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Abstract

Journalistic co-orientation is defined as journalists' use of other media with the function of ensuring legitimate news decisions or enhancing journalistic prestige, as well as promoting economic success under conditions of uncertainty. Among the different forms of co-orientation, the effect of the routine use of quality media as a source of orientation in news selections is analyzed. Data from a content analysis was used, covering the period of one year. In a time series analysis based on both linear models and neural networks, the news value conferred to a political issue by one of the two national German newspapers included in the study was shown to have an effect on the intensity of coverage by one of the two regional newspapers under consideration. There is a similar tendency for the evaluation of the issue. In particular, a non-linear component can be found in the relationship between the different newspapers' coverage.

Keywords

Co-Orientation, Journalism, Time Series Analysis, Neural Networks

Numerous studies in mass communication research assume that processes of co-orientation strongly influence journalists' news decision making (Harcup 2004: 44–45). As a part of their working routine, journalists monitor how other media set the news agenda and news frames and how they evaluate both facts and people (Reinemann 2004: 857). Consequently, research often focuses on opinion-leading media only, as other media are said to be consonant with them due to co-orientation. It is sometimes assumed that co-orientation is functional from a journalistic and a societal perspective: It ensures efficiency and high journalistic standards (Krämer, Schroll & Daschmann 2009). On the other hand, co-orientation might enforce agenda setting processes and therefore enable a society to focus on specific important problems (Krämer, Schroll & Daschmann 2009: 14).

In contrast to these assumptions and lines of research, the diversity of opinions is highly esteemed in Western cultures. Any newspaper may be biased with regard to news selection and may favor certain points of view, but newspaper coverage in its entirety should be balanced or represent the sum of all relevant opinions in society. However, this system only works if editorial offices are independent from each other. The concept of co-orientation contradicts this normative standard if published opinions of several newsrooms strongly correlate with each other (Danielian & Reese 1989). In this case, instead of setting the agenda with regards to societal problems, journalism would only keep up with the latest trends. Even if journalism's ability to place societal problems on the public agenda is not denied, the

adequacy of agenda setting cycles for the problems and issues emphasized could at best be viewed as being uncertain.

Summarizing the perspectives above, co-orientation can be both functional and dysfunctional for a society, as well as for journalism itself. However, although the practical importance of co-orientation seems clear enough (Rössler 1997: 80–81), there is little substantial empirical evidence. As we will argue below, existing studies often do not use statistical methodologies appropriate for modeling co-orientation. We will attempt to perform a rather strict test of co-orientation

Our theoretical argument and our empirical study focus on routine reliance on other media instead of short news hypes (Fishman, 1978; Vastermann, 2005). Both forms of co-orientation are surely relevant as to their influence on of media coverage, but require different methodological approaches (see below) and probably also different theoretical explanations.

After showing the theoretical plausibility of routine co-orientation, we will set up a methodology and a sample for a conservative test. If routine co-orientation is relevant, it should emerge as a stable pattern between the coverage of different media outlets. A strict test includes a precise notion of causality: It should manifest as a cross-correlation between the intensity of an issue's coverage in different media, controlling auto-correlation. We will present criteria for an appropriate selection of media outlets, issues, periods of analysis and a justification for the intensity of coverage as an indicator of co-

orientation. We will conclude that for a thorough attempt to falsify

assumptions of co-orientation, non-linear relationships should also be tested.

2. Theoretical Assumptions

The use of other media as a part of journalistic routines seems to be

theoretically plausible, and previous studies indicate that journalists rely on

other media outlets for orientation. In communication research, this

phenomenon is subsumed under several concepts, e. g., inter media agenda

setting (e.g., Danielian & Reese 1989), media opinion leadership (Breed

1955a), diffusion of information (Greenberg 1964), and co-orientation. The

latter is preferred here, as it refers to the motives and functions of journalist's

media use. The main functions of co-orientative behavior are the

legitimization of decisions over news coverage as well as ensuring economic

success or enhancing status (see Reinemann 2004; Krämer, Schroll &

Daschmann 2009, and below). Both refer to the structural uncertainty in the

journalistic work process and mass media's qualities to moderate it. The

consequences of this behavior can be both intentional and conscious, or

remain unnoticed by the journalists. They are complemented by other

influences on journalistic work on the personal, organizational, systemic

(from, e. g., the media, the political, and economic systems), and societal or

cultural level (Weischenberg 1992: 68; Shoemaker & Reese 1996).

2.1 Structural Uncertainty in Journalism

As time, space, and the audience's attention are limited resources for

the media, a major part of journalistic work consists of the reduction of the

complexity of reality by selecting news, as well as interpreting and evaluating facts. The decision as to the newsworthiness of an event or issue is the basis for further considerations on framing and evaluation. Thus, journalists are confronted with the problem of legitimate descriptions of reality in terms of truth, relevance and evaluation (Donsbach, 2005).

Although judgments have to be made under constant time pressure (e. g., Breed 1955a; Mathes & Pfetsch 1991), journalists have neither clear detailed criteria for news selection (despite such abstract criteria as news factors) nor detailed knowledge about audience preferences. Despite some new developments in audience research, we can still follow Donsbach's (1981) argument that journalists can never be certain in advance whether a particular issue or evaluation will be appreciated by their readers.

News decisions cannot be legitimized based on their function for the audience alone, particularly if the customers' preferences are unclear. The media are also expected to contribute to public welfare and democratic opinion making, as well as to follow professional norms. This legitimacy is not easy to achieve in everyday practice.

On a more abstract level, co-orientation can be used to establish both a journalistic and an economic strategy, even if information on market conditions is scarce. With regard to economic strategies, a differentiation of the textual content, as well as the adaption of successful market behavior, can both lead to economic success. In contrast, other strategies focus on the accumulation of prestige. Quality newspapers may serve as a prototype for

less important newspapers striving for recognition (Breed 1955b; Mathes & Pfetsch 1991). It has, however, yet to be determined in which way other media constitute an appropriate source of orientation.

2.2 Media's Function in the Reduction of Uncertainty

In order to discuss the media's usefulness in the context of journalistic practice, we first have to limit the concept of co-orientation. Breed (1955a, 1955b) has already demonstrated the necessity of distinguishing between different types of co-orientation. Journalists can either consult colleagues in their own organization or align with those working in other organizations. This study focuses on the second option. Therefore, opinion leading media can be defined as those mass mediated partners of communication which a journalist prefers to consult in order to deal with the restrictions discussed above.

Under conditions of uncertainty, intersubjective descriptions of reality validate one's own view and reduce the anxiety not to deviate from shared worldviews and norms, in particular those of an ingroup such as one's colleagues (cf. Donsbach 2005). Mass media are considered a reliable source of information by journalists (cf. Gans 1980). They rely on their peers to accurately investigate, select, frame, and evaluate the news from different events. At the same time, the use of mass media is much more cost-efficient than any other method of inquiry (Donsbach 1991). For example, at the level of selectivity, the news value of issues that are covered by other media has already been verified. Journalists tend to highlight the news value of their stories by attributing a number of news factors to the events selected for coverage (Donsbach 1991; Eilders 1996; Kepplinger 2005), which may cause

their colleagues to concentrate on these events. Finally, events and issues are more likely to be covered if they comply with the norms of a journalistic style of presentation. "Other media provide journalists with a journalism-adequate version of a story, one that already has all the ingredients that make a 'real' story" (Reinemann 2004: 860). Peer journalists represent professional norms. Therefore, they are considered the most legitimate influence on a journalist's decision-making (Donsbach 2005), not only in terms of selections, but probably also regarding framing and evaluation.

Using other media, particularly those with a strong reputation, as a guideline for publications may thus reduce uncertainty and provide legitimacy (cf. Krämer, Schroll & Daschmann 2009): Good journalism (from a professional and a social responsibility perspective) is what experienced journalists who work for quality media do. If there is a certain consistency of coverage over several media outlets, as well as a degree of permanence in reporting, journalism is also legitimized as a whole.

Consequently, the findings of Reinemann (2004: 863) indicate that journalists rely heavily on different kinds of news media at all stages of the news making process.

2.3 The Role of Political Judgments and Alignments

Co-orientation may also be explained by a tendency to follow (opinion) leaders with a similar political view or by motives of conformity with an ingroup such as the fellow journalists (Donsbach 1981), either regarding the selection or evaluation of events. In particular, events may be

selected for coverage according to their function to support a particular political position, as postulated by the theory of instrumental actualization (Kepplinger 1989). Here, additional forms of uncertainty and of need for legitimization may occur. Instrumental actualization can lead to two different cases. If the instrumental value of an event is clear from the outset, there is no need for co-orientation, but there may only be uncertainty whether its (politically opportune) publication can also be justified in terms of relevance (according to the instrumental theory of news value, Staab 1990). However, if the instrumental value is uncertain, a newspaper with a similar political bias can be useful in terms of co-orientation, and the dependent newspaper will ascribe a similar news value to the event, following the opinion-leading medium in its judgment of instrumentality. In both cases, the result is the same: one newspaper following the other regarding the news value ascribed to an event. Partly, this news value is then expressed in a variable intensity of coverage beyond the simple decision to cover the event. Additionally, journalists may emphasize certain newsworthy aspects of the event in question in order to justify the publication of the and intensity of politically opportune coverage.

While certain forms of political and "conformist" co-orientation cannot easily be reduced to the reduction of uncertainty, we may still notice some similarities between the different forms of striving for the "right" editorial decisions, be it in political, professional or economic terms. Conversely, a certain political bias of an opinion leading medium may contribute to its attractiveness as a source of orientation even in cases where the political

implications of an event or issue are not the primary concern of journalistic

decision, for example because the medium is trusted more than its

competitors.

2.4 Forms and Functions of Co-Orientation

By summarizing these considerations, the following theoretical

assumptions can be made: Reducing uncertainty in selecting, framing and

evaluating events, legitimizing these decisions, aligning with colleagues or a

certain political camp, and achieving economic success or journalistic prestige

are the main reasons for co-orientation. This is supported by the specific

qualities of mass media products. In an extreme case, observing other media

could even mean that the media coverage is dissociated from the actual events

and becomes both the object and the justification of the coverage itself

(Vastermann 2005). The functions of co-orientation are increasingly fulfilled

in relation to the importance of the actual or attributed influence and the

perceived quality of the medium a journalist relies on. Being part of the

working routine, everyday co-orientation occurs in all stages of the journalistic

work process and results in the news value, the thematic frames, as well as the

evaluations and the importance a journalist confers to a story or an event

within the journalistic product. Beyond the specific textual manifestation,

different strategic directions or levels of co-orientation can be distinguished

based on the aspects of time and content. Regarding the aspect of time, co-

orientation can either be regulative or prospective. Regulative co-orientation

means that other media are used to verify their own coverage in the past. In

contrast, prospective co-orientation focuses on future as well as on current

news coverage. As to the content, we can distinguish between general or abstract and particular or issue centered co-orientation. A general or abstract co-orientation manifests in socialization rules (Breed 1955b) or general economic and journalistic strategies, for example, when addressing a specific target group or realizing the political views of a publisher. Contrary to that, issue centered co-orientation refers to content. Journalists might check specialized media for vernier adjustment in a restricted thematic context or routinely use prestigious media for orientation on a wider range of separate issues. This study focuses on routine prospective, issue centered co-orientation. We assume that decisions on particular issues are strategically relevant and involve a high degree of uncertainty; thus co-orientation is the most functional approach in this case.

3. Study Framework

In this study, we attempt a strict test of routine co-orientation. This has several implications for our methodological framework. Although interviews and observational studies are relevant to provide evidence of co-orientation behavior, the most important indicator and manifestation are patterns in media content itself, i. e., correlations between the coverage of different media outlets over longer periods of time. Thus, co-orientation is demonstrated by its consequences rather than by surveying journalists' motives or their media use (Breed 1955b; Reinemann 2003, 2004). The relationship between the coverage of two or more media organizations implies the definition of causality as introduced by Granger (1969: 428):

1. A phenomenon (e. g., coverage at one point of time *t*) can only be the cause of another (e. g., later coverage at *t+1, t+2, ...*) if it occurs before or at the same time as the effect.

2. Causality is present if the status of an object (e. g., coverage by one medium) can be better explained by knowing the status of a second object (another medium) in the past.

Some of the previous studies based on such patterns and on media content focus on specific consequences of co-orientation such as convergence (Danielian & Reese 1989) or the consonance of coverage (e. g., regarding the coverage on politics or scandals, Kepplinger 2005). The data of these studies are only interpreted in an aggregate form, as is the case for some studies on inter-media agenda setting based on cross-correlations between the agendas of several media at two or more points of time (Boyle 2001; Roberts & McCombs 1994; Lopez-Escobar u.a. 1998; Lee, Lancendorfer & Lee 2005). A more detailed analysis of co-orientation in the progress of coverage over time was only rarely conducted so far. These studies trace back the coverage of one medium to the content of another at previous points in time. This is, however, often done by inspecting graphical representations of the times series instead of using statistical procedures to identify their exact relationship (Mathes & Czaplicki 1994) or by calculating time-lagged correlations without controlling for autocorrelations (Boyle 2001; Golan 2006). Similarly, Kepplinger et al. (1986) analyzed bi-variate cross-lagged correlations between the evaluation of a politician by different daily and weekly print media on a monthly and quarterly basis. They found various correlations among those

media that, however, can all be considered as prestigeous and opinion leading newspapers and magazines. To our knowledge, there has been no strict test of the effects of co-orientation by applying elaborated procedures of time series analysis, using data on journalistic coverage on a less aggregated basis over a longer period of time, and including opinion-leading as well as other media.

As a part of our more conservative test for the co-orientation effect, we analyze permanent routine co-orientation that results in a lasting relationship between the coverage of the particular media instead of a co-orientation only appearing in situations of increased uncertainty. We thus exclude situations of the wavelike cumulation of strong coverage, or phenomena of self-enforcing media coverage such as media hype or pack journalism (Vastermann 2005; Donsbach 1999). All excluded situations can be regarded as being exceptions from daily work routines which could, therefore, result in even stronger co-orientation due to increased uncertainty. Furthermore, to investigate hypes or news waves, a completely different research design would be necessary. This form of co-orientation can only be measured by the temporal order of the peaks of coverage in different media, e.g., by inspecting graphical representations of the time series. For a strict test for co-orientation in those situations, a larger number of non-routine situation would be required, as news waves are, per definition, short-termed phenomena and the number of peaks in the coverage on a single issue is very small. While it would be desirably to study routine reliance on other media with regard to a large number of issues, we will start with a single one that however provides a sufficient number of

points of time for a statistical test for cross-lagged correlations on a daily and weekly basis.

In the present analysis, we concentrate on the co-orientation behavior of regional newspapers in relation to national ones. We analyze two of the possible dimensions of co-orientation. First, the determination of whether an issue is newsworthy or not is one of the earliest co-orientative actions in an editor's working process. Moreover, the intensity of coverage is a good starting point for a more complex statistical examination of co-orientation. This aspect is easier to operationalize than, for example, media frames or issue attributes. Consequently, the intensity of coverage can be more reliably measured.

Second, we examine whether explicit evaluations of a political issue in opinion-leading media influence judgments of others. Again, this relationship can be analyzed more reliably than other phenomena involving evaluations, such as instrumental actualization. If we assume that the media cover events that fit into their publication interval, the instrumental value of an event cannot easily be determined on the basis of back issues of another medium. For other types of events, the researcher may be unable to determine which past interval could have been the point of reference for the following medium, as this may vary according to the event.

Several requirements have to be met concerning the issue of news coverage. First of all, co-orientation only occurs if events and facts can be clearly attributed to an issue and if there is a possible variance in its news

value. The issue should also be of national importance because otherwise it will not be mentioned by the nation-wide quality media. Finally, long-term significance in the public arena is important in order to facilitate the formation and detection of stable patterns of co-orientation.

As to the selection of our sample, this study focuses on the German newspaper market, which is, apart from a few national newspapers, essentially divided into numerous regional segments with monopolies or oligopolies. Many of the regional newspapers concentrate exclusively on their regional markets, and the competition for market share or the maximization of monopoly rents within the respective markets. Their co-orientation behavior may be assumed to be vague and episodic with regard to national issues, and centred on the more or less short-lived topics of regional importance as a key factor of market success in the cases where the appropriate sources of orientation exist—even in the form of competitors. Thus, it seems more pertinent to our approach to analyze a particular category of regional newspaper—those with a determination to accumulate journalistic prestige, which appear in larger cities, and which try to combine journalistic legitimacy and economic success. They can be assumed to regularly observe the national quality media, and to adapt to short-term changes with regard to national issues and their coverage in prestigious newspapers (apart from possible long-range imitation strategies on a more abstract level). If co-orientation does not manifest in this constellation, it seems rather improbable in less obvious relationships.

Accordingly, we formulate the following hypothesis:

Hypothesis 1: The extent of routine news coverage on an issue and its

evaluation by a regional newspaper can be statistically traced back

to the extent of content previously published by a national

newspaper on that issue.

However, this does not mean that the content of regional newspapers is interchangeable. In particular, if two of these newspapers operate in the same regional market, they may use different national media as a source of orientation in order to compete by differentiation while striving for general journalistic prestige.

We therefore formulate the following research question:

Research question 1: Do newspapers operating in the same regional

market and striving for prestige, differ in their co-orientation

behavior?

A central limitation of previous content analyses on co-orientation is their focus on linear relationships among the measures of media content. Taking threshold and ceiling effects into account (e. g., Mathes & Czaplicki 1994), it seems plausible to attempt a non-linear modeling of co-orientation. This may appear as a less conservative test, but if we neither find a linear nor a non-linear relationship between the respective coverages, the assumption of co-orientation is falsified more comprehensively. In agenda setting research,

several different forms of non-linear relationships have been proposed

(Neumann 1990, Brosius & Kepplinger 1992, Watt, Mazza & Snyder 1993).

As we are not sure which one may be applicable to co-orientation, we ask the

following question, without assuming a particular form of linear or non-linear

function:

>   Research question 2: Is a non-linear model of co-orientation superior to

>   a linear model in its ability to trace back the extent and the

>   evaluative bias of news coverage by a regional newspaper to the

>   coverage by a national newspaper?

We do not control for third variables in our models for two reasons. A

first category of external influences on journalism is relevant to all the media,

in particular the events covered by them. Those causes act simultaneously on

the different media, so they do not bias cross-lagged correlations. For

example, although journalists often cite news agencies as a source of

orientation (Patterson & Donsbach, 1996), their relevance for our analysis is

very restricted. If news agencies issue some reports on a day $t,$ news media

will in almost any case cover the underlying events on the same day or never.

If the amount of coverage of one medium at day $t+1$ correlates with the

coverage of an issue by another medium at day t, this usually cannot be due to

any influence of the news agencies (or other simultaneous influences such as

political events themselves), as coverage on $t+1$ will be based on more recent

reports and events (possibly influenced by previous coverage by the same

medium or others, resulting in auto- and cross-lagged correlations). Furthermore, news agencies only have restricted formal means to indicate the importance of an issue, compared to the conventional signals of relevance employed by newspapers. A second type of influence only affects particular media, so they only create additional variance in the respective coverage that is either unexplained by cross-lagged correlations or that is transferred to another medium via the cross-lagged correlation. In both cases, the strictness of our test is unaffected.

4. Method

To test the hypothesis and answer the research questions, we conducted a single issue content analysis of four German daily newspapers. We selected the *Süddeutsche Zeitung* (SZ) and the *Frankfurter Allgemeine Zeitung* (FAZ) as newspapers of national importance. The *FAZ* is politically conservative, while the *SZ* is said to be liberal. Both papers are regarded as opinion leading media in Germany. For newspapers with regional importance, we analyzed the *Berliner Zeitung* (BZ) and the *Tagesspiegel* (TS). Both are regarded as politically liberal, with the *TS* being traditionally associated with the former West Berlin, while the readership of the *BZ* is confined to the Eastern part of the city. Nevertheless, both newspapers may be described as competing for a more complete coverage of the city-wide market and for gaining national prestige as a quality paper published in the capital, at least within the period under analysis here.[1] Consequently, we assumed that *BZ* and *TS* co-orientate towards the established *SZ* and *FAZ*, while potentially following different strategies.

The news coverage on Germany's health care reform in 2004 meets the above requirements for a conservative analysis of co-orientation. The issue had national public relevance for a period of more than a year. Furthermore, the issue contained a variety of aspects, and it was discussed by numerous political and non-political actors. Most of these aspects and the major actors played an important role during the whole period. Our content analysis includes all articles containing at least one content-related aspect of the health care reform. They were published between July 1st, 2003 and June 30th, 2004 in one of the four newspapers described above. Altogether, we identified 1,250 articles on 317 days.

The intensity of coverage was measured as follows: We selected those articles in which the health care reform was either the only or the dominant issue. The length of these articles in terms of the number of words was aggregated for each day and for each newspaper, resulting in one case per day in our data set.[2] The data was completed by including those days during which the media did not report on Germany's health care reform. In this case, the intensity of coverage was set to zero. This step was necessary for two reasons: On the one hand, in time series analyses, missing cases should be avoided. On the other hand, the conjoint absence of news coverage can also be a result of co-orientation.

Among the different objects of possible evaluations within the coverage of the reform, we selected the evaluation of its consequences. We defined such evaluations as those statements describing the intended or factual outcomes of the reform (in their entirety) as right, good, appropriate, desirable,

etc. or not. For every article, the sum of all judgments (if there was at least one) was coded on a five-point scale: unequivocally positive, predominantly positive (but with qualifications), ambivalent, predominantly negative, and unequivocally negative.

In comparison to other objects such as the government or other single actors, the outcomes were evaluated most often, resulting in a relatively continuous time series. Nevertheless, we did not find such evaluations on every day in every newspaper. Anyway, co-orientation in this dimension may rather be based on an overall impression of other media's evaluations in the past few days or even weeks (cf. other studies such as by Kepplinger et al., 1986, where a monthly or quarterly basis was chosen). Thus, we used the weekly average per week and medium, resulting in a data set of 53 points of time. Table 1 summarizes the number of articles covering the reform and evaluating it.

Table 1

Number of articles covering the health care reform (and aggregated on a daily basis for the time series on the intensity of coverage) and evaluating the reform (aggregated on a weekly basis for the time series on evaluations), by medium.

Medium	Articles covering the reform	Articles evaluating the reform
SZ	345	149
FAZ	301	137
TS	352	126
BZ	252	113
Total	1250	525

5. Strategies of Analysis

Different statistical models were used to assess the relationship between the intensity of coverage and the evaluation the health care reform by the national and regional newspapers. The common logic of these time series models is to explain the intensity of coverage by the regional media at a point in time *t* by the intensity of coverage at previous points in time, denoted as *t-1*, *t-2*, ... *t-n* (*n* being a number of time units which in the present case is the number of days or weeks respectively). Some models that were established in this study are only based on a single time series, the coverage of a regional newspaper being explained by its past coverage. These were compared to others that also included data on past coverage by the national newspapers as independent variables. All of the models refer to Granger's definition of causality.
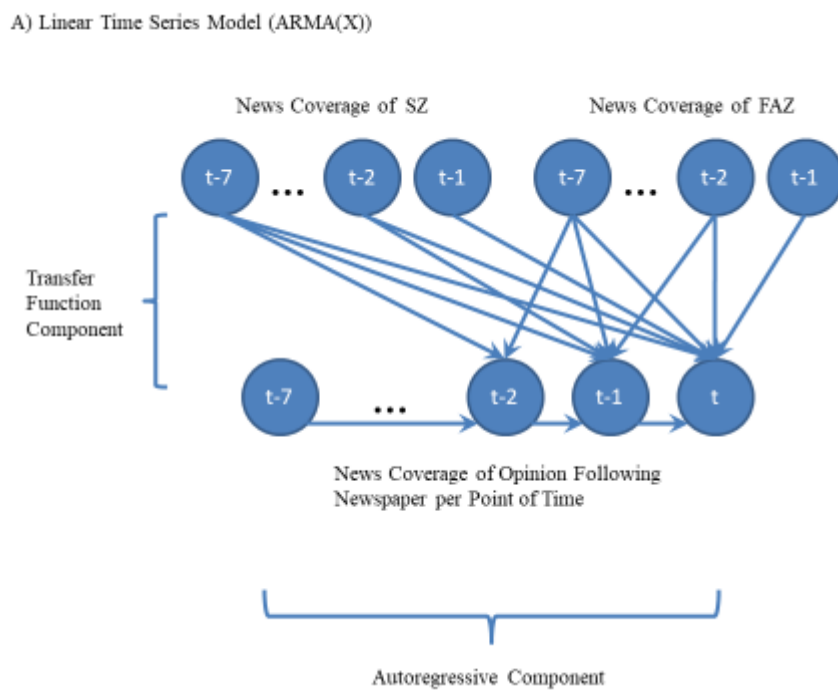
The first class of models used for data analysis are autoregressive moving average models (or *ARMA*[3] models; Box & Jenkins 1970). The intensity of coverage at the point in time *t* is described as a linear function of the intensity of coverage at *t-1*, *t-2*, ... *t-n*, with a varying number of lags *n* (this part of the model is the autoregressive component), plus a component (the moving average component) that is a linear function of the error occurring when estimating the autoregressive component for past points in time. Apart from the described *ARMA* model, another model was established, introducing the intensity of coverage by the national newspapers as an independent variable and using an algorithm proposed by Fang and Tsay (2005) which automatically estimates a linear *ARMAX* model (the *X* standing for exogenous inputs) including only parameters that are significantly different from zero.[4]

The second class of models used are neural networks. Although they were developed originally as an analogy to the human brain (McCulloch & Pitts 1943), they are now used as abstract models for complex, non-linear relationships.[5] In this case, they consist of a number of nodes (also referred to as neurons), each connected to at least one other node by a linear function. There are three different types of neurons: First, input neurons represent the independent variables (in our case, this is the intensity of coverage at past points in time). Second, output neurons represent the dependent variables (the intensity of coverage at *t*). The last group of neurons consists of hidden neurons, representing non-linear functions such as logistic ones. Their role could be compared to intervening latent variables in a causal model. They combine the influence of different independent variables and apply a non-
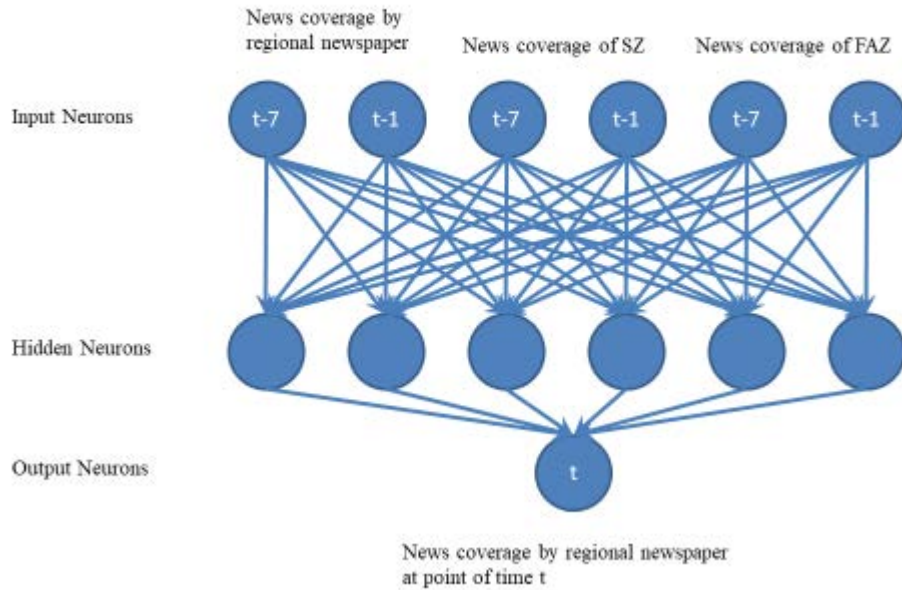
linear transformation before the values are passed on to the output neurons. By combining the different types of neurons with linear functions (referred to as links or connectors), and thus mapping input to output values, any mathematical function can be approximated (Kohonen 1989; Funahashi 1989; see Figure 1 for a graphical representation in comparison to *ARMA* models). In all cases described subsequently, the neural network had one layer of hidden neurons, whose neurons were linked to all of the nodes in the input and the output layer.

Figure 1

Structure of linear time series models (ARMA (X)) and neural networks

A) Linear Time Series Model (ARMA(X))

News Coverage of SZ

News Coverage of FAZ

t-7   ...   t-2   t-1   t-7   ...   t-2   t-1

Transfer
Function
Component

t-7   ...   t-2   t-1   t

News Coverage of Opinion Following
Newspaper per Point of Time

Autoregressive Component

B) Neural Network

News coverage by
regional newspaper   News coverage of SZ   News coverage of FAZ

Input Neurons   t-7   t-1   t-7   t-1   t-7   t-1

Hidden Neurons

Output Neurons   t

News coverage by regional newspaper
at point of time t

Once the structure of a network is defined (the number of input,

hidden, and output neurons, and the configuration of the links), certain

parameters are modified so as to fit the data, that is to ensure that a given set

of inputs is transformed to output values that are optimal predictors of the

observed values of the dependent variables. This is achieved by modifying the

slope parameters of the linear functions (the parameters are referred to as link

weights). Thus, the artificial neural network is adjusted to the statistical

relationships in the data: an iterative procedure which is called the "training"

of the network. We used the very common backpropagation algorithm

(Werbos 1994) for this task. Neural networks, due to their capacity to

approximate any non-linear function, tend to adapt to the random features of

the data used for training, which reduces or destroys the ability of the model to

generalize beyond the fitting data. This is avoided by cross-validation. In the

present case, a simple variant of this method was used: The data set was split

into two parts at random, one part of two thirds was used as a training set for

the network, while the other part was used as a validation set. The network

was only trained to the point where the prediction error in the validation set

reaches its minimum (Scholz 1995; Fine 1999). Further training would

decrease the error in the training set while increasing the error in the validation

set, indicating that the networks have adapted to random variations in the

training set.

All in all, neural network models can be seen as a generalization of

ARMA models as they include non-linear functions instead of exclusively

linear ones. Thus, neural networks are able to detect any linear and non-linear

relationship of co-orientation.

One important restriction had to be considered: It was impossible to

include too many points in time in the past. For example, up to seven days

would be a reasonable limit regarding the results of the *ARMA* models for the

intensity of coverage presented below (where the number of lags was not

determined *a priori*). This would, however, lead to 21 input nodes in the case

including one regional and two national newspapers. At least 3, if not 7 or

more, hidden neurons would be a good choice then, allowing for quite

complex non-linear functions to be approximated. This in turn would lead to a

number of connections, and thus a number of parameters, in the model which

comes quite close to matching the number of cases in the data set used for the

training of the networks. The main function of a statistical model – the reduction of complexity – would no longer be achieved. Therefore, only data for *t-1* and *t-7* were used to predict the intensity of coverage at *t*, as these lags were shown to be good predictors in the linear *ARMA* models. This restriction was also made with regard to the comparability between the linear and the non-linear models. As this specification results in 6 input nodes in the case including the independent variables, the same number of hidden nodes was chosen for all neural networks used in the calculations described subsequently. To analyzed the time series on evaluation, lags 1, 4, and 5 were in included as the linear models indicated a rather short-term co-orientation behavior in terms of weekly lags with those lags being essential to a good prediction.

6. Results

A graphical inspection of the time series does not indicate any temporal order of the ups and downs. There is only one period at the beginning where the intensity of coverage seems to accumulate to form some kind of wave. However, the peaks are all contemporaneous (in negotiations on the previous day, the government and the opposition started to approach a compromise on the reform, making its implementation very probable). We therefore exclude that there was some kind of hype initiated by one medium and detached from the events themselves.

Thus we turn to the time series models. The results for the regional newspaper *Berliner Zeitung* are considered first, followed by a brief overview of the results for the *Tagesspiegel*.

In a univariate *ARMA* model a large share of the variance in the intensity of coverage by the *BZ* can be explained ($R^2 = .20$, $p < .01$; Table 2 gives an overview of the explanatory power of all statistical models used in this study). Particularly the coefficient for *t-1* in the *AR* as well as in the *MA* component and for *t-7* in the *MA* component are positive and significantly different from 0, with a smaller negative coefficient for *t-2* in the autoregressive part of the model. The second model, established on the basis of the algorithm proposed by Fang and Tsay (2005), used the coverage of the national newspapers as independent variables. The resulting model is similar to the univariate model (including *t-1* in the *AR* component as well as *t-1* and *t-7* in the *MA* component, the latter with a negative coefficient) but includes a significant positive coefficient for *t-1* in the time series for the liberal national newspaper, the *Süddeutsche Zeitung*. However, the explanatory power does not differ from that of the univariate model. Simply put, the coefficient for the first lag in the time series for the *Berliner Zeitung* is lower in the *ARMAX* model, while the respective coefficient in the case of the *SZ* compensates for this difference. The coverage of the *FAZ* was not identified as a relevant predictor.

Table 2

Explanation of the variance in the intensity of coverage and evaluation of the

health care reform by the Berliner Zeitung and the Tagesspiegel by different

statistical models (Pearson's R²).

	Intensity of coverage		Evaluation of the reform's consequences	
Model	**Berliner Zeitung**	**Tages-spiegel**	**Berliner Zeitung**	**Tages-spiegel**
univariate ARMA model	.20**	.10**	.24**	.23**
automatically identified ARMAX model	.20**	.06**	.35**	.15**
automatically identified ARMAX model with the residual from the univariate ARMA model as dependent variable	.03**	.00	.00	.00
univariate neural network model	.24**	.06**	.01	.17**
multivariate neural network model	.34**	.11**	.29**	.07

* p < .05

** *p* < .01

Using neural networks, two different models were established. Once

again, correlative patterns in the times series for the *Berliner Zeitung* were

modeled independently. Training and cross-validation were performed with a

training set of $n = 200$ and a validation set of $n = 107$ (7 days were excluded as this was the maximal number of lags considered). The resulting model explained 24 % of the variance in the coverage of the *BZ* ($p < .01$). As this share is larger than in the case of a linear univariate *ARMA* model, a non-linear autocorrelative component is probably present in the time series.

If the independent variables (the intensity of coverage by the *SZ* and the *FAZ* at *t-1* and *t-7*) are included as an input of a neural network, the amount of explained variance raises to 34 %.

The intensity of coverage in the national newspaper appears to explain the additional variance in the coverage of the *Berliner Zeitung* rather than simply lowering the explanatory power of the autocorrelative component by the control effect of a spurious correlation. This finding can also be illustrated by an automatically identified *ARMAX* model (using the same algorithm as above) using the residuals of the univariate *ARMA* model first described in this section. In the resulting model, the coverage of the *SZ*, lagged by one day and being the only predictor included, explains some additional variance in the coverage of the *BZ* ($R^2 = .03$, $p < .01$). In the present case, Hypothesis 1 is confirmed, as the variation in the coverage by the regional newspaper can be traced back to the coverage of the national newspaper. A non-linear component is also present in this relationship (see Research question 2). The confirmation of the hypothesis is not entirely clear when only considering linear models, although it becomes apparent when using neural networks.

In the case of judgments on the reform's consequences, we do not find any significant single auto-correlative component (despite the sum of explained variance being significantly different from zero). A cross-correlation automatically identified in the second type of model positively links the *BZ* with the evaluations by the *FAZ* three weeks before; another positive correlation links both media at lag 4, a negative one at lag 5; and the same two relationships are also found in the MA component. However, when strictly controlling for auto-correlation, the evaluations by national newspapers do not explain any additional variance.

With a reduced set of lags (1, 4, and 5), the multivariate neural network model explains a considerable portion of the variance (29%) in the evaluations and surpasses by far the univariate model (training and cross-validation were performed with a training set of $n = 36$ and a validation set of $n = 12$; 5 weeks were excluded as this was the maximal number of lags considered).

The case of the *Tagesspiegel* is different from that of the *BZ* (see Research question 1). The variance in its coverage on the issue of the health care reform as explained by the different types of models (see Table 2) does not indicate any influence of the national newspapers on the article length in this regional medium. Neither do the neural networks seem to be more effective than the linear models (*R²* was not adjusted for the number of parameters included in a model). Furthermore, the linear *ARMA* model seems to represent the best fit for the data while also being the most parsimonious. In an automatically identified *ARMAX* model, the positive coefficients for *t-1* and *t-2* are the only ones which were identified as making a significant

contribution to a well-fitted and parsimonious model, which is also plausible theoretically. As to the evaluations, we find a negative cross-correlation with the *FAZ* five weeks before, but generally, the multivariate models do not perform better than the univariate ones and do not explain any additional variance. In the case of the *Tagesspiegel*, Hypothesis 1 has to be rejected and Hypothesis 2 is not applicable as there does not seem to be any substantial and constant relationship to the coverage of the national newspapers.

7. Interpretation

Several statistical models were established and compared in order to answer the question of whether the intensity of coverage by regional newspapers can be explained by the coverage in national newspapers, as stated in Hypothesis 1.

First, it must be noted that in a univariate analysis considerable correlative patterns can be found in the intensity of coverage of both regional newspapers. The *Berliner Zeitung* exhibits a certain degree of constancy in its coverage (expressed by a positive coefficient in the *ARMA* model for the first lag). Interestingly, it is not simply the 6th lag that is important in the *AR* component of the models, which would point to an effect caused by the potentially different structure of the newspaper's issues on different days of the week. Rather, it is a general regularity that the coverage in about every seventh issue is similar, and that a particularly low or high intensity of coverage is compensated for about seven issues later (as expressed by the moving average component of the time series with a relevant coefficient for *t-7*). These findings may indicate that, over a period of slightly more than one

week, the debate on the reform loses or regains its impetus, or that over the same period newspapers lose or regain interest in the debate. In the case of the *Tagesspiegel*, these regularities are less important. A univariate model explains about half of the percentage of variance in comparison to the *Berliner Zeitung* and in its more parsimonious and plausible version does not contain any longer term regularity.

For the *Berliner Zeitung*, models that include time series on the national papers better predicted the cumulated article length and, at least in the case of non-linear models, also the evaluations of the reform's consequences in the regional paper. This effect partly persisted when controlling for correlative patterns in the dependent variable. However, there is a strong control effect: A large part of the explanatory power of the exogenous variables can also be attributed to the autocorrelation of the predicted time series themselves. There are two possible interpretations which both require theoretical assumptions. While in one case, co-orientation explains the patterns in coverage to a larger degree, in the opposite case it would be necessary to assume either regularity in the debate itself or some journalistic working routines that lead to a greater attention to political issues that were already very salient on previous days. In this view, co-orientation only plays a minor part, if any, in shaping editorial decisions. The second assumption is certainly more adequate in the case of the *Tagesspiegel*.

It has been assumed that journalists of the regional newspapers published in the federal capital seek to reduce complexity in editorial decisions and strive for prestige. Therefore, they use the national quality

newspapers as a benchmark to assess the importance of ongoing events in the debate on the health care reform and, consequently, to assign these events an amount of space in the paper that seems adequate to them. While in the case of one paper the evidence reported above may be interpreted to be tendentially in favor of this hypothesis, it is rather improbable that the journalists of the other regional newspaper engage in the routine type of co-orientation behavior as defined in this study.

The statistical models on the intensity of coverage discussed above suggest a relationship between the intensity of coverage of the *Berliner Zeitung* and the *Süddeutsche Zeitung*, rather than the *Frankfurter Allgemeine Zeitung*. This would be in line with the editorial policy of the newspapers: While the *FAZ* is said to be rather conservative, the *SZ* is seen as more liberal or center-left, as is the *BZ*. However, in the dimension of evaluation, the *FAZ* may be more important, if co-orientation exists at all. Although the *Tagesspiegel* is also said to be liberal, it does not use the same national paper as a source of orientation: It uses neither of the two included in this study. Apparently, the two regional newspapers issued in the capital differ in their co-orientation behavior as indicated in the second research question. Of course, while we do not argue that the *Tagesspiegel* does not use other media as a point of reference, this may be the case with regard to media that are not included in this study or to dimensions of coverage not measured here (e. g., framing).

8. Conclusion

The present study has submitted the co-orientation hypothesis to a rather strict test by analyzing linear as well as non-linear relationships between the intensity at which national and regional newspapers cover a distinct issue, controlling for autoregressive components in the dependent time series and using a sampling period of one year with daily measuring points instead of a small number of cross-lagged correlations. Although there are strong theoretical arguments for the assumption of co-orientation (such as the reduction of uncertainty, the attractiveness of other media as a source, and the competition for quality and reputation), the evidence was mixed. While in the case of one newspaper the results can be interpreted as an indicator of some co-orientation behavior, another regional newspaper probably does not rely on its nationwide counterparts in a way that can be expressed by a constant statistical relationship regarding the intensity of coverage.

The findings in this study represent important implications for journalism research in general: While there is some evidence for the existence of more or less constant co-orientation behavior in newspapers, a more nuanced view to the phenomenon seems necessary. It is an oversimplification to equate co-orientation with an accidental media effect on journalists or with "pack journalism". Rather, the specific forms and functions of the underlying behavior, as discussed in the theoretical section, are to be kept in mind. The sample chosen here illustrates the importance of these considerations: Regional newspapers from the federal capital and prestigious national quality newspapers were selected for analysis, focusing on a clear-cut issue of general

political interest. The positions of these newspapers in the German media system (their status and political position) and their economic strategies, together with their similarities and aspirations with regard to journalistic criteria, probably determined the relationship (or its absence) between their respective editorial decisions. Even if co-orientation may not be taking place as continuously as hypothesized, the phenomenon is probably not restricted to "news waves" and "media hypes" (Vastermann 2005), which other authors have shown to exist, but can also occur in a longer debate on political issues where key events are rare or even absent. Rather than being driven by a kind of "herd instinct" or reduced to undifferentiated inter-media agenda setting, co-orientation may also be determined by the struggle for prestige, political alignments or simply by the intent to apply the "right" criteria for news selection. Its consequences, however, may well be functional or dysfunctional for journalism or society.

Other forms of co-orientation than the one investigated here are conceivable. They may affect different properties of a newspaper's content, such as evaluations of both political measures and politicians, or the prevalence of frames, in addition to fulfilling different functions. Journalists may, in some cases, also use the content of other newspapers as more abstract feedback for evaluating and adapting their editorial decisions, rather than as a constant source of orientation.

Neural networks have been shown, at least in one of the two cases, to be a useful model to describe co-orientation relationships as a complex and potentially non-linear function. By using this approach, it was possible to give

a more accurate estimation of the explanatory power of the co-orientation hypothesis in the specific form investigated in this study. Further theorizing should also include speculation on the form of the non-linear effects of co-orientation and explanations for these relationships. Subsequent studies should also combine more indicators of co-orientation applied to the same constellation of media and issues, but possibly to a multitude of issues. The measurement could then include reported media use or observations, experimental evidence for the influence of other media's editorial decisions, and content analyses.

9. Notes

[1] This can be illustrated by the dictum of the *BZ*'s former editor, Erich Böhme, who once said that he wanted to transform the paper into "Berlin's Washington Post" (Böhme 2006).

[2] Some of the newspapers are issued on Sundays while others are not. Since the *Berliner Zeitung* is not published on Sundays, data for this day was completely excluded when considering the *BZ*. This results in the total number of 314 days included in the analyses. Saturdays were thus directly followed by Mondays in the three time series used for analysis. Unlike the *BZ*, the *Tagesspiegel* is published on Sundays. When analyzing the intensity of coverage on the health care reform by the *TS*, Sundays were included. While the SZ is not published on Sundays, the *FAZ* is. The latter's Sunday issue has a different layout and title - *Frankfurter Allgemeine Sonntagszeitung* or *FAS*. The *FAS* is issued by the same publisher and, as it is regularly regarded as the Sunday equivalent of the *FAZ*, we will use the data of the *FAS* for Sundays. All seven days of the week were included in the analyses concerning the *TS* (358 days in total), replacing the missing values in the case of the *SZ* by zero. Omitting the data on Sundays, the results for the *TS* are not essentially modified (the models reported below were calculated analogously for a data set without data on Sundays).

[3] The four newspapers' coverage on the debate on the health care reform can be regarded as stationary in the sampling period. The space

devoted to the issue follows a weak but significant downward trend in our data set, but practically it is bounded above and below (coverage is neither smaller than zero nor more extensive than a large but finite number of words). In the long run, any time series based on this variable is stationary. In the present case, the decomposition of the time series by means of an ARMA model is therefore justified without further transformations, in particular differentiation (which would lead to an ARIMA model – I for "integrated").

[4] Our argument against the measurement of third variables can be stated as follows in terms of time series analysis: The origin of the autocorrelative (AR) component of the models is not central to our argumentation. It may be caused by regularities in the behavior of the media themselves or in the external events covered. The moving average (MA) component can be interpreted as a reaction of a system (the news organization) to unmeasured external shocks (e. g., particular events). Only the cross-correlation of the residuum of the dependent time series with the independent ones, controlling for the AR and MA components, is of interest in this context, as it may be explained by co-orientation.

[5] In the following paragraphs, a particular but very common type of neural network is described, often called the 'multilayer perceptron', which was used in this study.

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