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Corporate Networks

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Abstract:

What is the role of (corporate) networks in IPE scholarship? Throughout its young history, the field has developed different conceptual and empirical approaches to answer this question. At the same time, corporate networks are still underappreciated as fora for political and economic change. In this chapter we argue that such underappreciation can be remedied by bringing in the insights and methodological advances of the 'big data' revolution of the 2010s. Such an application can help in answering and bringing existing conceptual ideas to the fore. Beyond either using 'networks' as an anecdotally illustrated metaphor or as a methodological tool only, we propose to develop new ways of combining long-standing theoretical problems with innovative empirical methods and applications. By surveying the literature on networks in IPE of the last decade, we show how the gap between theoretical and empirical accounts still persists, but is being increasingly bridged by contributions outside the 'mainstream core' of IPE journals.

1. Introduction

In 2012, the New York Times proclaimed the age of ‘big data’ – the harnessing and analysis of large swaths of previously unavailable information about the social world (Lohr 2012). This proclamation was not only limited to the usual suspects running their business model on large amounts of user data. A ‘new breed of political scientists’ (ibid.) was expected to thrive in this new age of data abundance. The major field of application of this abundance was quickly identified as network science (Przulj and Malod-Dognin 2016). This was an exciting promise for the relatively young discipline of IPE for the 2010s. Previous theoretical and qualitative insights postulated that corporate network fora like elite communities were driving political economy phenomena from global trade governance to European integration (see, e.g., van Apeldoorn 2002). With the availability of large-scale, fine-grained corporate network data and the application of cutting-edge methods, these insights could be empirically bolstered and leveraged on a global, cross-temporal scale. With its strong rooting in grand theories of international (economic) relations, IPE as a discipline presented a fruitful ‘testing ground’ for the application of data-driven network analysis. Reflecting this hope in 2009, Robert Keohane named network analysis a ‘much more sophisticated’ way of analyzing complex interdependence in IPE, and expressed hope that network analysis (among others) would retain the ‘I’ in IPE for the future of the discipline (Keohane 2009, 39).

In this chapter, we take stock of the role of corporate network analysis after a decade of the proclamation of the age of big data (see also the chapter by Young and Winecoff). Specifically, we ask in how far the introduction of data abundance and new methods was actually employed to answer older, paradigmatic theoretical questions related to corporate networks as fora for political change. To do so, we survey the corporate network-literature in six major IPE journals over the last decade. Our contention is that while corporate networks have increasingly captured a major position as fora of political contestation in IPE discussions, the field still does not comprehensively exploit the abundance of ‘big data’ and the respective methods to answer essential questions related to the issue. Despite some landmark studies outside of core IPE journals (see, e.g., Vitali et al. 2011), big data and respective methods are often still not widely used in corporate network studies, or they are being employed to answer rather specific questions in subfields of the discipline. However, we also find a number of studies that lately deliberately fuse big questions with big data and network analytics (see, e.g., Ajdacic et al. 2021; Babic et al 2020; Heemskerk and Takes 2016; Winecoff 2020). We

argue that such fusing of both aspects can help IPE to re-appreciate corporate networks as central fora for transformation and change in the global political economy. Finally, we describe recent work outside of the mainstream core of IPE which engages in a fruitful fusion of big questions and big data and which present promising avenues where large-scale corporate network analysis can make a real empirical contribution pushing the field forward into the 2020s.

In the remainder of this chapter, we first survey the mainstream IPE literature on corporate networks of the last decade and analyze in how far the emergence and availability of big data has had an identifiable impact on the field (section 2). We then review work outside of this mainstream core that illustrates ways of bringing big data approaches to corporate network studies and create important impulses for a further development of the field (section 3). Here we focus on how rapidly reconfiguring corporate ownership networks act as underappreciated fora for politico-economic change. We conclude by embedding our findings in the broader context of a changing IPE in the 21st century (section 4).

2. Corporate networks research after the first decade into the age of big data

In order to make qualified statements about the state of the field of IPE and network science, we surveyed the contributions of the following academic journals since 2010: *Competition & Change*, *European Journal of International Relations*, *International Organization*, *International Studies Quarterly*, *New Political Economy*, and *Review of International Political Economy*. While this is not an exhaustive list of what can be considered IPE (and especially GPE¹), we deem this selection to represent the core of the mainstream discussion within the broad field of IPE. We searched for papers with 'network' in their title and/or abstract. From an initial sample of 74 papers we had to cut those that did not relate specifically to corporate networks. We checked whether the abstracts of these papers are dealing with corporate networks in the broadest sense. Our final sample then includes 53 papers that match our search strategy.

In our search strategy, we define 'big data' quite broadly, namely that a publication uses large-scale, often fine-grained corporate (network) data for analysis. What is 'large-scale' depends to some degree on the subject of study, but the used data should be global in the sense that it strives to cover the whole extent of a phenomenon, not only a fraction or sample of it. In most cases of corporate network data, this means that we speak of thousands to millions of financial, ownership, investment, etc. relations. Consequently, the methods used to

¹ At the time of writing, a new journal called 'Global Political Economy' is being launched by Bristol University Press. This branching out into global themes is motivated by 'an explicit intention of cross-disciplinarity', as the editors state on the journal website, see: <https://bristoluniversitypress.co.uk/journals/global-political-economy>.

analyze big (corporate) network data in this type of research often differ (Heemskerk et al. 2018). Instead of ‘variable-based’ research designs that seek to establish (causal) inference, big data approaches often resort to so-called ‘pattern-based’ designs that embrace causal complexity instead (Oatley 2017). Naturally such a focus lends itself to network analytics that embrace complexity and large-scale patterns of corporate and human behavior as their unit of analysis (Glattfelder 2010; Wasserman and Faust 1994). Our understanding of ‘big data’ hence entails a strong connection between this data and the usage of network science or at least network metrics to analyze a given amount of information.

In our analysis, we specifically look for work that tackles ‘big questions’ of IPE and corporate network analysis in particular. The reason for this is that we regard the yardstick of the success of the big data revolution in whether such approaches can actually help to push the field meaningfully forward. We hence specifically look for contributions blending big data approaches with asking historically relevant, cross-cutting questions about corporate and state power, global hegemony, economic development, the rise and fall of global actors, and the demise and transformation of global economic structures. Put simply, we want to stress the *asking of big questions* such as for instance: who controls today’s major global corporations? Who holds power in the international system? What are the drivers of global capitalist transformation? How can we understand the evolution of global corporate control? Are states or corporations more powerful in the 21st century? Is a global corporate elite emerging or are elites still fragmented along national lines? And many others. What distinguishes such fundamental theoretical questions from ‘everyday’ social science questions is that tackling the former requires researchers to innovate either theoretically, methodologically, or empirically to provide a meaningful answer. They are, to paraphrase Robert Cox (1981), not merely problems to be solved but issues that require innovative out-of-the-box thinking. Such thinking is often found in cross-disciplinary research that embraces causal complexity rather than strictly unidirectional problem-solving research designs.

Within the sample of publications we gathered from the last decade, we find that out of 54 papers, seven papers fit our definition of big data publications, while 22 tackle fundamental theory questions in the broadest sense. A majority of network-related papers are thus not concerned with big theoretical questions, while only around 15% use a big data framework. In total, five papers, or around 9% of all publications, actually combine fundamental theoretical and big (corporate network) data questions. While this is a rather modest amount, we have to take into account that we survey here the core of the mainstream literature on the topic; and that we employ a network-centered focus. The mere existence of such publications in top IPE journals is hence already a basis to work with.

Among the 22 papers tackling fundamental theoretical questions, we can find contributions from various theoretical strands, from critical IPE to more mainstream accounts.

In one way or another, most of these studies analyze how corporate and/or state networks are 'fora' for politico-economic change whose importance is not yet appreciated. The topics covered range from question about corporate elite networks (De Graaff and Van Apeldoorn 2014), global value chains (Neilson et al. 2014), and state transformations (Ougaard 2018), to issues of development and global inequality (Mahutga 2014; Selwyn 2013). Many of those studies actually employ a network analytical approach, for example van der Pijl et al. (2011) on transnational capital fractions, De Graaff and Van Apeldoorn (2014) on foreign policy making networks, Gray and Potter (2012) on trade networks, or de Graaff (2020) on the integration of Chinese corporate elites into global networks. The focus of the lion share of these studies certainly fits within a 'pattern-based' research approach. Most studies interested in big questions relating to corporate power or elite transnationalization employ a descriptive, but theoretically very firm approach to tackling these questions. They also aim to cover as much ground as possible in their studies and choose data collection strategies aiming at presenting a *global* picture of their respective topic. As an example, van der Pijl et al. (2011) collect various board membership information on the top 100 transnational corporations in 1992 or the top 150 corporations in 2000 and 2005 to present a global picture of the phenomenon at hand. Others like de Graaff (2020) collect detailed biographical information on Chinese elite network members to create their globalized ego networks. Mahutga (2014) analyzes global garment and transportation equipment trade data through network analytical techniques.

Such studies have in common that they aim to cover global phenomena in accordance with their 'big questions asked' approach, and therefore have to find a methodological way of dealing with data limitations: van der Pijl et al. (2011) for instance combine different data sources and acknowledge the limited nature of some these data (ibid., 395). De Graaff (2020) furthermore explains that her approach covers a more limited sample of firms and organizations, but therefore allows her to actually conduct a complete biographical mapping of her elite data (ibid., 212). Mahutga (2014) argues that a 'lack of cross-nationally comparable firm-level data' (ibid., 166) necessitates him to use nationally aggregated trade data instead. These examples show how scholars aim to reconcile big questions of the discipline of IPE with methodological aspects that would optimally require large-scale, often fine-grained, firm-level data. Heemskerk (2019) describes the relation between theoretical ambition and empirical implementation for some of these studies (e.g. van der Pijl et al. 2011) as 'unfulfilled promise'. He asks whether and why 'theory trumps empirical analysis?' (Heemskerk (2019, 235) and calls for a more rigorous application of empirically oriented work that complements the big theoretical questions raised by such IPE corporate (network) analyses.

Such a rigorous employment of big data and the respective methods is being conducted in another, smaller subset of our sample. Studies like Pažitka et al. (2021) use fine-

grained firm-level data on IPOs (initial public offerings; i.e. firms that list on the stock market for the first time) over a longer timeframe sourced from the Dealogic ECM database. They employ this data to create the explanatory variables for their study, which also includes prominently network measures (ibid., 9). The usage of such data allows them to analyze which investment banks are extracting how much profit by underwriting IPO deals over a certain time period. Another such example is the collection and analysis of a large amount of textual data by James et al. (2021). This study uses responses to EU financial regulatory consultations, which are employed to map patterns of (networked) financial industry coordination within Europe. Drawing on over 8,000 written responses, the authors create a unique and large dataset which allows them to carve out the emerging cross-border networks of financial industry coordination (ibid., p. 909).

Those studies have not only in common that they aim to deliver new, potentially 'big' datasets that are able to tackle the issues described in these papers. Moreover, they employ these data and respective innovative methods to fill specific gaps in the respective literature, or extend and correct our knowledge of specific themes. Pažitka et al. (2021) aim to describe rent extraction practices of a specific group of financial actors, while James et al. (2021) seek to advance the study of the variety of financial lobbying networks through their methodological contribution (ibid., 899). Such problem statements are crucial to advance IPE as a problem-driven discipline (see the introduction of this Handbook). The methodological and data-related contributions of these papers are an important extension of the first identified group of papers that put a stronger focus on 'big' theoretical questions. Taken together, both sets of contributions advance our understanding of corporate networks as fora for politico-economic change.

A third and smaller subgroup of papers attempts a combination of big theoretical questions and big data, and which lays the groundwork for further research we discuss in the next section. Taking a closer look at those publications that combine both aspects shows some of the already realized potential and the thematic breadth of this fusion. In his study, Dasandi (2014) asks whether and how international inequality affects poverty in the global system. The paper tackles a long-standing problem of the political economy of global development: what factors cause some states to remain 'poor' while others remain relatively rich? (Gunder Frank 1966; Rostow 1959). Different from many mainstream approaches, Dasandi probes a structural and global explanation: he argues that it is the unequal relations emerging within the global trading system that produce and sustain poverty and relative inequality. The gist of this argument is clearly a 'grand theory' question in the best tradition of World Systems and Dependency theory (Cardoso 1982; Wallerstein 2005). However, the methodological approach Dasandi uses is not at all traditional, but rather innovative. He employs network analytics to a large dataset on global trade relations between 1980 and 2007 in order to

determine the relative position of different countries within the global trade network. The study utilizes different network concepts like regular equivalence to measure these positions (Dasandi 2014, 208). Dasandi argues that such a measure better reflects the complex nature of international trade today, as it incorporates *indirect* relations, and hence interdependence, and not only direct ties to other states. In a second step, the study employs another network analytical technique, namely hierarchical clustering, to determine country clusters based on their similarity (ibid., 209). The results show how countries can be located in four different clusters depending on their relative power position in the global trade network.

A second study in this group takes on another important question of political economy and corporate networks research, namely the evolution of the global trade system in the 20th century. Abdollahian and Yang (2014) argue that classical economic theories explaining ever rising trade volumes such as the Heckscher-Ohlin model need to be complemented by empirical work fusing trade, growth and globalization in the 20th century. In trying to think these three themes together, they seek to 'derive patterns describing the structure and evolution of global trade in ways that traditional econometric measures cannot' (ibid., 605). This means first and foremost to employ network analytic methods to a large dataset on global trade of 180 countries between 1960 and 2009. They employ different network measures such as degree, betweenness, and eigenvector centrality to carve out these patterns on a global scale. Afterwards, they take a sample of seven large trading countries and explore the found patterns further for a longer time period, namely from 1920 to 2010. The paper finds that over the course of the 20th century trade convergence has taken place and trade inequities are declining, at least among major powers. Abdollahian and Yang take this as an indicator that globalization might not after all increase trade inequities over the long run, but they also caution that their paper is only a first step into exploring these patterns over a longer time frame. The focus on a pattern-based instead of variable-based research design enables them to cover more ground, but it also implies that these findings need to be scrutinized against studies that indicate the persistence of inequity in the world system, like the discussed paper by Dasandi (2014). The potential controversy arising out of such different findings of different approaches fusing big data and important theoretical questions is a fruitful avenue for further research and scrutiny from this perspective.

Staying within the debate on the merits and consequences of globalization, Heemskerk and Takes (2016) take up another key debate in corporate network research: in how far has transnationalization created a global corporate elite that forms a distinct social community? The authors aim to contribute to this question by exploring the structural qualities and network characteristics of this global corporate elite. They are not the first scholars to do so, as corporate elite network research has a long history in the field (see Carroll and Fennema 2002; Mizruchi 1996; Useem 1986). However, Heemskerk and Takes bring a big data corporate

network approach to the table that does not work with (limited) samples, but utilizes the wealth of the whole Orbis database to extract millions of board interlock positions on a global scale. In order to understand how corporate control is distributed in the 21st century – a long-debated theoretical question – the paper draws on state-of-the-art network techniques such as community detection. Heemskerk and Takes source in total the largest 968,409 firms from 208 countries, which entail over 3 million individuals in senior management and on corporate boards (ibid., 98, 99). Within this sample, they find around 1.7 million board interlocks, which form the basis for their large-scale study. By iterating over this sample with a community detection algorithm, the authors refine the emerging structure of the global corporate elite and find in total eight distinct communities (for an overview see ibid., 107). The resulting network of global corporate elites is not a ‘flat’ one, but has its power locus in the North-Atlantic and Commonwealth cluster, which shows also dense relations to other European communities. As a general result, the fusion of grand theory and big data enable Heemskerk and Takes to show that the global political economy is becoming more multipolar, while at the same time retaining some stability in the ‘core’ centered around North America and Europe.

A recent study by Winecoff (2020), which also belongs to our sample, revisits a long-standing theory question not only of corporate network research, but of the field of IPE as such. Winecoff asks how Susan Strange’s notion of structural power in the world system could be analyzed empirically by the means of modern network science tools and access to large-scale and fine-grained data sources. Strange (1987) argued that the (then-and-now) prevailing notion that US power is declining in the international system can hardly be sustained ‘when it is subjected to close and searching scrutiny’ (ibid., 552). She argued that the structural position of the US in the realms of finance, trade, security, and knowledge remains pervasive – a thought which stands against the ‘frequently relational, linear, and monotonic’ (Winecoff 2020, 212) standard model of an (alleged) US decline (see also Oatley et al. 2013; Starrs 2013; Fichtner 2017). Winecoff then aims to put this intuition of Strange on a solid empirical basis. With the help of insights from network science, he contends that the global political economy is a complex system in the truest sense of the word: it consists of different units (nodes) that interact in order to produce a system which is more than the sum of its underlying parts (ibid., 214). Based on this insight, Winecoff argues that

‘[i]f we develop a strong understanding of the ways in which global networks emerge, evolve, and are shaped and reshaped over time then we can not only better understand the importance of interdependence, but also uncover the organization of structural power’ (ibid., 216).

The key tool the paper uses to do so is the fitness plus preferential attachment (FPA) model derived from network science, which makes it possible to include ‘node-level’ (here:

state-level) attributes as well as more systemic characteristics (ibid., 220). With this model, Winecoff analyzes the four structures of world politics suggested by Strange and concludes that US power is far from being replaced or that it is likely to diminish over time. On the contrary, in many global structures the US could even expand its structural power position since 1990 and 2008, respectively. In this sense, Winecoff's paper fuses concrete network science tools and data analysis to push the frontiers of our knowledge about enduring issues in corporate network and IPE research.

Our survey of several IPE journals revealed some important patterns across the mainstream core of the field. We can see that 'grand theory' questions are far from being marginalized within the mainstream journals. Furthermore, we observed that approaches drawing on large-scale (network) analysis represent a minority in our sample, but that they at least took place in the last decade. Within this limited amount of publications, we also found some papers that fused both aspects and thus attempted to break new ground within and beyond the research on corporate networks. The fact that such papers still play a minor role in the grand scheme of things is in our estimation rather due to missing 'big data' approaches than to the lack of big questions asked. And this is actually good news: we do not believe that a lack of ambition or the vanishing importance of grand theory is actually something that is likely to happen to the field anytime soon. If this ambition is present as ever, all it takes is to bring in new methods and perspectives on how to tackle those questions. Contributions like Winecoff (2020) exemplify that this is possible and desirable; and that mainstream IPE has the means to bring large-scale data analysis to important questions of corporate networks as fora for politico-economic change.

As a final step, we want to draw the attention to innovative IPE work that speaks to this issue and that is taking place *outside* of the mainstream core of the field. It is not controversial to say that the field of IPE as an intellectual project spans much more than a handful of peer-reviewed, high-impact journals. For newly emerging approaches like the ones we survey in this chapter, it is not unusual to 'come in from the side' as they often break with long-established disciplinary boundaries and rules of how to do 'proper' research. As already discussed in this chapter, the pattern-based and hence often descriptive nature of much of big corporate network data-based research is certainly disruptive in the sense that it is clearly of a quantitative nature, but does not adhere to the usual 'rules' of variables-based quantitative research. It is hence maybe not so surprising that some of the most path-breaking work is located outside of the core IPE journals surveyed here, and is only slowly finding its way into these outlets. We discuss some of these publications in the following section with a focus on how corporate networks are a 'forum' for broader political and economic change that is yet unappreciated in the IPE mainstream.

3. Closing the gap: IPE contributions on corporate networks as fora for politico-economic change

Among the literature outside the mainstream that fuses big questions with big data in studying corporate networks, Vitali et al. (2011) represents a landmark study. The authors analyzed for the first time the entire global network of corporate ownership. Before this analysis, only small national samples were studied and – according to Vitali et al. (2011) – there was no appropriate methodology to analyze corporate ownership and control from a truly global perspective. Using the Orbis database they generated a dataset covering the entire network of transnational corporations in 2007, which included over 600,000 nodes and 1,000,000 ownership ties. Vitali and colleagues then applied a novel algorithm to compute network control. They found that in 2007 the top three global ‘control-holders’ were the British bank and asset manager Barclays, followed by the two US asset managers Capital Group and Fidelity. The authors summarize their novel contribution as follows:

We present the first investigation of the architecture of the international ownership network, along with the computation of the control held by each global player. We find that transnational corporations form a giant bow-tie structure and that a large portion of control flows to a small tightly-knit core of financial institutions. This core can be seen as an economic “super-entity” that raises new important issues both for researchers and policy makers. (Vitali et al. 2011)

On the one hand, this study was truly path-breaking for corporate network research in IPE, because it provided the first empirical analysis that covered virtually all transnational corporations and developed novel methods to compute which firms hold the greatest degree of control in this global corporate ownership network. On the other hand, the paper did not pursue the development of theory. The topic lends itself to tackle fundamental questions of IPE research, such as corporate and state power and globalization. However, Vitali et al. (2011) did neither investigate why this described global corporate ownership network had developed the way it did nor what some of the major politico-economic consequences of this ‘small tightly-knit core of financial institutions’ might be. This is certainly also because the authors would not necessarily count themselves into the broader field of IPE. Nevertheless, the study paved the way for fusing fundamental questions of corporate network research with large-scale data analysis and became an inspiration for much subsequent work in the field (see e.g. Babic 2021; Garcia-Bernardo et al. 2017).

Other work outside the IPE mainstream core however did engage closer with what we understand as significant development of grand theory that is interlinked with large-scale

corporate network data analysis. Using data from the Orbis database by Bureau van Dijk, Fichtner et al. (2017) have analyzed the complete ownership network of all 3,882 publicly listed companies in the United States. Drawing on insights from Vitali et al. (2011) as well as crucial work by Davis (2008) and Braun (2016), Fichtner et al. (2017) identified that in 2016 the network of US listed corporations was dominated by just three American asset managers: BlackRock (which bought the asset management division of Barclays in 2009), Vanguard and State Street, which they consequently dubbed the 'Big Three'. These three giant US asset managers, seen together, constituted the largest shareholder in almost 90 percent of the 500 largest American corporations. These findings can be seen as transformational for the field of IPE, since the traditional view held by many economists and corporate governance scholars was that ownership of large listed US corporations would be dispersed and fragmented (see e.g. Windolf 2002). Importantly, Fichtner et al. (2017) also provided a first explanation why the 'Big Three' were growing much more rapidly than almost all other asset managers: they dominate the burgeoning segment of 'passive' funds that simply track existing stock (or bond) indices. What is crucial is that in passive index funds there are large economies of scale and significant first-mover advantages – once there are a few large and liquid passive funds that track any given important index (e.g. S&P 500 in the US, FTSE 100 in the UK, and EuroStoxx 50 in the Eurozone) there is no reasonable chance for other funds to attract major asset inflows. This new situation is radically different from the previous era of actively managed funds in which no giant asset management firms could emerge due to an absence of large economies of scale.

The combination of big questions – who holds power in US capitalism? – and big data analytics advanced the study of corporate networks in IPE in important ways. This new passive mode of investing via index funds has direct consequences for the formation and reconfiguration of ownership networks of publicly listed corporations. In the past, active fund managers (e.g. Capital Group or Fidelity) bought shares of (domestic or international) firms they deemed would generate high returns and they sold shares of firms they believed would underperform. This resulted in dispersed and transient, i.e. constantly changing corporate ownership networks. In this new age of passive asset management, investors in index funds are effectively outsourcing or delegating their investment decisions to the three major index providers MSCI, S&P Dow Jones and FTSE Russell, as they determine which firms and countries are included in key indexes (Petry et al. 2021). Moreover, the index funds industry is dominated by the 'Big Three'. As a result, corporate ownership networks in many countries are becoming much less transient, while at the same time BlackRock, Vanguard and to some degree State Street are growing into the largest holders within these ownership networks. In the words of Fichtner and Heemskerk (2020), these asset managers are becoming the 'new permanent universal owners' of this incipient era of index investing.

Corporate ownership determines corporate control; and the behaviour of publicly listed corporations plays a pivotal role for politico-economic change in most countries. Simply due to its sheer size as the largest node in many corporate ownership networks, BlackRock has become somewhat of a 'focal institution' that is increasingly de facto setting standards for listed firms concerning topics such as diversity and climate change mitigation. In the US this new index investing paradigm has led to the situation that the 'Big Three', seen together, on average now hold more than 20 percent of each of the 500 largest listed corporations. A recent episode has shown that this central position in the ownership network can be used to force change in large corporations. The 'Big Three' supported the small hedge fund Engine No.1, which elected sustainability-oriented board members against the will of ExxonMobil, the largest US oil firm. It remains to be seen whether this episode was just a one-time (public relations) event or whether the 'Big Three' will increasingly use their pivotal network position to act as agents of (lasting) politico-economic change.

A last paper we want to highlight in this respect is recent work on corporate elites by Valeeva (2021). In her contribution, Valeeva observes that much of the work on corporate elites in the past has established that transnational corporate networks play a major forum where power and control is exercised. At the same time, we know quite little about the geography of these elites: where they are located, how these locations are connected, and where power and control is concentrated within this network. Valeeva calls this the 'backbone' of the transnational corporate elite. She applies a set of community detection and network centrality analysis methods in order to filter, reduce, and analyze the vast network of transnational elite connections. Her (cleaned) dataset consists of the board members of over 10,500 of the largest global firms with over 2,600 city locations (ibid., 15). Building on this unique dataset, she creates a city-by-city network using geographical information from the Orbis database and the Google Maps API. She then assigns this geographical information to the corporate board interlock network into a final dataset consisting of over 1,600 cities which are connected via over 7,500 corporate ties. Valeeva applies a set of different methods to this network to weight the different nodes and to filter for significant ties. The results show that the cities in the sample share on average 61 individuals sitting on corporate boards, which illustrates the connectivity of the global corporate elite. It also becomes clear that half of the detected communities of transnational corporate elite members are located across different countries and regions, whereas the other half is 'only' connected in the same region. This is a new and relevant finding and extends our knowledge of how global corporate elites re-organize in the 21st century. Among the first group of cross-regional communities there are interesting new patterns to be observed such as newly emerging Asian-European communities that are growing alongside well-established and well-researched communities like those in the Transatlantic and Anglophone world (ibid., 20).

Valeeva's research does not only push forward the integration of new methods and large datasets into the study of corporate networks, but it also speaks to a long and established tradition of trying to understand the composition and structure of (transnational) corporate elites (Carroll et al. 2010; Fennema 1982; Mizruchi 1996). She contributes to long-standing debates within the research on corporate networks by employing new large-scale data and network methods to find out how the global corporate community is structured. The question of how global corporate elites are connected necessitates such approaches that build on data covering the whole globe. The study by Valeeva is hence a prime example of how to fuse big questions of corporate (elite) networks research with big data and network methods to generate new knowledge that pushes the field forward. It also importantly illustrates how corporate networks can be fora for global dynamics and change: the emerging Asian-European corporate communities Valeeva finds imply a slow shift from the 'old' 20th century locus of power in the Transatlantic and Anglophone world towards Asia and the Pacific Rim as a new power center of global capitalism.

The research discussed in this section illustrates how a fusion of big questions of corporate network research with big data approaches can yield results that advance our knowledge of corporate networks as fora for politico-economic change. All papers provided important insights into how global capitalism functions and changes on the basis of large-scale datasets that were analyzed not only for themselves, but with an eye to answering major questions of the field. We mentioned before that these studies are in some ways 'outside' what is considered the IPE mainstream because they were not published in the main journals we identified above. The papers we surveyed also take inspiration from other disciplines such as sociology, finance, or computer science, and hence for some might not fit neatly into a narrow 'IPE' definition. At the same time, however, the work conducted outside of mainstream journals is by now already part and parcel of the global discussion on the direction and future of IPE and corporate network studies in particular. From our experiences of visiting and organizing global conferences, workshops, and other fora for professional exchange, of submitting papers and book manuscripts for peer review, and engaging in other forms of scholarly activity, we do have the impression that the type of research we described in this section has a firm standing among the variety of approaches within the field of IPE. This being said, producing and establishing cutting-edge research that gets published in top journals is also a matter of timing. We are optimistic that the promising approaches we identified here for the future of corporate network research will find their way even more into top publications and the so-called 'mainstream' of IPE in the coming years.

4. Conclusion

In this chapter, we aimed to sketch the current landscape of corporate networks research and we specifically paid attention to how these networks act as underappreciated fora for transformation and change in global capitalism. We argued that the age of big data that began in the early 2010s presented major opportunities to the field, as it enables researchers to draw on vast swaths of information to tackle long-standing contested or open questions of the field. These 'big questions' concern mainly the globality of many phenomena we are interested in when it comes to corporate networks: who holds power in global capitalism? How are corporate governance and corporate control changing? Is there a transnational capitalist class or elite and where is it located? Questions like these are old, and for a long time scholars had to resort to limited data or reductionist approaches in order to tackle them. Building on this existing body of (limited) knowledge, new approaches fusing old questions with new datasets and cutting-edge methods break new ground and pave the way for a better understanding of how corporate networks can be fora for politico-economic change – today maybe even more so than in the 20th century.

We however also saw that such approaches and studies are still a minority among the core mainstream journals of IPE. This is not entirely surprising, as much of the work that only started to thrive in the second part of the last decade still needs to establish itself in sometimes long-winded paper and book development processes. For the future of the field of IPE this means that we should expect a proliferation of the innovative work we reviewed in this chapter; and that our review is a snapshot within this process. Such proliferation will surely also be fuelled by the increase in BA and MA programs focusing on computational social science and related interdisciplinary programs we can observe at least in Europe in the last years. These and further developments will strengthen the interdisciplinary character of corporate network research and IPE as a whole, and hopefully also lead to an increase in major publications dealing with big questions using large-scale datasets and techniques down the road. The 2010s were an era of bringing together new approaches and insights and long-standing theoretical questions of the field. Our expectation and hope is that recent developments will give IPE a boost through work that embraces a reciprocal and alternating progression of empirical analysis and theory building in the 2020s. As a scholarly community, we should also be highly interested in keeping these conversations going and make IPE as an intellectual project as attractive, inclusive and open as possible. If we fail to do so, cutting-edge research on corporate networks might move into other fora outside of the core of IPE – for example in general flagship journals like *Scientific Reports* (Garcia-Bernardo et al. 2017) or *Nature* (Battiston et al. 2016). In this sense, there is a possibility that work which is not taking place in the IPE mainstream might also just 'move on' to greener pastures elsewhere. From our

analysis above, we would count this as a loss for our field, as the merging of big data and big questions is especially interesting and fruitful for IPE as an intellectual project.

How exactly this project going into the 2020s will look like depends also on the relevant topics and interests of academics who will work in the field in the coming years. We believe that especially recent IPE work concerning finance/security infrastructure networks (de Goede 2021), the new interdependence approach (Farrell and Newman 2019), and a political economy of complex interdependence as such (Oatley 2019) will be fertile grounds for further strengthening the nexus between corporate network research and big data approaches. All three themes embrace the complexity of the global political economy of the 21st century without reducing this complexity to 'being complicated'. They acknowledge that the ways in which (digital) infrastructures, global (corporate and security) ties, and cross-border networks shape global capitalism are fundamentally changing. From the weaponization of cross-border networks to the exploitation of such ties by corporate, state, and other actors, understanding the complexity of the global political economy will need both fundamental theoretical and conceptual work as well as the empirical application of new methods and large, previously unavailable datasets. We are positive that despite epochal shifts in corporate networks and their organization across the globe, IPE and its neighboring fields have the theoretical and empirical means to make sense of a transforming global order. The research reviewed in this chapter shows how bringing together big questions and big data is possible and desirable in order to understand a global political economy in flux.

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