

Coopetition in Crisis: The Rise of Silent Citations and the Structure of the Danish Digital News Ecosystem

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Extended Abstract

“Coopetition” – the collaboration of competitors for mutual benefits – is a common feature of digital ecosystems (Hannah & Eisenhardt, 2018; Jacobides, Cennamo, & Gawer, 2018). In the news ecosystem, for instance, producing news articles that involve citations to content published by news agencies and other organizations is a frequent practice. How such cooperative practices evolve, however, and what structural implications they have for the ecosystem remains incompletely understood. While coopetition networks have been documented (Gnyawali, He, & Madhavan, 2006; Gnyawali & Madhavan, 2001), we know less about what happens when they come under pressure and potentially break down. To bridge this gap, this paper presents an exploratory large- N two-decade longitudinal citation network analysis of the Danish news ecosystem. We utilize a major crisis that the key Danish news agency, Ritzau, underwent during the period 2008-2015, which allows us to explore whether and how *formal* cooperative arrangements were substituted by *informal* coopetition, and how these adaptations affected the structure of the ecosystem in terms of the status order reflected by citation patterns.

To investigate these issues, we combine ideas from the status-based model of market competition (Podolny, 1993, 1994) with the perspectives found in the coopetition literature. Specifically, the focus is on news organizations’ citation practices, where news articles are produced by citing news agencies or competing news organizations. The paper argues that obtaining citations can be seen as a cooperative practice and is a way to further the status position of a firm in a digital ecosystem. Thus, changes in an ecosystem’s structure are probable when changes in citation practices occur. We define two variants of citations: 1) “formal citation” of news agencies in line with formal coopetition arrangements, such as Ritzau, and 2) “silent citation” which is the uncoordinated citation of a competing news organization that silently agrees to the practice.

We use a mixed methods approach and utilize triangulation between three sources of data: citations from Danish news articles ($N = 6,347,310$), qualitative interviews with journalists and editors ($N = 8$), and archival data. Citation data was scraped using Selenium scripts written specifically for a database containing ~31.7 million news articles published between 2000-2021 by 362 Danish news organizations. ~1.2 million search strings were cast individually to the database, resulting in a dataset containing the annual counts of citations between all organizations in the sample. The scraping procedure was repeated thrice to increase confidence in its accuracy.

The news articles are used to trace the citation flows between news organizations, and annual citation networks between 2000 and 2022 are constructed. Our measure of behavioral cooperative change is operationalized as citations in published news articles, and changes to ecosystem structure are measured via structural properties of annual citation networks. The PageRank algorithm (Page, 2001) is deployed using the Python library NetworkX to assess node centrality and – as we operationalize PageRank score as an indication of status – the node’s position in the status order. Further, we use network centralization (Madhavan, Koka,

& Prescott, 1998) and market concentration measures (Herfindahl-Hirschman Index) to assess citation distribution and ecosystem structure over time. Networks are visualized in Gephi and presented. Qualitative interviews are used to inform quantitative results and explain the role of citation in news ecosystems. Archival data, mainly in the form of news articles about Ritzau, is used to contextualize the uncertainty that arose about the formal coopetition arrangement.

Results show that a search for alternative coopetition strategies took place during a time of uncertainty regarding formal coopetition agreements and a decrease in formal citations (Figure 1). This led to a shift in citation practices at the behavioral level, from almost exclusively citing news agencies to also citing competing news organizations through silent citations (Figure 2). Further, the emergence of this alternative coopetition strategy, which we term silent coopetition, aggregated to temporarily instantiate a decentralization process in the Danish news ecosystem (Figure 3). This change in structure arose because citations become more widely dispersed in the network compared to before Ritzau's crisis (Figure 4). Thus, the ecosystem adapted to the near-failure of its most central actor by decentralizing its structure.

The paper's contribution to the literature is twofold. First, it outlines a methodological framework that allows for quantitatively investigating how organizations and ecosystems adapt when new coopetition strategies emerge as old coopetition agreements break down. Second, we define a novel variant of informal coopetition called *silent coopetition*: coopetition taking place without formalized agreements. In contrast to formal coopetition, silent cooperative behavior is a nonformalized and uncoordinated reality that is silently agreed upon between coopetition participants that can emerge from uncertainty about existing formal coopetition arrangements. These findings highlight the robustness and adaptability of digital ecosystems that involve coopetition, as uncoordinated alternatives to the established coopetition might act as temporary answers to uncertainty and allow the ecosystem to survive near-failures of central formal coopetition arrangements. Given the democratic importance of some digital ecosystems, e.g., the news ecosystem, durability to shocks is an important characteristic.

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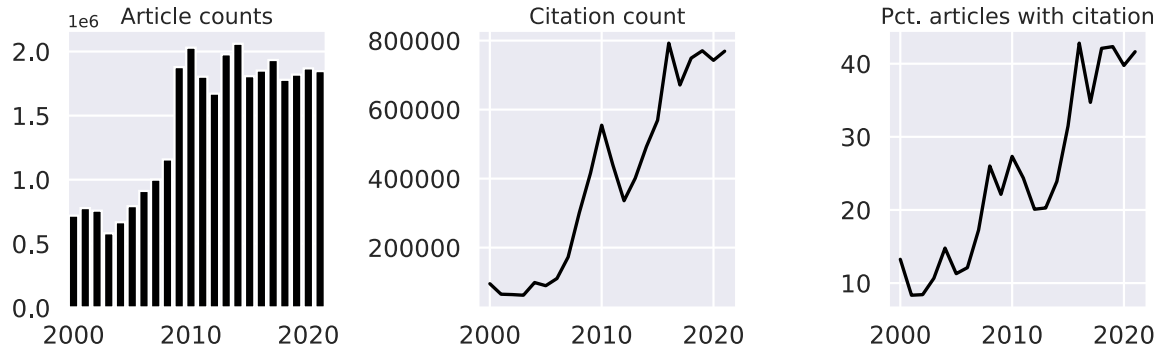


Figure 1: Left: Article counts per year in millions ($N = 31,700,129$). Middle: Citation count per year ($N = 6,347,310$). Right: Percentage of all articles within a year containing a citation over time. Citation counts per year increased over the 21-year timeframe, although decreasing between 2010-2012 during the Ritzau crisis.

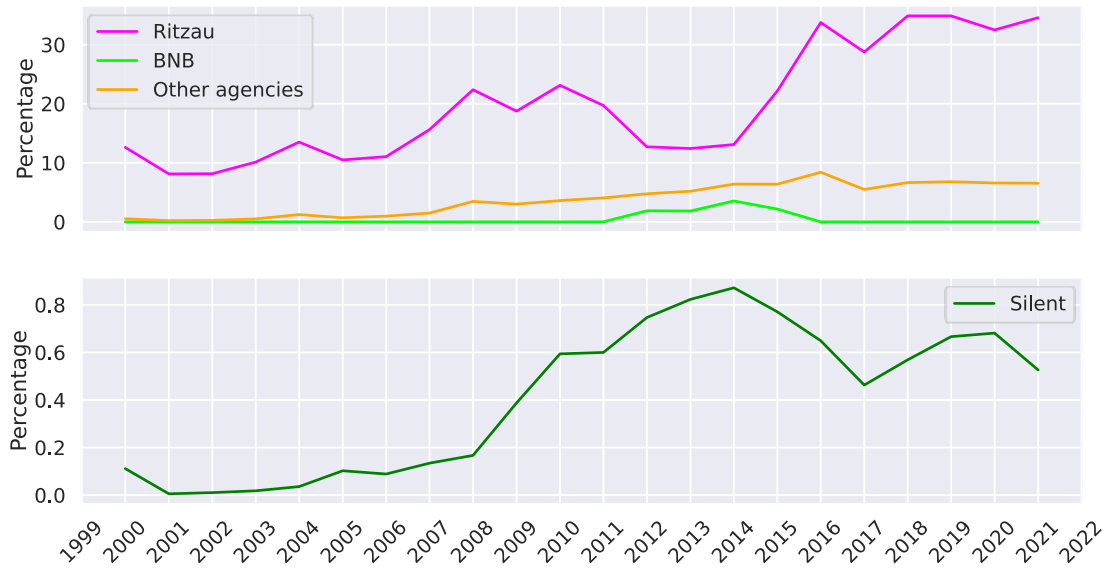


Figure 2: Percentage among all articles containing a citation of either the formal (top plot) or silent variation (bottom plot). A Kruskal-Wallis H test was performed over three periods: before the Ritzau crisis (2000-2008), during the crisis (2008-2015), and after the crisis (2016-2022), and shows significant differences in distributions across the three periods for Ritzau ($H = 22.50, p < 0.0000$), other agencies ($H = 84.56, p < 0.0000$), and silent citations ($H = 1206.98, p < 0.0000$).

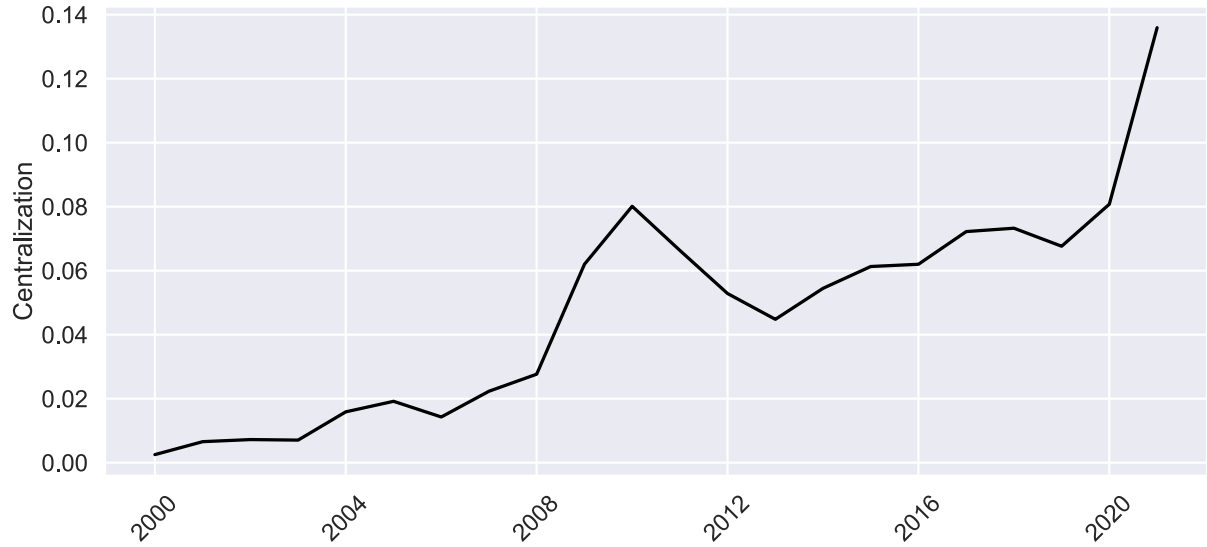


Figure 3: We use the network centralization formula defined by Madhavan et al. (1998) on PR centrality scores among all nodes in the given years ($N_{min} = 337$, $N_{max} = 346$). We observe a temporary decentralization of the ecosystem structure during uncertainty from 2010 and three years onwards.

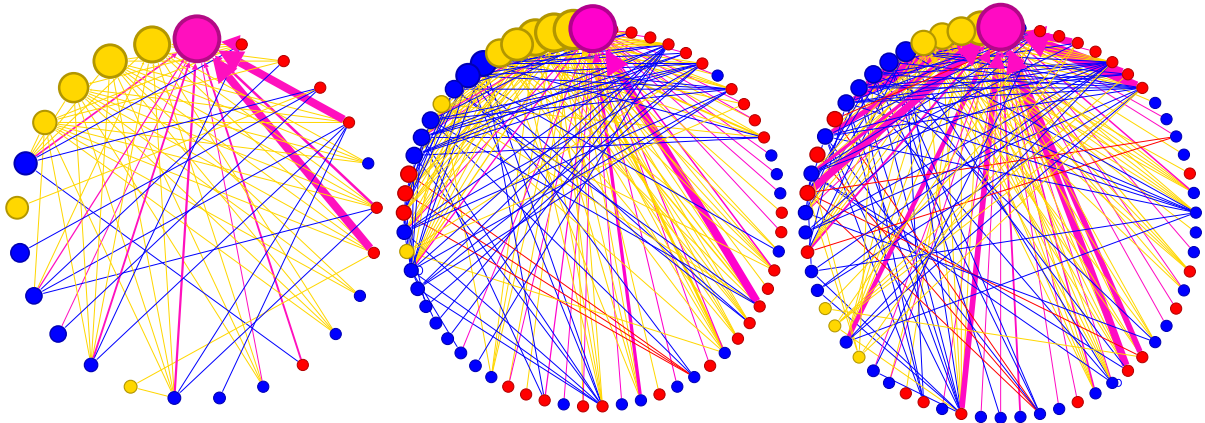


Figure 4: Network visualizations for three different years. Left: 2007. Middle: 2013. Right: 2018. Only nodes with a degree score ≥ 1 are visualized. Nodes are colored by type (blue=national organization, red=local organization, yellow=news agency, purple=Ritzau) and size indicates PageRank score (bigger is higher), ordered counter-clockwise (from low to high). Edges are weighted by citation count (thickness) and colored by target type. Ritzau, becomes less central in 2013 compared to 2007, as more nodes are connected in the network independent of Ritzau.