the natural logarithm of magazine age and its square, the natural logarithm of the number of editorial pages and its square, advertising share (the number of advertising pages relative to the total number of pages), sixteen content share variables (fashion; cosmetics; handicraft; sensational entertainment; interior design; children and education; partnership; vacationing; health and beauty; counselling; the arts and cultural events; fiction, riddles and humor; sex as entertainment; TV guide; service pages of the editors; cars and motorcyles), the Hirschman–Herfindahl index of topics concentration, a set of quarter dummy variables (with the fourth quarter as base quarter) and five year dummy variables (with 1996 as base year).

The fact that both consumers and producers know the unobserved product quality component ξ_{jt} causes product price p_{jt} and within–group market share $\bar{s}_{jt|g}$ to be endogenous variables in the demand equation. Appropriate instruments are (functions of) characteristics of the other magazines (Berry 1994, p. 254). I use the means across all magazines (denotes by M_{all}) and the means within the magazines of the own group (denotes by M_{group}) of the following variables as instruments: editorial pages and square, advertising share and square, share of entertaining pages and square as well as magazine age.

The nested logit demand equation is estimated by three–stages Least Squares. Table A displays estimation results. The instruments neither jointly nor individually have a significant effects on the reduced form demand equation.

Based on the estimation results, the semi–own price elasticity of magazine demand is calculated as:

$$\epsilon_{jt} = \frac{\alpha}{1-\sigma}(1 - \sigma\bar{s}_{jt|g} - (1-\sigma)).$$

Table A: estimation results for 'nested logit' demand model

	Reduced form estimation results			**Structural form**	
	Demand eq.	**Price eq.**	$ln(s)_{j\|gt}$ **eq.**	**Demand eq.**	
	Coeff.	**Coeff.**	**Coeff.**	**Coeff.**	**Std. err.**
α				-0.5570***	0.1693
σ				0.5641***	0.2089
ln(age)	0.3882***	0.3835***	0.3125***	0.4460***	0.0850
ln(age)^2	-0.0755***	-0.0487***	-0.0663***	-0.0672***	0.0153
ln(# of editorial pages)	-4.7432***	3.2633***	-6.6389***	0.3123	2.3036
ln(# of editorial pages)^2	0.4096***	-0.2627***	0.5568***	-0.0006	0.1909
Advertising share	0.7968	-1.1445	1.8713**	-0.9368	1.0007
Advertising share^2	0.8580	2.2957**	-0.9679	2.9616**	1.3665
1st quarter	0.0990	-0.0374	0.0080	0.1184***	0.0410
2nd quarter	0.0174	0.0361	0.0099	0.0474	0.0386
3rd quarter	0.1164	-0.0530	-0.0159	0.1522***	0.0417
1997	-0.1557	-0.1189	-0.0316	-0.0967*	0.0502
1998	-0.2924	-0.0994	-0.2150	-0.1547***	0.0494
1999	-0.2908	-0.2024	-0.1489	-0.2229***	0.0580
2000	-0.2787	-0.2571	-0.0871	-0.3005***	0.0556
2001	-0.2861	-0.2383	-0.1295	-0.3539***	0.0515
Fashion	0.0532***	0.0037	0.0672***	0.0169	0.0148
Cosmetics	0.0084	-0.0103	0.0109	-0.0005	0.0115
Handicraft	0.0582***	-0.0109	0.0623***	0.0160	0.0155
Sensation	0.0618***	-0.0188**	0.0515***	0.0204	0.0149
Furniture	0.0078	-0.0113	-0.0021	0.0052	0.0124
Children	0.0921***	-0.0820***	0.1165***	-0.0246	0.0435
Beauty	0.0049	-0.0227**	0.0050	-0.0090	0.0140
Partnership	0.0334***	-0.0163	0.0330***	0.0023	0.0134
Vacationing	-0.0534***	0.0457***	-0.0621***	0.0084	0.0218
Counselling	0.0676***	-0.1100***	0.0542***	-0.0259	0.0330
Art	0.0388***	0.1095***	0.1171***	0.0250	0.0200
Fistion	0.0702***	-0.0343***	0.0713***	0.0084	0.0204
Sex as ent.	0.0585**	-0.0665***	0.0507*	-0.0180	0.0360
TV program	0.0168	0.0019	0.0188	0.0067	0.0110
Infopages	-0.0310*	-0.0528***	-0.0107	-0.0501**	0.0208
Cars	0.0043	0.0735***	-0.0230	0.0564	0.0365
Topic conc.	-0.0012***	0.0005***	-0.0010***	-0.0004	0.0003
Constant	2.1730	-5.9954	35.5345	-4.2590	5.8069
Instruments					
M_{all} ed. pages	-0.0033	0.0012	-0.0016	0.0564	0.0365
M_{group} ed. pages	-0.0013	-0.0012	-0.0051***	-0.0004	0.0003
M_{all} advertising share	-4.5508	-27.5377	-6.4354	-4.2590	5.8069
M_{group} advertising share	1.7530	-3.6603***	-1.8776		
M_{group} ed. pages^2	0.0000	0.0000	0.0000		
M_{all} advertising share^2	5.3951	45.6204	6.6771		
M_{group} advertising share^2	-2.6350	10.1059***	6.3957		
M_{all} share entertainment	0.2301	0.4135	-0.6820		
M_{all} share entertainment^2	-0.0021	-0.0055	0.0092		
M_{all} # of pages	0.0114	-0.0195	-0.0073		
M_{all} # of pages^2	0.0000	0.0000	0.0000		
M_{all} ed. Pages	-1.0806	1.0026	-0.6125		
Adj. R^2					

Note: The asterisks' ***, ** and * denote significance at the one, five and ten per cent significance level respectively. For brevity, standard errors are displayed for the structural form equation only. F–tests show that the instruments are jointly insignificant in the reduced form demand equation and that they are jointly significant in the pricing and within–group market share equations. ??? observations are involved in the estimation.

Appendix B: Descriptive statistics

???

Appendix C: The ordered logit model for duration data

Failure times are observed in discrete (quarterly) units of time in the period I/1996 to IV/2001 ($t = 1, 2, ..., 24$). The hazard rate of magazine j — its failure rate at time $\tau + \Delta$ conditional on survival until τ — is

$$lim_{\Delta \to 0} \frac{P(\tau < t_j < \tau + \Delta | t_j > \tau}{\Delta} = \lambda_0(\tau) exp(-\boldsymbol{z_{jt}\gamma}),$$

where $\boldsymbol{z_{jt}}$ denotes (potentially time–varying) variables affecting survival, $\boldsymbol{\gamma}$ is a vector of coefficients and λ_0 denotes the 'baseline' hazard — the hazard rate which is identical across observations and which is rescaled in time by the vector of covariates $\boldsymbol{z_{jt}}$. The natural logarithm of the integrated hazard rate is

$$\delta_t = ln \int_0^{t_j} \lambda_0(\tau) d\tau = \boldsymbol{z_{jt}\gamma} + \varepsilon_{jt},$$

where ε_{jt} is assumed to be extreme value distributed. The probability of failure in period t hence is

$$\delta_t = ln \int_{\delta_{t-1} - \boldsymbol{z_{jt}\gamma}}^{\delta_t - \boldsymbol{z_{jt}\gamma}} f(\varepsilon_{jt}) d\varepsilon_{jt},$$

so that the δ–parameters and the coefficients vector $\boldsymbol{\gamma}$ can be estimated by a simple ordered logit model (Greene 2000, Ch. 19.8) for duration data, with the δ–parameters being the usual fixed 'threshold' parameters that are to be estimated.

In the case of right–censoring, the relevant contribution to the likelihood–function probability is sum of the probabilities from I/1996 to the date where the observation is right–censored (and not just the cell corresponding cell probability).

Unobserved heterogeneity can easily be implemented into the ordered logit setting. Indeed, taking into account heterogeneity in the form of a Gamma distribution leads to a cloosed–form likelihood function so that numerical integration is not needed. Unobserved heterogeneity adds an additional parameter — the variance of the Gamma–distribution — that is estimated along with the δ's and $\boldsymbol{\gamma}$'s to the likelihood function. Details can be omitted here since the model with unobserved heterogeneity of Gamma–form never reached convergence. Han and Hausman (1990, pp. 4–5) provide details on the incorporation of unobserved heterogeneity to the ordered logit model.

Appendix D: Weibull model estimation results

Table B: Weibull model estimation results

	Coeff.	Std. err.
ln(# of advertising pages)	7.3849***	2.2512
log(semi–own price elasticity)	-3.2092***	1.0364
log(# of titles published by own publisher)	-1.2164**	0.5902
log(# of subscribers)	2.4501***	0.7827
log(share of entertaining pages)	12.2434***	4.0460
Magazine less than 12 years old	9.6997***	2.6556
Magazine between 11 and 22 years old	3.4777*	2.1354
Magazine between 23 and 49 years old	1.5793	1.4505
log(share of readers online)	-1.2853***	0.4773
# of women's magazines online	-0.2489	0.3745
Share of magazines online in own group	17.5818***	4.6747
Constant	-117.0486***	32.1291

Note: 700 observations involved; the estimate of the shape parameter is 6.5730 (std. err.: 2.4920). The specification is in log relative hazard form so that the coefficients corresponding to variables in natural logarithms translate to elasticities and the coefficients related to the dummy variables translate to chanhes in the hazard rate.