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Making Data Flow for the Climate Risk Market

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Abstract

In 2011, the U.K. government announced that the national meteorological agency would be releasing a significant volume of data as part of its Open Data policy agenda. This article explores the interrelationship between this announcement and efforts to boost the competitiveness of the United Kingdom's weather derivatives industry. Primary qualitative data are analyzed to produce a genealogical account of these policy developments, and Braman's concept of "informational power" is used to frame a critical narrative of the broader dynamics of power at play. We argue that although there have been significant tensions around efforts to open the United Kingdom's weather data, these have largely been absorbed by and, ultimately, contained within the hegemonic structures of the United Kingdom's neoliberal state. We conclude by arguing that this struggle needs to be broadened and externalized beyond the state so that critical questions about the deepening data-driven financialization of climate change can be addressed.

Keywords

weather derivatives, climate risk markets, open data, meteorological data, data policy, informational power

Introduction

Media are increasingly constituted by data: "binary elements (digits, symbols, electrical signals, magnetic patterns, etc.) processed and transmitted electronically by technologies such as computers and cellular phones" (Floridi 2008, 3). The binary nature of digital data enables them to be reused and put to work for different purposes in different places and contexts, often in unexpected ways. New patterns of data flow and

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reuse contribute to the emergence of what Jose van Dijck (2013) calls "the ecosystems of connectivity," through which social actors are becoming increasingly interconnected. Although van Dijck and others draw attention to these processes primarily in relation to social media data, many other types of data contribute to emergent forms of interconnectivity. Attention needs to be paid to some of these less-familiar data flows, examining where data flow and why and in whose interests data flows are being shaped and reshaped. This article aims to take this step, focusing specifically on efforts to make data flow for the climate risk market.

In November 2011, the U.K. government announced that the national meteorological organization would be releasing the largest volume of "open" weather data made available by any country (HM Government 2011a), meaning that vast amounts of data would be made publicly accessible and freely reusable by anyone. At one level, this announcement can be read as part of the successful rollout of the government's flagship Open Data agenda—a widely celebrated policy initiative that has cross-party support and which is part of a wider program of "open" initiatives, including mandated open access to research publications and data. However, the specific ways in which these "open" initiatives are being shaped has been critiqued, with a number of authors identifying a process of co-option of the commons-based principles and practices of many open initiatives by commercial interests (see, for example, Bates 2012 and Muellerleile, forthcoming). There are clearly a wide range of sociotechnical drivers behind efforts to open data (Bates 2014; Longo 2011; Martin 2014; Saxby 2011). It is therefore important to unpack the underlying power dynamics that are driving key decisions and developments in particular national contexts.

In the case of efforts to "open" the United Kingdom's meteorological data, closer inspection illustrates that the decision to open data was tied to a further policy narrative that centered around efforts to make meteorological data more readily exploitable by traders engaged in the climate risk market—a market that enables hedging against and speculation on climatic uncertainty. By opening meteorological data, it was argued, financial and administrative barriers experienced by traders and other commercial reusers of data would be reduced, and thus, the competitive position of the City of London in the global financial markets could be enhanced. In this article, we draw out this lesser-known narrative—analyzing key events, discourses, silences, relationships, and tensions—to illuminate some of the unexpected ways that data are being used and data policies are being shaped to better position data as a constitutive force in the accumulation of financial capital.

We draw upon empirical research conducted on two intersecting research projects: one on Open Government Data and the other on meteorological data infrastructures. Across the two projects, thirty-nine semi-structured interviews, textual analysis of key policy and industry documentation, and observations of relevant events and working practices were conducted. This combined body of research informs our understanding of the broader context that the developments discussed in this article are situated within. The core of our analysis draws upon a subsection of this empirical work and is based upon the following: (1) semi-structured interviews with key informants, including two senior representatives of a small firm that acts as an important data

intermediary in the climate risk industry (interview codes: DS1 and DS2) and three senior policy officials in central government departments (interview codes: GOV1 and GOV2) and the Met Office (interview code: MO2); (2) documentary resources, including a thorough review of relevant policy documentation and announcements on Open Data and Re-use of Public Sector Information, industry press releases and reports, and websites of relevant firms and organizations such as the Weather Risk Management Association (WRMA); and (3) observations of working practices in the data intermediary firm and Met Office. The specificity of the topic means that only a few individuals and organizations have been directly involved in these developments, and this subsection of interviewees is therefore small; however, among them are important and influential actors within this space. Of this subsection of interviews, all were conducted in 2014, apart from one interview conducted with a senior central government policy maker in 2011 (GOV2). Observations were undertaken in 2014. Documentary data collection and analysis was conducted on an ongoing basis between 2010 and 2015. These primary data were analyzed alongside secondary sources from the academic literature and industry press to develop a genealogical account—"a history of present" (Meadmore et al. 2010)—through examination of the related events, discourses, relations, and struggles behind the U.K. government's 2011 announcement (Carroll 2004, 228). The aim of this analysis is to shine a light on some of the established claims around opening the United Kingdom's meteorological data, and to develop a critical narrative of the politics and power playing out behind the scenes.

We begin the article by drawing upon a review of primary and secondary sources from the academic, media, and industry literatures to provide a detailed overview of developments in the climate risk industry over the last two decades. We then draw upon our analysis of the empirical data to examine in depth ongoing efforts in the United Kingdom to "open" the meteorological data that the climate risk industry is dependent upon prior to using Braman's (2006) concept of "informational power" as a lens through which to analyze the broader context and dynamics of power surrounding these developments. We argue that although there have been significant tensions around efforts to "open" the United Kingdom's weather data, these have largely been absorbed by and, ultimately, contained within the hegemonic structures of the United Kingdom's neoliberal state. We conclude by arguing that this struggle needs to be broadened and externalized beyond the state so that critical questions about the deepening data-driven financialization of climate change can be addressed.

Weather Derivatives and the Financial Markets

Weather derivatives are a type of climate risk product traded in the global financial markets. Key actors include businesses wanting to hedge against climate risk, reinsurance firms, institutional investors, and exchanges such as the Chicago Mercantile Exchange (CME). Since the mid-1990s, the United Kingdom economy has become increasingly dependent upon the wider financial sector (Berry 2013). This increased dominance of the sector is largely the result of the competitive "de-regulation" (Stiglitz 2012) and "re-regulation" (Major 2012) of financial markets by the U.S. and U.K.

governments since the 1980s: a process that contributed to the development of an "Anglo-liberal growth model" (Hay 2010) of a strong postindustrial service sector powered by a lightly regulated global financial center (i.e., the City of London) that was imagined by advocates as a "model for the future" (Jodal et al. 2012). These developments opened the way for a variety of innovations in financial products and services, led to significant growth in the sector's contribution to the United Kingdom's GDP, and, ultimately, contributed significantly to the financial crisis of 2008 (Berry 2013; Hay 2010). Despite the financial crash, the U.K. economy remains heavily dependent upon the finance sector (Berry 2013), and it is perceived that the power and influence of the City of London has strengthened postcrash (Berry 2013; Jodal et al. 2012). These observations draw attention to the continuing, potentially increasing, power of the financial sector within the United Kingdom. They also highlight the attention paid by U.K.-based advocates of this Anglo-liberal model of economic growth to how the City of London is competitively positioned, particularly in relation to the U.S. financial sector.

Weather derivatives are a relatively niche product traded within this wider financial sector. The products cover businesses for "moderate departures" from expected weather conditions as opposed to traditional indemnity insurance, which covers "large departures and catastrophes" (Dischel 2002, 8). Rather than insuring against a specific observable loss, payouts on these products are instead triggered when particular meteorological conditions, as written into contracts, are detected in vast indices of weather observation data.

Much of the primary market trading in weather derivatives occurs in the over-the-counter market, through which bespoke contracts are negotiated in private between buyers and sellers (Speedwell Weather, n.d.). Buyers typically are firms in sectors such as energy, agriculture, and construction, while sellers tend to be reinsurance firms such as Swiss Re. Although many buyers in the primary markets have traditionally been aiming to hedge against weather risks, a new class of speculative investor in weather risk has emerged postfinancial crash. In 2013, the largest source of new trades in the market was from hedge funds speculating on average monthly temperatures (Thind 2014). There is also a secondary market in weather derivatives that trades primarily through the CME (SCOR 2012). In this secondary market, primary market contracts are traded to manage risk.

The success of the weather derivative market over the last two decades has been mixed. Although the market saw significant growth in the mid-2000s, it suffered during the financial downturn and showed only slow signs of growth by 2011 (notional trading value of $11.8 billion; WRMA 2011). These figures, based upon surveys undertaken by PricewaterhouseCoopers on behalf of the WRMA, cover the period 2003 to 2011. No surveys have been published since 2011, and no up-to-date figures for the size of the market therefore exist. However, in 2011, the WRMA was hopeful for weather derivatives, pointing to continuing growth outside the U.S. markets throughout the downturn, growing interest in nontemperature-related weather derivatives, and increasing interest from outside the energy industry (WRMA 2011), and

more recent industry reports suggest that the market is beginning to expand (Thind 2014).

Making Data Flow for the Market

As financial products based on vast indices of weather observations, weather derivatives and similar products are dependent upon traders' access to meteorological data. During the early years of weather derivatives trading, the right to reuse without charge weather data produced by national meteorological agencies was a prominent discourse at industry events (DS1). Over recent years, focus on this issue has reduced; however, the ease with which market actors can access and reuse publicly funded meteorological data is still perceived to be a significant issue, and a lack of freely available data in some countries is perceived as a barrier to market growth (DS1). Although lack of data is a key issue in many countries, restrictions on commercial actors' access to and reuse of public meteorological data are perceived to be a significant problem in others. Although some countries, such as the United States, make their data freely accessible for commercial reuse, many others—including the United Kingdom—charge (DS1).

Although the climate risk market used to be largely dependent upon data from public meteorological organizations (Dischel and Barrieu 2002), in recent years, data intermediaries that supply the market have been capturing data from an increasingly diverse range of public, private, and amateur sources (DS1). However, despite this diversification of sources, data produced by national meteorological organizations are still perceived to be crucial due to their quality and the scope of their archives:

> The national met offices . . . will always be higher quality than other data sources . . . because they're posher instruments. (DS1)

> Our preference is to work with the national Met Service in any country . . . they are the most likely to have the longest records and hold the national archive, which is of huge importance to us . . . they should be adhering to WMO [World Meteorological Organization] standards. (DS2)

In the United Kingdom, the national meteorological organization—the Met Office—has functioned as a commercial Trading Fund since 1996, making it dependent upon the commercial exploitation of its meteorological data and services. Although a substantial proportion of Met Office income comes from its contract with the U.K. government for provision of the Public Weather Service, as a Trading Fund, it must also exploit its data more widely, including through levying charges for commercial reuse.

Those advocating for the development of weather derivative markets have challenged this commercialization of meteorological data for a number of years (see Randalls 2006 for a previous empirical study of this issue in the United Kingdom). They have called for Met Office data to be made available at marginal cost so that data intermediary firms and traders in the sector can freely access and reuse it. It is argued that such measures would enable U.K. and other European markets to compete more

effectively with the U.S. markets where data are openly available free of charge. In an article frequently cited in support of such arguments, Weiss (2002) calculated that restricted access to European meteorological data had resulted in a weather risk management industry 13.5 times smaller than the nascent U.S. industry, which by 2002 had built up US$9.7 billion of contract value in more than five years.

Convincing the Policy Makers

One organization that has been engaged in advocating for open meteorological data on behalf of the weather derivatives industry is the WRMA. Although one market actor perceived the WRMA to be a mere "talking shop" (DS1), attendees of the 2002 and 2003 WRMA conferences included powerful and significant players within the global economy: CME, Goldman Sachs, Ernst & Young, Citigroup, PricewaterhouseCoopers, JP Morgan, Entergy-Koch Trading, reinsurance companies including Swiss Re and AXA Re, energy companies including BP Energy and Centrica, risk modelers such as Risk Management Solutions, and data suppliers to the weather markets such as Speedwell Weather Derivatives (WRMA 2007).

Between them, these organizations have had significant influence on U.K. policy makers' beliefs about how reuse of meteorological data should be governed. For example, the WRMA, some of the conference attendees named above, and other powerful actors in the United Kingdom's financial sector such as the Lighthill Risk Network—a network cofounded by key players in the reinsurance industry including Aon Benfield and Lloyd's of London—are cited, along with Weiss (2002), in a 2008 policy document that calls for industry demands for "freer access to UK and other European weather data" to be taken into account by the U.K. government (Department for Business, Enterprise and Regulatory Reform 2008, 52).

Similar arguments are also made in commissioned policy research. The "Models of Public Sector Information Provision via Trading Funds" report (aka "the Cambridge Study"; Newbery et al. 2008), commissioned from economists at Cambridge University by the Department for Business, Innovation and Skills and HM Treasury, presents an analysis of the optimal charging policy for "unrefined" public data. Echoing arguments made in previous reports about the monopoly position Trading Funds such as the Met Office had acquired in the information market (e.g., Office of Fair Trading 2006), Newbery et al. (2008, 109) conclude that Trading Funds "enjoy a near-monopoly . . . a monopoly furthermore made possible or strengthened by government activity." Furthermore, they argue that it would be economically advantageous to have a marginal cost pricing model for "unrefined" core public data such as meteorological data. The report draws upon Weiss (2002) to demonstrate some of the benefits of such a move, arguing that growth of the weather derivatives industry is one potential economic benefit of marginal cost meteorological data.

Interestingly, one of the authors of the Cambridge Study, Rufus Pollock, is a key Open Data advocate in the United Kingdom and cofounder and president of the international nonprofit network Open Knowledge (formerly Open Knowledge Foundation). As the United Kingdom's civil society Open Government Data initiative grew in strength from

around 2008, the Open Knowledge Foundation and other Open Data groups around the United Kingdom were also responsible for increasing the pressure on policy makers to question the Trading Fund model of commercialization of core public data, and in 2010, Pollock was invited to join the new coalition government's Transparency Board to advise on Open Data policy. During this period, as the Open Data campaign grew in strength, it became clear that the language of "Open Data" was being adopted and becoming increasingly influential within key parts of central government. The language of "Open Data" is readily observable in policy documentation and in all our interviews with policy makers—with one claiming to "go with the Pollock line" on the issue of Open Data (GOV2). However, not all civil servants were in favor, and there was perceived to be a tension between Open Data advocates based in the Cabinet Office and parts of the Department for Business, Innovation and Skills, and the "old school" in HM Treasury and the Shareholder Executive that favored managing public data as a commercial asset to be exploited by the state (GOV2).

What is observable in these early developments is an increasing awareness within central government that the deep commercialization of the national core data infrastructure that was a key component of the first two decades of neoliberalization of the U.K. state had created a monopoly position for the Trading Funds in the information market, which was not necessarily in the best interests of competition and growth. During the early years (1980s) of the United Kingdom's neoliberal state, under the broader framework of the "Rayner Doctrine," public institutions were actively encouraged by the government only to produce data to satisfy the needs of the state, and it was mandated that if nonstate organizations needed these data, they would have to pay for it (Blakemore and Craglia 2006, 18). Essentially, this approach positioned the state as a self-interested, albeit heavily restricted, actor in the information market. This policy shifted in the 1990s, when it was acknowledged that the neoliberal state also had a role in producing data for business and the wider public, and that this presented a significant commercial opportunity for public bodies such as the Met Office (Blakemore and Craglia 2006): a shift that led to the deepening commercialization of core parts of the United Kingdom's public data infrastructure through the Trading Fund model of governance. Over the last decade, however, thinking on core infrastructural data has shifted again, with many key policy makers, advisors, and politicians now arguing that such data should be "open," and treated as an economic resource that can be freely exploited by market actors to generate economic activity and growth (e.g., Deloitte 2013; Newbery et al. 2008; Shakespeare 2013). This shift and tension in center-right thinking is neatly expressed by one market actor:

> I mean I think, I'm essentially a Thatcherite [but] . . . provision of meteorological data in a nation is an infrastructure good . . . so therefore it's a public good and should stay in the public . . . So how do you avoid [creating] the antithesis of a public good? You make it free. So it's actually, I suppose in spirit it's extremely socialist isn't it? . . . The very first thing they should do is to stop tolls on bridges. And if they get that then Open Data will come. (DS1)

Here, we can observe the co-option of the "socialist" notion of a public good (i.e., the commons, welfare, etc.) into a "Thatcherite" vision of state provision of key infrastructural resources demanded by market actors: a vision that avoids any consideration

of the broader notion of the public or common good or whose interests are advanced when decisions are made regarding priorities and criteria for opening public sector data.

The Decision to Open the Data

Following on from early interventions by policy makers and advisers, meteorological data became "one of the early priorities" (GOV1) of the United Kingdom's Open Government Data agenda, initially in the last year or so of the Labour Government (1997–2010) and then during the early years of the coalition government (2010–2015) when Open Data became a flagship policy as part of the new Transparency and Open Government Data agenda. In the Autumn Statement of 2011, the policy developments around "opening" Met Office data came to a head with the announcement by Chancellor of the Exchequer, George Osborne, that the U.K. government was opening "the largest volume of high quality weather data and information made available by a national meteorological organisation anywhere in the world" for anyone to reuse without charge (HM Government 2011a, 10).

According to senior policy makers interviewed in 2011 and 2014, it was anticipated by them that these proposals would contribute to the development of a national data infrastructure that would make the U.K. weather risk markets more competitive with the U.S.-based markets (GOV2, GOV1): a discourse that fits within the broader competitive drive that shaped developments in transatlantic regulation of the financial sector in the preceding decades.

> The commercial side, you know the classic Peter Weiss analysis from about ten years ago on the weather markets in Europe against the weather markets in the U.S. . . . It also showed things like weather derivatives . . . Which was very much larger in the U.S. than in the U.K., and the Weiss figures for weather derivatives were a snapshot, in fact they've grown to a much more significant figure in the U.S. (GOV1)

A similar emphasis on supporting the growth of the climate risk market is also observable within key Open Data policy documentation and a speech made by senior Conservative politician and Open Data advocate Francis Maude, who at the time was Minster for the Cabinet Office:

> The role of this public data in supporting a rapidly growing weather risk management industry underwriting financial risk management instruments, valued at approximately $8 billion. (HM Government 2011b, 53)

> The opportunities for enterprise won't always be obvious. For example when some years ago the US released its public weather service one surprise result was a boost to the insurance industry. The data helped farmers to protect their profits leading to dramatic improvements in agricultural productivity. Today the weather derivatives market in the US alone is worth $3.5billion—that's all powered by Big Data. (Maude 2012)

Although much of the popular discourse around Open Data has tended to emphasize its benefits for democratic reform and easing reuse of public data by small and medium-sized enterprises (Bates 2012), it is clear that influential sections of the U.K. government including senior politicians and policy makers perceived that the Open Data agenda could also be used to push for the "opening" of Met Office data with the aim of promoting the growth of the climate risk industry.

The Met Office Responds

The Met Office has found adapting to this new Open Data landscape challenging, and some policy makers have complained about the Met Office being "resistant" (GOV1) to opening data, particularly historical data, which is of significant value to the climate risk industry. This perceived "resistance" is not connected to the relationship between open weather data and the growth of climate risk markets. In fact, over the years, the Met Office has been engaged directly within the weather derivatives industry in different ways. In 2001, for example, the Met Office established a data intermediary company called weatherXchange in partnership with the financial broker Umbrella Brokers to supply data to the weather derivatives market. The venture failed in part because the Met Office, on realizing the revenue to be generated through the sale of data to this market, began to compete with and "deliberately undercut" weatherXchange (Randalls 2010, 706). Eventually, the data part of the weatherXchange business was sold to Speedwell Weather Derivatives, which is now a key data intermediary in the climate risk market.

The challenges faced by the Met Office in adopting an Open Data policy are primarily based upon the government-mandated Trading Fund model under which it operates as well as the complexity of the data that it generates, manages, and processes. As one Met Office participant described, the organization felt somewhat threatened by the new Open Data landscape:

> So we wouldn't have chosen to have made data openly available specifically had it not been for the government's drive for Open Data and the way that that was going . . . We realised that as a Trading Fund that causes us issues because if we provide the data for free then it's very difficult to . . . not only sell the data, but also it means that you're opening up a huge amount of competition, they're getting the data for free . . . And because of the way the organisation is set up we're not as agile as we would like to be in some cases, and certainly not on the commercial side. (MO2)

Despite these challenges and concerns, the Met Office has made significant amounts of data open.

> So our Open Data is the data that's on our website. So that is our weather forecast data . . . some climate data as well, so we have things like the anomalies and averages . . . So that was agreed with the Cabinet Office . . . we needed to somehow scope and we said "Well, if it's on our website and people are using it, then that would seem like a reasonable kind of boundary of what is Open Data." (MO2)

It has also developed the DataPoint application programming interface (API), which enables free access to real-time Open Data; however, restrictions on the number of data requests that can be made via the API makes it less useful for firms with a high demand for data such as data intermediaries in the climate risk industry.

> I think I have come across that [DataPoint API], but that's not something we use, no. Okay, so if that were to be broadened . . . . (DS1)

A further area of contention with some policy makers has been around the opening of the Met Office's historic data. As mentioned above, access to archives of meteorological data is vital for the weather risk industry—one participant deemed "access to the national archive" the "primary" reason that data intermediaries prefer working with national meteorological organizations (DS2). Currently, historic data are not Open Data and are only available for commercial reuse through the Met Office's commercial team (MO2). That the Met Office's historical data remain a commercial product has been met with frustration by both market actors and policy makers advocating for the weather risk industry:

> I don't think they've implemented in spirit or probably in letter what ministers agreed and announced they would do . . . Historical data – they've dragged on—but they've definitely digitised—it has proved in other countries to be enormous value . . . So, for instance Climate Corp in the U.S. (GOV1)

Despite these barriers to opening data, the pressure for open meteorological data in the United Kingdom continues. New European Union (EU) Re-Use of Public Sector Information regulations aim to further enforce the marginal cost pricing model for public data across the EU, and although there are still exemptions in these regulations for Trading Funds, the economic opportunities of Open Data are increasingly accepted by policy makers and politicians. The Met Office has also become a partner of the Open Data Institute's membership program in a bid to drive forward its Open Data activity. However, the need to invest significantly in the management of some data remains a significant barrier to widening the scope of the Met Office's Open Data policy, particularly given the organization perceives no "customer demand" for such investment (HM Government 2014). Although over the last decade there have been significant steps toward meeting the weather risk industry's demand for open meteorological data and the momentum currently continues in that direction, the struggle is therefore still ongoing.

Data Power and the Climate Risk Market

In her analysis of the development of the "informational state," Sandra Braman (2006) observes a deepening form of "informational power" emerging in the 1970s and 1980s. Although traditional analyses of power have tended to emphasize its instrumental, structural, and symbolic forms, Braman (2006, 26–27) argues that over recent decades,

processes of information intensification have led to a fourth form—"informational power"—becoming more central to the working of contemporary power relations. Illustrating her argument with reference to Smart Weapons, Internet surveillance, personalized web services, social profiling, and manipulation of public opinion, this "informational" form of power, she argues, interacts with other forms of power by "manipulating" their "informational bases." Similar processes are also identified by Harvey (2007, 3) when he observes the necessity for the development of "technologies of information creation and capacities to accumulate, store, transfer, analyse, and use massive databases to guide decisions in the global marketplace" in the practice of realizing neoliberal ideas.

As Braman (2006, 27) argues, the relations between instrumental, structural, symbolic, and informational forms of power are "multiple . . . usually interdependent . . . and may be cumulative." In the struggles to open the United Kingdom's meteorological data, the above discussion evidences a complex interplay of powers aiming to shape the informational base, in this case, the public data infrastructure, to open data so that they are more conducive to global finance's ability to exercise power through exploitation of systemic uncertainty in the global climate. Efforts to open the United Kingdom's meteorological data have been driven by the exercising of both symbolic and structural forms of power that are intersecting to reshape the informational base.

Although the unfolding of social relations over time means that an isolated starting point for these developments cannot be readily identified, for the purpose of constructing a narrative about the underlying power relations, one place to begin is the increasing political power of financial capital in the United Kingdom as the government deepened its process of competitive deregulation with the United States in the 1990s. As Jodal et al. (2012) argue, the narrative constructed by financial elites and their political allies about the role of the finance sector in creating a prosperous postindustrial economy was largely ideological. However, what was "striking" about these developments was the combination of structural and symbolic forces that allowed an emergent financial elite to "convert economic muscle into influence over policy" during the 1990s and early 2000s through professionalization of their lobbying activities and the construction of strong relationships with political actors, particularly in the major political parties. These developments, Jodal et al. (2012) conclude, produced a "new, formidable politics of the City," barely vulnerable even in the face of the 2007–2008 financial crisis and its aftermath.

Yet despite this "formidable" political power of the City of London, the rather obscure demand of the weather risk industry for marginal cost reuse of the United Kingdom's meteorological data was, at first, relatively unheard in policy circles. As the demand percolated slowly from industry to policy makers in the 2000s, advocates of the weather derivatives industry were able to take advantage of a further symbolic force emerging in the United Kingdom in the mid-2000s: the growing demand for Open Data. Although the call for "Open Data" emerged initially as a civil society initiative aimed at the development of a more democratic and accessible data infrastructure, the concept was soon adopted by powerful political and commercial actors who had been lobbying for free commercial reuse of the United Kingdom's public data for

a number of years (Bates 2014). The empirical data suggest that the interweaving of these two narratives about the role of the finance sector and the benefits of Open Data in the minds of key political actors led to a growing demand inside the state for structural changes aimed at opening the United Kingdom's meteorological data to bolster the weather derivatives industry. As explored above, however, these efforts to open meteorological data have faced challenges as a result of the Trading Fund model instituted as part of the previous shift in center-right thinking about the economics of public data in the 1990s.

The resulting tensions around opening meteorological data have largely been about the impact on the Met Office as a commercial Trading Fund if it opens data that it currently extracts revenue from and whether significant investments should be made to open data for which there is no widespread demand. What is interesting and important to observe is that this tension around opening the United Kingdom's meteorological data has not been about whether the government should be opening publicly funded meteorological data so that it can be more readily exploited by the climate risk industry. Rather, the tension relates to a shift in center-right thinking and policy regarding how to treat public meteorological data as an economic resource: a shift that has been influenced by demands from both the financial sector and civil society Open Data advocates.

Thus far, the struggle to open the United Kingdom's meteorological data has therefore been largely contained within the hegemonic framework of the United Kingdom's neoliberal state and the demands of the wider Open Data movement. Significantly, the arguably bigger question of whether part of the public data infrastructure should be restructured to enhance the competitive position of the United Kingdom's financial sector in the weather derivative markets has not been addressed. Indeed, although others have questioned the efficacy of financialization as a means of addressing climate-related risk (Cooper 2010; Fuchs and Wolff 2011; Isakson 2015; Randalls 2013), significant questions still remain unanswered about the material impacts of weather derivatives markets, particularly in relation to their potential to disincentivize economically powerful actors' engagement in climate change mitigation activity and the socioeconomic implications of empowering financial elites' efforts to exploit deepening climate uncertainty.

Conclusion

The genealogy presented above demonstrates some of the complex dynamics of power and influence in the ongoing efforts to open the United Kingdom's meteorological data. As Braman (2006, 7) argues, it can be illuminating to "look where the light don't shine" to get a better appreciation for the influence of data policy on broader societal developments. It would be problematic to argue that increased access and rights to reuse weather data are something to be resisted—data are, after all, also necessary for those seeking to establish sustainable, democratic, and ecologically sound political economies. However, the United Kingdom's Open Data agenda, working under the neoliberal assumption that all economic growth is socially beneficial, aims primarily

to set market forces to work on public data. This assumption needs complicating. Open data policies are a key means for reducing barriers to data flow and thus contribute directly to the development of emergent "ecosystems of connectivity" that bring social actors into new forms of relation with one another. The above research demonstrates that closer attention needs to be paid to how Open Data are being used in different contexts, in whose interests data flows are being shaped and reshaped, and, ultimately, how opening data enhances its role as a constitutive force in the development of social relations.

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