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Как да се цитира тази статия / How to cite this article:

Telarico, F. A. (2024). A Network Approach to the Study of the Military-Industrial-Media Complex in Bulgaria. *Economic Thought Journal*, 69 (4), 442-463.
<https://doi.org/10.56497/etj2469402>

To link to this article / Връзка към статията:

<https://etj.iki.bas.bg/microeconomics/2024/12/12/a-network-approach-to-the-study-of-the-military-industrial-media-complex-in-bulgaria>



Published online / Публикувана онлайн: 13 December 2024



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A NETWORK APPROACH TO THE STUDY OF THE MILITARY-INDUSTRIAL-MEDIA COMPLEX IN BULGARIA

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Abstract: Both the media and arms manufacturers play a key role in shaping public opinion on the conflict in Ukraine. Thus, it is necessary to question the extent to which the latter influences or even colludes with the former. In this context, the term media-military-industrial complex gives theoretical backing to the hypothesis that the media has a vested interest in promoting (not-so-)banal militarism for the benefit of the military-industrial complex. Favourable coverage of military operations and firms would likely be highly correlated to cross-sector corporate ties and/or sheer thirst for advertising revenues. Combining a network approach to the analysis of data on corporate structures with theoretically and empirically grounded arguments, this paper sketches a picture of the extent to which a military-industrial-media complex exists in Bulgaria and its reach.

Keywords: Bulgaria; network; military-industrial complex; media; blockmodeling

JEL codes: C60; C88; F51; F59

DOI: <https://doi.org/10.56497/etj2469402>

Received 13 October 2024

Revised 29 October 2024

Accepted 11 November 2024

Introduction

Defence expenditure in Bulgaria, the poorest and one of the most unequal countries in the EU, has outgrown economic growth since Bulgaria joined NATO in 2004, raising from €71 per capita in 2006 to €551 in 2020 (EDA, 2022). The most noteworthy piece of this puzzle is that a single budgetary item accounts for most of the growth in Bulgarian defence expenditure: procurement. In fact, expenses for procuring weaponry and equipment grew almost 1800% during that period, whereas the Bulgarian armed forces' (BAF) operative costs fell by over 63% (EDA, 2022). This reduction was partly

achieved by constraining personnel expenditures, which increased just 1% per year over the same period, despite yearly inflation having averaged 3.4% between 2006 and 2017 (WB, 2023).

The media regularly glosses over the fact that increasing procurement while reducing operative costs jeopardises the BAF's operational capabilities (Wezeman & Kuimova, 2018, p. 10; Ministry of Defence of the Republic of Bulgaria, 2008, p. 11) Yet, since Russia's full-scale invasion of Ukraine, there has been no scarcity of airtime dedicated to military spending. Since 2022, Bulgarian public and private media have regularly hosted officers and analysts calling for increased defence procurement spending to accelerate the BAF's 'modernisation' (e.g., Shalamanov, Tagarev & Bozhilov, 2022; Panaŏotov, 2022; Spiridonov, 2022). Given the one-sided nature of the related public discourse, it is unsurprising that support for increased military spending is more widespread in Bulgaria than any other NATO state (NATO, 2022, p. 8).

Against this background, the paper provides analytical tools to answer the question regarding the extent to which a military-industrial-media complex (MIMC) aptly defines the relationship between the media and military firms in Bulgaria. It does so by leveraging quantitative, data-driven methods to flesh out the concept of the MIMC. Namely, it offers a novel dataset mined from an open-access public register, proposed ad-hoc corporate-control metrics that expand on the ones offered in the financial network literature, and cross-validating inferential arguments using sophisticated network-clustering techniques. In sum, the study provides both substantive and methodological answers to the research questions. Empirically, it sheds a light on the key actors in the MIMC and shows that capitalistic relations play a key role in strengthening MIMC ties in Bulgaria. Methodologically, it offers new network analysis methods tailored to the characteristics of a MIMC while also applying network methods to an empirical study for the first time.

The text is schematically articulated as follows. The literature review connects this study to the existing scholarship on the military-industrial-complex (MIC) and the MIMC. The subsequent section describes a novel dataset detailing board interlocks and common ownership relationships between 6,553 firms and individuals (managers, board members, owners, shareholders) connected to military and media firms registered and operating in Bulgaria, as well as the methods needed to construct a network stylisation of the direct control and indirect connections between military-industrial and media businesses. Based on the literature, the network model of capitalistic relations within the MIMC can be used to describe this complex in any advanced market economy. The network is thus described in terms of its structural/topological features, and inferences then are drawn systematically on its community structure. Consequently, these results are interpreted to answer the

research question, and arguments are made for both the existence of consolidated ties between the traditional MIC and media firms in Bulgaria and the usefulness of quantitative network methods in this type of study. Finally, the conclusion summarises the results and lays out possible avenues for further research.

Literature review: Mapping actors and relationships in the MIMC

This paper builds on the empirical and theoretical literature about the MIC and the MIMC. Instrumentally, these studies provide a mapping of the key actors in both complexes and strengthen the argument that capitalistic relations play a key role therein.

In the most succinct formulation, the phrase military-industrial complex is “an atheoretical description of a loose coalition of powerful groups or actors who share economic, institutional or political interests in the continuance of high military expenditure” (Mintz, 1983, p. 103)

The literature proposes several elaborated topologies of such actors. For instance, authors studying the American MIC have unanimously mapped some ‘core’ members (Moskos, 1974; Cuff, 1978; Cassidy, 1991; Hooks, 1991; Nester, 1997): professional soldiers; managers (and, in market economies, owners) of companies involved in military procurement; ranking bureaucrats whose careers depend on military spending; and elected officials who benefit politically via military investments. According to some, the MIC also encompasses a variety of ‘associates’ such as veteran groups, defence firms’ associations, and wealthy investors (see Rosen, 1973, pp. 2-3). Overall, a survey of the literature shows that only the ‘core’ is similarly composed in most countries (see: Asaturian, 1972, on the USSR; Mintz, 1983, on Israel; Markusen & Serfati, 2000, on France). Perhaps this is because the latter reproduce and amplify core members’ influence over military policy and spending in ways that are specific to each political system (cf. Slater & Nardin, 1973). Hence, to preserve maximum generalisability, this study focuses on core members.

Regarding the channels through which these actors interact, there is less agreement. Some Marxists and otherwise critical authors argue that the MIC is market-based, and its internal functioning relies on financial capital, revolving doors, and other eminently economic tools (Boff, 1969; Adams & Adams, 1972; Domhoff, [1967] 2013; Duncan & Coyne, 2015). Others, mostly interpreters of Machiavelli and Weber on the political right, posit the main propeller of the MIC as non-elected officials at all levels of government; they also argue the members of the complex interact within a centralised, state-management bureaucracy (Melman, 1970; Horowitz, 1971). However, it seems most reasonable to take the extent to which public authorities expressly regulate these actors’ activities as the key factor (as Weber, 2023, does). In this sense,

the MIC has operated mostly outside the market since Robert McNamara, President Kennedy's Secretary of State, set up a federal agency to centralise all aspects of military production in the U.S. (Melman, 1970, pp. 35-71). Similarly, managers of military enterprises in the Soviet MIC played an important role together with foreign policy hawks within the party apparatus (Aspaturian, 1972). Conversely, the relationships between the actors that make up the MIC take place "mainly through market relations" (Melman, 1970, p. 2) when public authorities do not dictate the organisation of military production. Arguably, the latter description best fits the U.S. as well as most of its allies after the Cold War, especially in light of the private military industry's rise (Shearer, 1998; Singer, 2005; Krahmann, 2005; Baum & McGahan, 2009).

The literature on the interface between the MIC and the media has focused mostly on this notion's epiphenomenal and discursive manifestations rather than its ontology (see Wark, 1996, for a summary overview), especially in the realm of entertainment media (Robb, 2004; Boggs, [2007] 2017; Stahl, 2009; Kellner, 2009; Vavrus, 2013). In particular, Der Derian's groundbreaking *Virtuous War* (Derian, [2001] 2009) explored the ability of the military-industrial-entertainment complex (MIEC) to recast social reality as effectively as the computer programme portrayed in the cult film *The Matrix*. Clearly, the traditional MIC's core members were under-resourced for this daunting task, only being able to mobilise 'fear' and 'pride' for their home-front 'psychological warfare' (Barnet, 1969, pp. 73-76). However, limiting the discussion to or focusing mostly on entertainment products may have led this strand of the literature to a dead end. In fact, entertainment media plays a minor role in the MIMC's mediatised arsenal designed to reproduce promilitary beliefs surreptitiously, preceded in importance by newscasts (McLaren & Martin, 2004; Moyers, 2007; DiMaggio, 2009; Bonn, 2010). Thus, using the broader MIMC as a basic notion explains how the MIC has gained unfettered access to "all the tools of the modern corporation: publicity departments, slick advertising campaigns, [...] marketing, and product-placement" (Turse, 2009, p. 18).

This paper interprets the MIMC as a positivist/structuralist complement to, rather than an antagonist of, the discursive notion of the MIEC. Indeed, the literature on the MIC has already dealt with the ways in which the media can serve the complex by distorting reality. Significantly, Barnet dedicated a chapter of *The Economy of Death* to the 'The Pentagon and the Public' (1969: ch. 4). Speaking more generally, Mintz (1983, p. 104) surmised that "a number of writers [...] have argued that the complex deliberately misrepresents reality in order to legitimate its own power and further its own particular interests."

Building on the MIC members listed above, the MIMC's 'core' bloc would enlarge to

include bureaucracies in charge of media censorship, as well as managers (and, in capitalist contexts such as Bulgaria, owners) of media companies. Clearly, the presence of the latter actors enhances the role that capitalistic relations must play in the internal logics of the MIMC. In fact, money flows in the forms of advertising contracts, revolving doors, and various emoluments put the media 'under obligation' to other components (cf. Solomon, 2007, pp. 60-62ff). Intuitively, purchasing shares in media companies would allow military firms to have direct control over the former's activities through completely legal mechanisms. However, the practice of obscuring shareholders' identities behind shell corporations and subsidiaries confounds corporate ownership structures, rendering the connection between media and military enterprises much harder to investigate. Yet this only reinforces the thesis that the MIMC is a useful empirical, structuralist description of the MIC's co-opting of corporate media through market instruments.

Data & Methods

The innovativeness and main contribution of the paper lies in its use of reliable data and sophisticated quantitative methods to study a phenomenon, the MIMC, that has long been the domain of discursive analyses. In particular, it provides a framework for the construction of a meaningful network representation of the MIMC based on corporate relationships (implemented in the R programming language by the package *FinNet*: Telarico, 2023) as well as a measure of novel influence, tailored to the network's theoretical and topographical characteristics.

Data

The paper uses a new database of 1,331 Bulgarian firms and 3,967 top managers, owners, and shareholders based on data retrieved from the Bulgarian register of businesses and non-profit legal entities (TR). The database was constructed by mining the TR's website using Selenium, an automated browser that allows data scraping from websites. Initially, the algorithm was instructed to look at information on the companies registered with the Bulgarian Chamber of Commerce's defence-sector organisation: the Bulgarian Defence Industry Association. These first seven companies are linked to nine legal entities and 52 people. Then the algorithm looked for information about the companies owned or managed by these individuals, as well as anything about the companies connected to the initial seven enterprises. Iterating these steps three times has produced a complete list of entities and people connected to Bulgarian military companies by at most four intermediaries.

Network construction

The data extracted from the TR contains information on two key capitalistic mechanisms of interaction between the members of the MIMC: board interlocks and common

ownership. First, common ownership is the basis of many measures of owners' indirect influence on companies in the finance literature: the 'network power index' (NPI), the 'control transfer index' (CTI), other 'effective control indices', and influence maximization (IM) algorithms (Mizuno, Doi & Kurizaki, 2020; Khalife, Read & Vazirgiannis, 2021). However, ownership-network approaches show serious shortcoming that make them unlikeable candidates for a study of the MIMC. First, cross-shareholding forcibly makes relations involving one or more mediators appear unmediated. Second, such networks consider owning shares the main if not only vector of firm-on-firm influence. Indeed, the economic literature acknowledges that common ownership "between strategically interacting firms", such as military and media ones in this case, "affect firm objectives and behavior" (Schmalz, 2018, p. 413). Researchers have yet to elucidate the way in which ownership alone affects companies' behaviour, especially for large, institutional investors (O'Brien & Waehrer, 2016). Moreover, economists recognise that 'board interlocks' – i.e., companies that share one or more top managers – induce changes in firms' behaviour (Lamb & Roundy, 2016). Given that both owners and managers are core members of the MIC and the MIMC, existing cross-/shareholding networks seem insufficient for the task. Thus, 'board interlocks' are considered on par with 'common ownership'.

Still, to simplify the network and remove less significant agents without losing information, units representing individuals have been merged into the largest (by capitalisation) company in their first-order neighbourhood (i.e., to which they were directly tied). The result is the directed company-company network wherein a tie from i to j indicates that company i exerts influence over company j by means of board interlocks and/or common ownership. The weight of each tie is as follows:

$$w_{i,j} = \frac{\text{no. of common managers}}{\text{size of } j\text{'s board}} + \frac{\text{shares owned by common owners}}{j\text{'s capitalisation}} \quad (1)$$

Measuring the strength of corporate control: Beta distance and beta ratio

The structure and topography of the company-company network representing the MIMC can provide insights into the pattern of relationships amongst its units. In fact, this company-company network enjoys assets related to common ownership, most notably, the transitive consolidation of voting rights (Crama & Leruth, 2007), as well as others due to the complementary or alternative chains of influence transmission offered by interlocking managements. Thus, one must also account for the *transitive consolidation of managerial influence*.

In this sense, the key notion of *corporate control distance* (CCD) retains its centrality in MIMC networks, albeit with an important caveat. CCD usually simply refers to the

number of ‘middlemen subsidiaries’ through which the main firm’s decisions pass before a subsidiary enforces them (Rungi, Morrison & Pammolli, 2017, p. 20) – or, basically, a mere shortest-path problem (ibid., 2017, p. 9). However, in analysing the MIMC, the number of intermediary firms between the owning/managing (military) company and the owned/managed (media) firm is theorised to be large enough to confound the relationship. So, what *actually* matters is not the length of the path between a military and a media company but the weight of the former’s transitively consolidated influence on the latter in terms of both in/direct equity linkages and board interlocks.

Practically, if firm i in/directly owns all the capital or appoints all the managers of j , it exercises complete control over it, and their distance should be null. As i ’s control over j decreases (e.g., due to the presence of competing shareholders and independent managers), the distance between the two grows.

Eventually, the maximum distance is reached for a predetermined ‘minimal’ degree of control w_{min} , which can be set as the value of the tenth quantile of the weight distribution. Formally, the distance between i and j over the path P is denoted $\beta_{i,j}^P$ and calculated as:

$$\beta_{i,j}^P = \sum \text{rescale}_1^0(w_{\text{along the path}}) \quad (2)$$

with $w_{\text{along the path}} = \text{squish}_{w_{min}}^{\max(w)}(w)$

For the sake of brevity, $\beta_{i,j}$ is used to indicate the minimum β -distance between i and j . Clearly, the path P that minimises the β -distance may include more units than the topologically shortest path. Thus, the ratio between the β - and topological distance between each pair of firms measures the closeness of the relationship between them:

$$\beta_{ratio} = \frac{\beta_{i,j}}{\text{length of the shortest path}} \quad (3)$$

Intuitively, the β -distance is tailored to the substantive needs of analysing the MIMC. In fact, theoretical knowledge on financial networks suggests that the paths between controlling (military) and target (media) companies may include many middlemen. Empirical research on common ownership and board interlocks indicates that there is usually very little attrition which middlemen can wield against the diffusion of the controlling firms’ interests. Thus, as the relationship between the core corporate members (military and media firms) of the MIMC grows closer, the β -distances get smaller than the corresponding shortest paths.

Network clustering

In most networks representing socio-economic phenomena, units exhibit the tendency to arrange themselves into communities. Hence, there are groups of units that show a higher density of edges between each other than with units outside the group. The presence of such ‘clusters’ also often emerges from the networks’ visualisations, especially when using specific algorithms (Kalinka & Tomancak, 2011). However, one strand of the literature approaches community detection in a more organic way by using stochastic blockmodeling (SBM, starting with the pioneering Snijders & Nowicki, 1997). Generally speaking, blockmodeling is a network method that “seeks clusters of equivalent units based on a selected definition of equivalence” (Žiberna, 2007, p. 105). In the specific case of SBMs, the algorithm tries to cluster together units that are “stochastically equivalent”, thus carrying out an *analogous role* in the network (Holland, Laskey & Leinhardt, 1983, p. 112). The predictive likelihood of an expectation maximisation (EM) algorithm – often in the ‘variational’ version (VEM) – provides inferences on this latent structure.

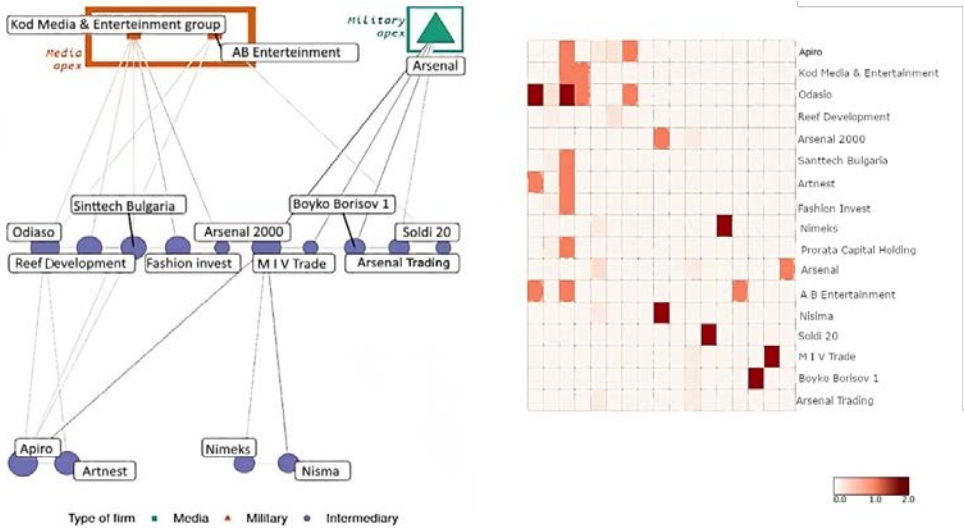
In choosing SBM for studying MIMC networks, two observations must be weighted. First, scholars have not used SBM extensively in the study of financial networks. Second, even when SBM is used, its study focuses narrowly on bipartite structures such as core-periphery relations (Barucca & Lillo, 2016), whereas MIMC networks are more complex. Thus, for analysing more complex relationships, it would be recommendable to look for cross-validation through two different SBM implementations: the AgroParisTech-MIA research group’s VEM algorithm to infer SBM (Tabouy, Barbillon & Chiquet, 2020), implemented in the programming language R with the package *sbm* (Chiquet, Donnet & Barbillon, [2020] 2023); and the multi-layer Bayesian SBM (Peixoto, 2020), executable in the programming language Python using the module *graph-tool* (Peixoto, [2018] 2019).

Results

This section discusses the results in light of the research question regarding the existence of a MIMC in Bulgaria. The first part describes the many ways in which a MIMC network distinguishes itself from traditional financial networks, supporting the idea that it is *not* the result of ordinary interactions between corporations. Furthermore, it lays out a topological analysis of the Bulgarian MIMC network based on β -distances that reinforces this argument. In addition, a second part of this section details the corporate structure of the Bulgarian MIMC by analysing the network’s community structure using two different blockmodeling approaches.

Topological analysis

Visibly, the MIMC network space is structurally different from those already offered in the literature in two essential ways: (1) reduced number of components; and (2) multi-apex hierarchies (see Figure 1).



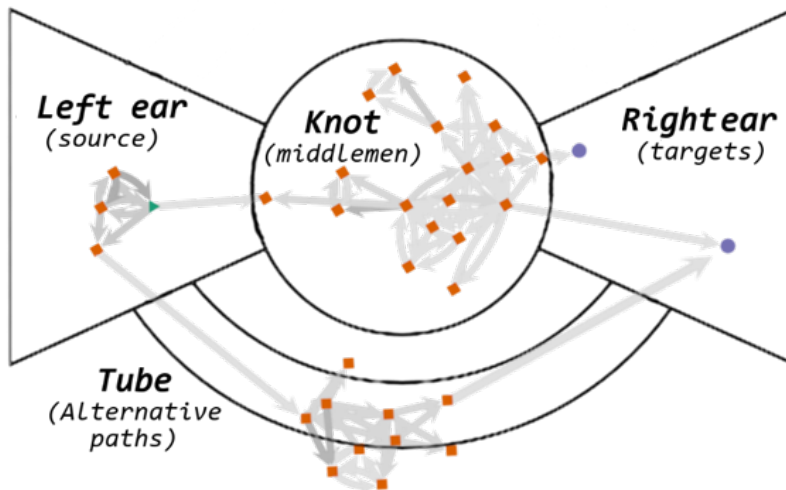
Source: Author's elaboration.

Figure 1. An example of a double-apex, single-component hierarchical corporate structure in its graph (left) and matrix plot (right) representation from the third-order neighbourhood of the military company Arkus (triangle on the left)

First, the literature on financial networks finds that rather than a single graph there several components or large groups of companies connected to each other, but without ties to units outside the group (e.g., Rungi, Morrison & Pammolli, 2017, p. 6; Khalife, Read & Vazirgiannis, 2021, pp. 9-10). This means that the ownership space of a traditional financial network is a perfect partition of all ownership graphs and may benefit from every related asset. However, these properties do not hold in the corporate network space of the MIMC. In fact, observations of a rather fragmented corporate structure will result in a lot of small components; and vice versa for a tightly integrated market (Glattfelder, 2010, p. 67). Market interaction is key in strengthening the interconnectedness amongst the core members of the complex. Hence, fragmentation in the MIMC network may indicate that the specific country under investigation has not developed a cohesive MIMC and ties between traditional corporate MIC members and media companies are sporadic. Surely, other market

channels could provide a different picture (e.g., advertising revenues, editorial boards, kinship), but data on these sorts of ties are much harder to obtain. In other words, to support the argument that a MIMC exists, the network space must reduce to a single graph even for very large numbers of firms. Obviously, in practice, imperfections in the data and under-reporting may lead to the presence of few components, one of which is many times larger than the other combined. Yet this case still satisfies the basic conditions for a MIMC. Practically, the MIMC constitutes the sort of ‘unique’ network in which “all components are possibly connected in a unique network” that the theoretical literature describes (Rungi, Morrison & Pammolli, 2017, p. 6).

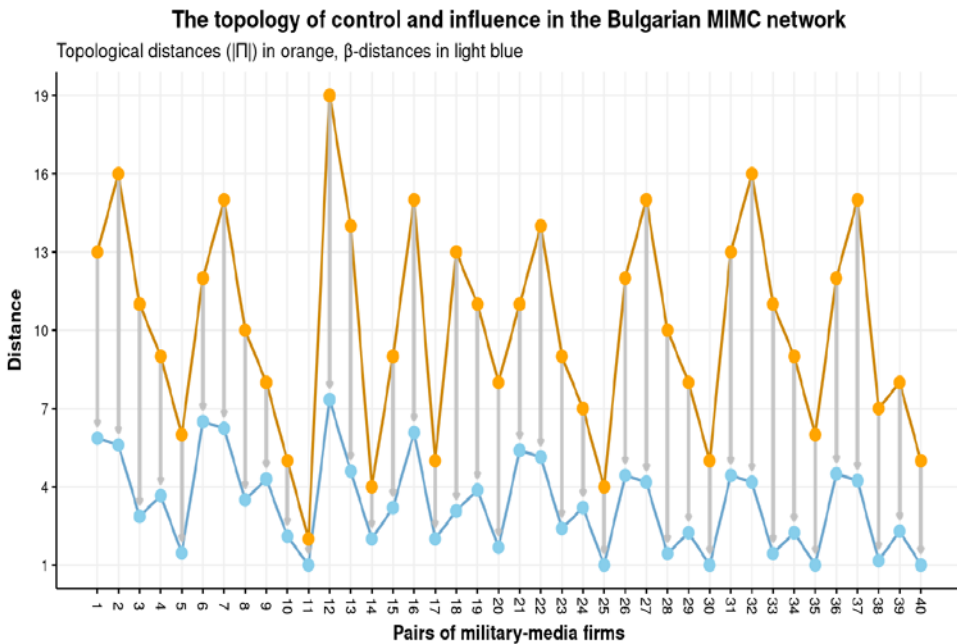
Second, studies on financial networks describe multiple hierarchical components of companies with parent firms at the top and subsidiaries/shell companies on the lower layers. Instead, each hierarchy within the MIMC’s network space has two (groups of) apexes that correspond to the two corporate cores of the complex: military and media companies. Each hierarchy within the MIMC network forms a bow-tie structure similar to that of the World-Wide Web (cf. Broder et al., 2000). Essentially, this structure reflects the flow of control from the companies in the left ear of the bow to the right ear. The knot at the centre of the bow encompasses a dense community of middleman firms that mediate this flow. Finally, the tie contains ‘tubes’ for alternative flows of control.



Source: Author’s elaboration.

Figure 2. Graph of the bow-tie structure of the fourth-order neighbourhood around the military company Arsenal

Further insights can be gained using the β -distance and the β -ratio (see Figure 3), both of which point to a tight-knit MIMC in Bulgaria. At first sight, military and media companies seem quite distant, with an average topological distance of 10 middlemen separating them across the network and as many as 19 of them in one case. However, the image changes dramatically when using β -distances. The average control distance is just three, and no pair of military-media firms has a β -distance larger than seven (after rounding). Consistently, the β -ratio is never larger than half (meaning that topological distances are at least double the β ones) and averages just one third over the entire network (i.e., the topologically shortest distance is on average trice the β -distance).



Source: Author’s elaboration.

Figure 3. Comparison between topological distances and beta-distances for military-media company pairs in the Bulgarian MIMC network

Blockmodeling analysis

Moving to the analysis of community structure using SBM, the results provide further evidence to support the MIMC thesis (see Table 1 for a tabular summary).

Table 1. Tabular description of the blockmodeling results for both approaches

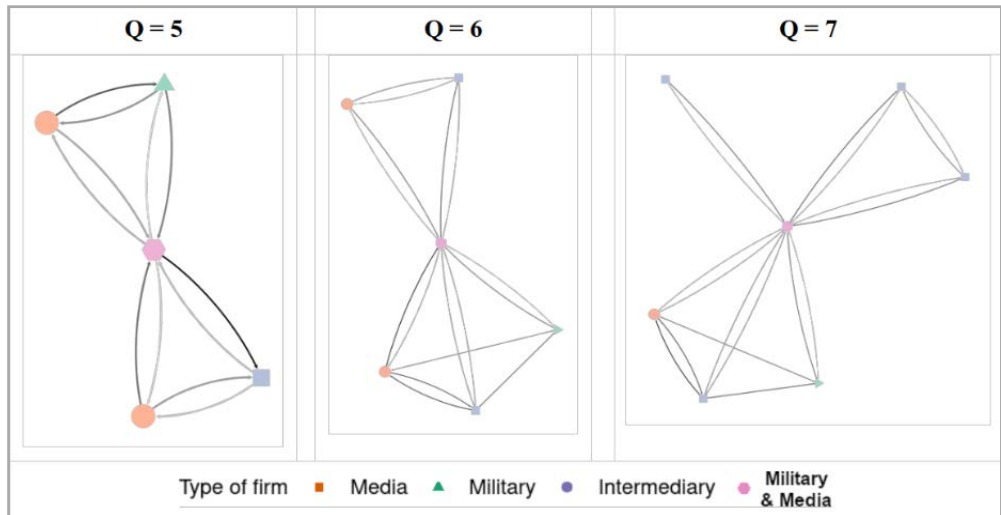
| AgroParisTech-MIA | | | | | | | Bayesian SBM | | | | | | | | | | | | |
|---------------------------------------|-----|----|----|----|----|----|--|-----|----|----|----|----|----|----|----|----|----|----|----|
| <i>Number of companies by cluster</i> | | | | | | | <i>Layers</i> | | | | | | | | | | | | |
| Cluster | 1 | 2 | 3 | 4 | 5 | 6 | Layer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Q=5 | 255 | 43 | 41 | 69 | 0 | 15 | Vertexes | 423 | 25 | 9 | 4 | 2 | | | | | | | |
| Q=6 | 256 | 43 | 41 | 40 | 28 | 15 | Clusters | 25 | 9 | 4 | 2 | 1 | | | | | | | |
| Q=7 | 258 | 32 | 41 | 40 | 28 | 8 | <i>Number of companies by cluster on the first layer</i> | | | | | | | | | | | | |
| | | | | | | | cluster | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | | | | | | | size | 18 | 10 | 20 | 15 | 11 | 28 | 2 | 30 | 19 | 6 | 24 | 16 |
| | | | | | | | continued... | | | | | | | | | | | | |
| | | | | | | | cluster | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 22 | 23 | 24 | 25 |
| | | | | | | | size | 13 | 13 | 10 | 19 | 20 | 20 | 16 | 14 | 29 | 9 | 22 | 9 |

Source: Author’s elaboration.

Notably, analysing a network comprising a large number of units using SBM can be quite complex and requires researchers to make a few choices that may bear a high degree of arbitrariness. Most evidently, it can be difficult to justify the choice of one or another number of clusters (i.e., groups), especially within a narrow interval where the difference is small. Moreover, even the integrated likelihood criterion (ICL) commonly used to simplify this selection (Snijders & Nowicki, 1997) is not always a definitive solution because there are different possible formulas and, usually, deciding whether to have one more cluster or one less is a close call. For that reason, this paper strives to achieve inferential robustness by cross validating the existence of the theoretically expected features of the MIMC in the data using two different implementations.

AgroParisTech-MIA’s VEM algorithm uses a metric called integrated criterion likelihood (cf. Snijders & Nowicki, 1997) to suggest the best ‘result’ and settles for a clustering with six groups. However, the solutions with five and seven clusters are quite close and, indeed, similar. In particular, all results show a similar structure with a very large community (labelled ‘1’ and represented by a hexagon in Figure 4) at the centre, hosting slightly more than half of the firms in the network, connected to all others. This cluster contains both two military firms and a number of media companies, but most of its members belong to the panoply of middlemen populating financial

networks. Furthermore, the structure is the same in the partitions with five and seven clusters. There is a possibility that the only differences are due to the splitting of some merging groups made up entirely of shell companies. In this sense, all of these results are characterised by the same bow-tie structure that can be located at the local level (see Figure 4).



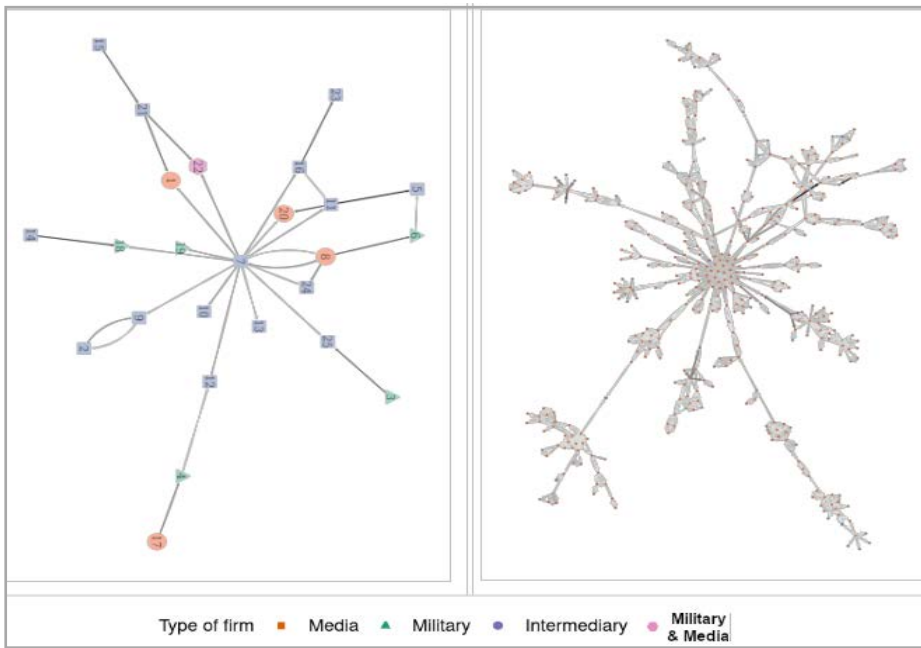
Source: Author's elaboration.

Figure 4. The partition with five, six, and seven clusters obtained with the AgroParisTech-MIA's VEM algorithm

Namely, cluster 1 constitutes the central knot of the structure, transmitting the influence of the military companies in cluster 3 (green triangle) to the media firms in clusters 2 and 6 (circles). Additionally, considering that cluster 1 also contains two military companies and some media ones, this approach may hide other bow ties within the largest group.

The Bayesian approach does not use ICL but chooses the 'best' clustering by solving a maximisation problem; hence, it shows a tendency to underfit the data (Peixoto, 2020). Therefore, its algorithm produces a multi-layer result by trying to group the clusters obtained via network analysis to further reduce the number of clusters until there is only one left (see Figure 5). Yet, in this case, the first layer provides an insightful peek at the fine-grained structure of the Bulgarian MIMC. As shown, cluster 7

is the central broker with connections to most other communities. However, this cluster hosts purely middlemen, containing neither military nor media firms. Meanwhile, each military company and its neighbours ties reside in a rather dense cluster (3, 4, 6, 18, 19), except for Optiks JSC, which is clustered together with an advertising firm in community 22.



Source: Author's elaboration.

Figure 5. First layer of the multi-layer hierarchical SBM of the Bulgarian MIMC

Analogously, media companies are nested in separate clusters (1, 8, 17, 20), albeit they are not as tightly connected to their immediate neighbours as traditional MIC firms are. Overall, cluster 7 operates as the central knot of three main bow-tie structures having clusters 18, 19, and 3 as their left ear (controlling military firms) and clusters 20, 8, and 1 as their right ear (controlled media firms). Still, in the case of cluster 3, the core knot includes the middleman community 25, which is not part of a network-wide knot. Similarly, by dissecting clusters 6/4 and 8/17, similar bow-tie interactions are noticeable between the military firms in the former two groups and the media companies in the latter ones. True, cluster 22 does not contain a bow-tie structure between Optiks JSC and the media companies; but this is due more to the peculiar

corporate structure of the Optiks group than to a defect of the clustering. In fact, Optiks JSC is the only military firm which controls a relatively large investment firm with dozens of common-ownership and board-interlock ties to other firms. Particularly, Optiks Invest LLC hold shares in several media-related entities.

Discussion

Topological findings

The media firms closest to a military company seem to belong to three sets of categories: advertisers, media consultancies, content producers, and distributors. Starting from advertisers, which are also exempt from most transparency obligations under Bulgarian law, these are the smallest in terms of capitalisation and are connected to military firms at short β -distances (pairs 30, 35, 40, 38, 20, 14). Thus, it is difficult to estimate how extensively these advertisers work with mainstream media. However, it is worth noting that the set of advertising companies in the network does not include all of the MIC advertisers. In fact, Bulgarian military companies do not just own, but control advertising firms mapped in this network. Rather, they have long-standing engagements with some of the largest, privately held advertising firms in the country (Infogram, 2017) that are less transparent than those with their publicly traded peers (e.g., Mars Armor JSC with Graffiti BBDO).

Second, Bulgarian military companies entertain frequent ties with publicly traded media consultancy groups (pairs 17, 19, 27, 32, 37, 22), most notably Inspire Media LLC. Taken together with their substantive investments in and contractual obligations towards advertising firms, the exertion of influence over media consultancies is highly relevant. In fact, it provides a substantive lead towards the existence of a systematic effort on the part of military firms to skew the media in favour of the MIC through capitalistic relations. In essence, it provides an indication of the interest that the MIC's traditional core members cultivate for the media. However, the third set of media firms connected to the MIC is even more interesting.

Arguably, the existence of close, intense, market-mediated connections between military firms and entities responsible for the creation and diffusion of media products is clear proof supporting the MIMC thesis. Looking at the network, relationships between the media and military firms are extensive, albeit comparatively less close than is the case of advertisers and consultancies (pairs 11, 14, 29, 34, 39, 24, 4, 19, 26, 31, 36, 21). Moreover, the firms at the centre of a majority of these connections can be reconnected to large broadcasting and content-producing businesses: bTV, the largest television media group in Bulgaria (bTV, 2023); and the Victor Popov Film Company,

which counts amongst its clients several foreign and domestic governmental actors (FKVP, 2023), nation-wide television stations (Televizia Evropa JSC, TV Skar, Televizia Kanal 3), radio stations (Radio Veselina, Radio Romantika), print media outlets (Dnevnik, Bankeru), producers (Global Films Ltd, Dream Teams LLC, Pioner Media LLC), and advertisers (MM New Media Group LLC). So, this set of connections does more than simply provide a substantive sign of the existence of straightforward collusion between military-industrial and media firms. Furthermore, the choice to not take shares or accept board seats directly on bTV's board is telling. In fact, the connection is mediated by almost total control on the part of several smaller broadcasters belonging to the bTV group. Analytically, the low β -ratio is an indication of an articulated attempted to mask these connections through several shell companies acting as middlemen, lacking any real autonomy due to common ownership and board interlocks.

Blockmodeling findings

It is instructive that two implementations of the SBM, differing in their underlying interpretation of probability, identify the main characteristic of a theoretical MIMC in the data. After all, network features that are very evident when using one approach but partially absent in another could be artefacts; but a consensus between different methods on the network's community structure provides a sound basis for inference.

In the present case, a blockmodeling analysis suggests that the bow-tie structure, which was theoretically assumed and anecdotally identified by using topological tools, is a feature of the entire Bulgarian MIMC. Its tightness is confirmed by the patterned connections between military and media companies in all results. Furthermore, when using an approach that does not overfit the data (i.e., the Bayesian SBM), the underlying structure emerges even more clearly. Arguably, the fact that the VEM algorithm is more likely to assign military and media firms to the same overcrowded cluster suggests that attempts at confounding the vectors of corporate control are indeed effective. Notwithstanding this, a theoretically informed analysis using several methods for cross-validation can dig up the real conduits of corporate influence in the MIMC.

These results, especially from the Bayesian multi-layer SBM, practically show that military and media firms are at opposing ends of a complex corporate structure that leverages capitalistic relations to exert influence from the former to the latter. Such transmission chains take the shape of bow ties in which many shell companies act as middlemen to obscure the MIC's influence over apparently unconnected media firms' management and capital.

Conclusion

As the war between Russia and Ukraine continues, an unbiased media is essential to guarantee that national and transnational military-industrial complexes do not exercise undue influence on the political process. Based on numerous studies on the MIC and the MIEC, this paper takes a network perspective and extends the logics governing the interactions within the MIC to a new class of actors: corporate media. Accordingly, it has addressed these capitalistic relations within the MIMC in an advanced market economy by presenting a network approach to gather data on these firms, proposing new measures to topologically describe their closeness, and applying existing methods to model their relationships. This methodology was tested on a novel dataset based on open-access public-registry data detailing board interlocks and common ownership among 6,553 firms and individuals in the Bulgarian MIMC. Building on contemporary methods in network construction and taking advantage of recent developments in blockmodeling, the paper has attempted to offer both a clear methodology for mixed-methods research into the MIMC and the first overall assessment of military-industrial firms' in/direct control over corporate media in Bulgaria.

This study empirically shows that military-industrial firms have a direct and identifiable influence over media companies Bulgaria. Although the results hereby reported are limited in scope to a single country in the eastern flank of the EU and NATO, future research can extend this approach (construction of a company-company network, β -distances and -ratios, and blockmodeling analysis) to the study of the MIMC in other countries. Moreover, additional effort should be invested into finding ways to access and integrate information on other connections between the MIC and corporate media (advertising revenues, editorial boards, kinship). Finally, the network structure could be extended, and forthcoming studies of the MIMC may acquire a dynamic dimension by employing implementations of blockmodeling for 'temporal' networks.

Conflicts of Interest

The author has no conflicts of interest to declare.

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How to cite this article:

Telarico, F. A. (2024). A Network Approach to the Study of the Military-Industrial-Media Complex in Bulgaria. *Economic Thought Journal*, 69 (4), 442-463. <https://doi.org/10.56497/etj2469402>