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Abstract

This note analyzes the existence of a possible media bias by determining the impact of automobile manufactures' advertisements on the probability that German car magazines review their products. By accounting for possible endogeneity, we find a positive impact of advertising volumes on test probability.

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1 Introduction

Media bias and diversity of opinion are standard issues not only in (media) economics but also in political and communications science as well as in journalism. However in economics both concepts have recently been rediscovered with the emergence of the concept of two sided markets (see Rochet & Tirole, 2003). Moreover, many countries such as Germany, the U.S., the UK and Australia either already have reformed or at least intensively discussed to reform the competition law with respect to media mergers. The most important indicators when assessing intra-media and cross-media ownership are of course diversity of opinion and media bias.

Media bias and limited neutrality can take several shapes. Stories, news or – generally speaking – coverage can be biased due to incorrect reproduction of facts, misreports, the selection of news or badly performed search of facts. A media bias therefore always exists when the media are (intended or not) not objective, not completely honest or neutral with their reporting. Obviously, a completely unbiased coverage is very unlikely even if it is produced incidentally. However, only a systematic bias is likely to lead to permanent too high information cost and therefore to a sustained deadweight loss.

A typical and often-cited type of bias is the so called political bias which is some kind of an ideological bias and not necessarily profit oriented.[1] Of course, in case that a political bias follows the preferences of the recipients it is also suitable to maximize profits. A completely different type of profit-oriented bias arises from the interdependence of recipients and advertising markets. As advertising volumes are frequently the most important source of revenues newspapers and magazines, e.g., can have severe incentives to increase the demand for advertising space in order to increase revenues (and ceteris paribus also profits). Thus, in case that coverage can be an adequate instrument to expand the demand for advertising space – e.g., by benevolent reporting – coverage is likely to be biased.

[1]The New York Times for example has frequently been accused to have a liberal (and therefore biased and non-neutral) viewpoint. Other ideological biases are, e.g., ethnic or racial bias, class and religious bias.

From an advertising customer's point of view, biased coverage can then be seen as a free of charge advertising. A slanting media is then suitable to increase the demand for the advertising customer's products.

In ordinary one-sided markets with negligible cost of biased coverage biased reporting would always have at least a non-negative effect on profits. In two-sided markets however the effect of biased coverage can either be stronger or weaker. As long as readers like advertising (i.e., network effects from the advertising to the reader market are positive) a media bias will always have stronger effects than in one-sided markets. This is due to the reinforcing impact of two-sided network effects. With higher amounts of advertising a higher demand for copies follows which in turn leads to a stronger demand for advertising volumes. In case that readers dislike advertising a trade-off between advertising and circulation exists though. An increasing demand for advertising space (and therefore an increasing number of advertisements) would then reduce the demand for copies and vice versa. The incentives for biased coverage would definitely be lower when reader are ad-haters.

Studies on media bias have a long tradition in journalism and political science (see, e.g., Glasgow University Media Group, 1982; Herman and Chomsky, 1988). With the invention of the theory of two-sided markets also an increasing number of economic studies dealing with media bias from different perspectives can be observed. An outstanding theoretical paper on political media bias from an economic perspective is Mullainathan & Shleifer (2005). The authors analyze the newspapers' incentive to distort the news coverage under both monopolistic and competitive markets structure. It is assumed that not only contents are biased but also that readers are characterized by their subjective beliefs which they like to see confirmed. Newspapers are then likely to (as Mullainathan & Shleifer put it) slant the stories toward these beliefs. Generally speaking, Mullainathan & Shleifer find that competitive forms might have a stronger incentive to bias coverage. Opposite results are provided by, e.g., Anderson & McLaren, (2007) and Gentzkow & Shapiro (2006a).[2] In contrast to Mullainathan & Shleifer (2005)

[2]See also Gal-Or et al., 2012, Gronnevet, 2009; Blasco et al., 2011

both papers find that competition is likely to reduce the media bias in case that readers are not able to judge the validity of the coverage. However, most of these studies are more or less dealing with a political media bias and only few analyze the incentives to slant content toward the advertising customers' beliefs. Exceptions are Hamilton (2004) and Ellman & Germano (2005).

Similar as for the theoretical studies also holds for empirical papers on media bias. Gentzkow & Shapiro (2006b) as well as DellaVigna & Kaplan (2007) and George & Waldfogel (2003) analyze the existence of a political media bias from different perspectives. Again only few deal with the impact of the advertising customers' behavior (see Dyck & Zingales, 2003, and Reuter (2002) and Reuter and Zitzewitz, 2006). Both Reuter (2002) and Reuter and Zitzewitz (2006) test the impact of advertising on wine ratings and mutual fund recommendations, respectively.[3] Reuter (2002) as well as Reuter and Zitzewitz (2006) find evidence for the existence of biased content. Magazines seem to slant their financial recommendations and wine reviews, respectively, towards their biggest advertising customers. Both studies are therefore closely related to our study.

Our study also aims at analyzing the existence of a possible media bias provoked by the interrelation of reader and advertising markets. Adding on the existing literature the impact of advertising volumes on the probability of a car manufacturer's product being reviewed is analyzed. Choosing car magazines comes with several advantages. At first data are disposable and can easily be collected from the magazines. Furthermore, the probability of a car being reviewed is far more objective than judgements on a "left-wing/right-wing"-scale which often has to be constructed in studies of media bias due to political news.

To identify a possible media bias, we use data on the two largest German car magazines, *Autobild* and *Auto, Motor und Sport*. The overall circulation of the magazines covers about 70% of the relevant market. The magazines also show by far the largest number of advertising volumes in comparison to other competitors.

[3] A similar study can be found at Gambaro and Puglisi, 2010. See Dunham, 2011, for a analysis on political media bias.

2 Empirical Analysis

2.1 Data and identification strategy

To analyze the manufacturers' probability of being reviewed we use data on the most important German consumer car magazines, the weekly *Autobild* (AB) and the biweekly *Auto, Motor und Sport* (AMS) over the period of 1995–2002 and 1992–2007, respectively. By this means we obtained information on over 412 (416) issues and on 31 (39) car manufacturers' as well as on their advertising volumes. During these periods more than 700 (600) models have been reviewed in AB (AMS) using single reviews and about 1130 (2140) models in AB (AMS) have been reviewed in a comparative test. Given that models of each manufacturer can potentially be reviewed (either in a single review or in a benchmark test) in each issue of the magazines information on over 11000 reviews (and non-reviews) are available for AB and AMS, respectively.

In order to analyze the test probability a dummy variable (Test) is generated which is equal to one when any of the car manufacturer i's models has been reviewed in issue t (see Table 1 for some descriptive statistics) and zero otherwise. Furthermore we use variables such as ads which is the total (average) number of advertising pages of each automobile manufacturer per issue, the monthly manufacturers' market share, the total number of pages per issue and a dummy variable equal to one for German car manufacturers. We also use dummy variables to account for time and group effects. We furthermore use several lags of the number of new car releases as we expect that a higher number of a manufacturer's new releases increases the probability that one or more models will be reviewed in on of the following issues.

As we assume that advertising volumes have impact on the probability of being reviewed, of course, also the reverse effect may hold. In case that automobile manufacturers can influence the car magazines behavior it is also reasonable to assume that a high (low) frequency of reviews leads to a decrease (increase) in this manufacturer's advertising volume. We therefore use instrumental variable methods to account for this possible endogeneity.

Table 1: Data

Variable	Mean		Mean		Min		Max	
	AB	AMS	AB	AMS	AB	AMS	AB	AMS
Test	0.15	0.21	0.36	0.40	0	0	1	1
Ads	0.53	0.87	0.90	1.24	0	0	12	20
German	0.23	0.26	0.42	0.44	0	0	1	1
Pages	88.49	219.75	20.12	47.32	56	101	168	384
Market share	0.04	0.04	0.04	0.04	0.0002	$7.35 \cdot 10^{-07}$	0.15	0.15
New registrations	44,245.09	40,727.98	42,951.47	41,141.55	247	0	199,121	199,121
New releases	5.97	7.97	18.38	28.08	0	0	326	834

Our identification strategy is based on two sets of variables. At first we assume that past car registrations have significant impact on advertising. Since new car registrations have a direct impact on manufacturers' market shares, producers' marketing strategy may somehow depend on car sales. In case that producers loose market shares, we would expect that marketing revenues are likely to be increased. Even though marketing strategies are planned a couple of months in advance there is also room for short-term sales promotions to respond to recent demand fluctuations. We therefore use up to eight lags of car registrations as instrumental variables in order to account for inter-temporal effects. Secondly, car manufacturers typically advertise new models some months in advance of their official market appearances. Hence, advertising volumes should also depend on future car releases. We use up to eight leads of the monthly new car releases as instruments to account for dynamic effects. Finally, the brands' market shares are included to instrument advertising volumes assuming a connection between advertising and market shares (see Schmalensee, 1972).

2.2 Results

At first, we use simple probit methods by regressing our left hand side variable *Test* on manufacturers' advertising volumes, the *German* dummy, the contemporary number of new releases as well as two lags of car releases. As one can see from the second column in Table 2 and 3, *ads* is positive and statistically significant. An increasing number of advertising pages by a specific car producer seems to have a positive impact on the likelihood of being reviewed. Moreover, German cars show a higher test probability than cars from foreign manufacturers, which may be interpreted as some kind of home bias to occur in both magazines. Contemporary and lagged values of new releases have also positive and statisti-

cally significant coefficients. New models have, of course, a higher probability of being reviewed.

Using random effects panel regressions for both samples more or less confirm our results from simple probit methods (see column 3 in Tables 2 and 3).[4] Again, regression results suggest evidence for a media bias as well as for some kind of home bias. However, controlling for unobserved heterogeneity leads to weaker levels of significance for new releases as well as to a seemingly smaller media bias.

Table 2: Regression results for *Auto, Motor & Sport*

	Probit Test	Panel Probit Test	IV Probit Test
Ads	0.138 (0.00)***	0.054 (0.00)***	0.607 (0.00)***
Germany	0.882 (0.00)***	0.994 (0.00)***	0.270 (0.00)***
New releases	0.003 (0.00)***	0.001 (0.05)**	0.001 (0.14)
New releases$_{t-1}$	0.002 (0.00)***	0.0004 (0.40)	-0.0002 (0.61)
New releases$_{t-2}$	0.002 (0.00)***	0.001 (0.17)	-0.0001 (0.82)
No of pages	0.0002 (0.63)	0.001 (0.20)	-0.002 (0.00)***
Month dummies	yes	yes	yes
Year dummies	yes	yes	yes
Group dummies	yes	yes	yes
Constant	-1.550 (0.00)***	-1.601 (0.00)***	-0.935 (0.00)***
Obs.	11,167	11,167	10,331
Wald Test	1,285.69***	417.58***	1,656.29***
Test statistics from linear probability model			
F-statistics of excluded Instruments			44.67
Stock-Yogo critical value for 5% max. IV rel. bias			21.31
Hansen J overid. test			11.62 (0.77)
Instrumental variables	Market Share, New Registrations$_{t-1}$–New Registrations$_{t-8}$, New Releases$_{t+1}$–New Releases$_{t+8}$		

*, **, *** statistically significant on the 10%-, 5%-, and 1%-level. Robust p-values in parentheses.

When controlling for endogeneity by using instrumental variable probit regressions somewhat different results can be observed. While instrumental variable regressions still confirm the existence of a bias, the estimated effects are significantly larger than before. Obviously, the coefficients in previous regressions are

[4]Note, that random effects are implemented on brand level.

biased downwards. In case that a lower test probability drives manufacturers to increase advertising activity in this specific magazine a negative relationship between test probability and advertising volumes exists. When not controlling for this endogeneity estimated parameters should in fact be downward biased. However, since we are not able to control for unobserved heterogeneity the true effect may be smaller than indicated by instrumental variable regressions.

Table 3: Regression results for *Autobild*

	Probit Test	Panel Probit Test	IV Probit Test
Ads	0.101 (0.00)***	0.040 (0.01)***	0.688 (0.00)***
Germany	0.640 (0.00)***	0.734 (0.00)***	0.129 (0.08)*
New releases	0.002 (0.00)***	0.001 (0.40)	0.001 (0.34)
New releases$_{t-1}$	0.002 (0.00)***	0.001 (0.30)	0.0003 (0.51)
New releases$_{t-2}$	0.002 (0.00)***	0.0003 (0.55)	0.0002(0.73)
No of pages	0.001 (0.61)	0.001 (0.33)	-0.004 (0.00)***
Month dummies	yes	yes	yes
Year dummies	yes	yes	yes
Group dummies	yes	yes	yes
Constant	-1.879 (0.00)***	-1.920 (0.00)***	-1.155 (0.00)***
Obs.	12,384	12,384	12,384
Wald Test	738.54***	149.03***	1,346.93***
Test statistics from linear probability model			
F-statistics of excluded Instruments			58.76
Stock-Yogo critical value for 5% max. IV rel. bias			21.31
Hansen J overid. test			11.26 (0.79)
Instrumental variables	Market Share, New Registrations$_{t-1}$–New Registrations$_{t-8}$, New Releases$_{t+1}$–New Releases$_{t+8}$		

*, **, *** statistically significant on the 10%-, 5%-, and 1%-level. Robust p-values in parentheses.

Concerning German manufacturers results are somewhat ambiguous. While for AMS a home bias still holds, the coefficient of Germany is statistically significant on a 10% level in the AB regression. Also contemporary as well as lagged new car releases are no longer significant. This result may arise from the fact that instrumental variables are highly correlated with some of our explanatory variables.

The economic significance of our instruments is confirmed by different test statistics. As one can see from Table 2 and 3, F-statistics for both specifications (AMS and AB) obtained from linear probability models are reasonably high and therefore suggest the relevance of our instruments.[5] Both values exceed the Stock-Yogo critical value for a 5% maximum iv relative bias considerably. Also Hansen J-test of over-identification indicates an adequate use of instrumental variables.

3 Conclusions and Outlook

As car manufacturers are important advertising customers for car magazines and as furthermore advertising revenues are a major source for magazines' total income publishers may have severe incentives to slant car reviews towards the preferences of the largest advertising customers.

This study analyzes a possible media bias in German car magazines caused by the car manufacturers' advertisements. Analyzing the impact of car producers' advertising levels in the two leading German car magazines, we find evidence for a biased selection of automobiles for single and comparative car tests. On the one hand producers with high advertising volumes show a higher probability of being reviewed also when controlling for endogenous advertising volumes. The results are robust independently of which method is used: simple probit regressions, panel techniques or instrumental variable regressions. Moreover, also evidence for a significant home bias towards German manufacturers exists. As expected also the releases of new models influence the test probability positively.

As we find evidence for the existence of biased test probability, our results suggest further research into that direction. As a next step, the possible distortions in the test results may also come into the focus of our analysis. Not only the choice of cars but also the evaluation of the overall performance gives the potential of possible biases.

[5] As instrumental variable probit models do not allow testing for weakness of instruments in terms of relative iv bias, we estimated respective linear probability version of our IV probit models.

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