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Connecting financialization and urbanization: the changing financial ecology of urban infrastructure in the UK

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ABSTRACT

This paper discusses a conceptual model for critically engaging with the effects of financialization on contemporary cities. The current state of theory on financialization in the urban context focuses foremost on the real estate sector activities, regulatory frameworks and governance structures that enable urban financialization. The paper addresses the calls for a closer examination of the spatial patterns that emerge from these practices. By combining financial ecologies as an analytical tool with infrastructure as a perspective, it provides a conceptual model in order to understand the impacts of financialization on cities. The paper discusses the conceptual model in the context of the introduction of the UK Municipal Bonds Agency. It concludes by outlining some of the spatial effects of the UK's changing financial ecology of urban infrastructure.

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INTRODUCTION

In the aftermath of the 2008 financial crisis, the impacts of financial practices on urban development became all the more apparent. In an ongoing liberalization of markets and policies since the 1980s, finance has continually accumulated power, influence and economic significance, outpacing all other economic sectors and establishing itself as the backbone of the globalized economy (cf. Epstein, 2005). This financialized economy affects the urban on multiple levels, most powerfully though via the different forms of investment in the urban fabric itself. Where do these investments flow, and where not? What are the roles of different investment vehicles in shaping spatial patterns? How do these abstract financial practices translate into different experiences of the city? These are all central questions for exploring the effects of financialization on contemporary cities.

These questions become particularly significant when we examine infrastructures, as they are the key link between global finance and the rapidly urbanizing planet. Infrastructures not only enable but also constrain; they divide where they do not connect; and lock in long-term path

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dependencies. They are the structures upon which current forms of social organization and interaction rest (Angelo & Calhoun, 2013). The examination of infrastructures in relation to financialization allows one to link complex global practices to the local, and to begin a conversation between theories, focusing on processes at an abstract global scale and their effects on the particular. This paper presents a conceptual model that links these discourses, thereby enabling a more thorough and nuanced understanding of the impacts of financialization on contemporary cities. Current debates around the financialization of cities focus foremost on the real estate sector, regulatory frameworks and governance structures that enable this process. Thus, this paper provides two main contributions to the literature: first, it adds to the discourse on financialization of cities by introducing the concept of financial ecologies as an analytical tool for addressing the calls for a closer examination of the spatial patterns of financialization (cf. French, Leyshon, & Wainwright, 2011); and second, it contributes to the discourse on infrastructure by applying the financial ecology concept to the infrastructure sector, establishing a clearer understanding of how it is affected by financialization. The topic of financialization has only recently entered the discourse on infrastructure and still faces many open questions (cf. Loftus & March, 2019; O'Neill, 2018). By using financial ecologies as a tool and infrastructure as a perspective, we can develop a more nuanced understanding of the spatial impacts of financialization on cities.

The paper is structured as follows. The next section overviews the recent work on financialization in the urban context, which will be used as the basis from which to extend the reach of these approaches by means of infrastructure theory, which is summarized in the third section. The fourth section discusses the concept of ecologies as an analytical tool for integrating financialization and infrastructure theory. The concluding section discusses how this conceptual model can be put to practice in the context of infrastructure provision in the UK.

FINANCIALIZATION OF THE URBAN

Historically, the fates of cities and their relationships with the financial practices of their time have posed many interesting points of departure. From the relationship of Italian city-states with their wealthy trading families to the American gold rush economy and the role of banks in translating this wealth into cities, finance in its early forms had significant influence on what these cities look like today. In more recent times, the question of how financial practices influence our cities has been somewhat overlooked in favour of more general debates about the impacts of capitalism on urban development (cf. Harvey, 1989). As Brett Christophers rightly observes (Christophers, 2010), much of Harvey's farsighted deliberation was only later given the label of financialization, the current understanding of which mostly derives from the work of authors such as Giovanni Arrighi and Kevin Phillips (Arrighi, 1994; Phillips, 1994). The emergence of the term 'financialization', however, reclaims the particular issue to examine the impacts of contemporary financial practices on urbanization.

Financialization in itself is most commonly described as 'the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of domestic and international economies' (Epstein, 2005, p. 3). Rutland (2010) expands on this and outlines four different approaches to financialization in the current literature: (1) the increasing significance of financial institutions and financial activities; (2) a certain mode of corporate governance that emphasizes shareholder value; (3) a shift in corporate dependence from bank-based capital to market-based capital; and (4) the new role of finance, empowered by its innovations in the neoliberal era. This basic notion of financialization has been expanded and complicated in recent years within the geographical literature, particularly where research on urban questions has exposed the multiple levels and areas on which financialization has had profound impacts. The literature on the financialization of the urban investigates a wide array of issues, roughly delineated as research into institutional and political change, social change, cultural practices, and

environmental impacts. Note that much of this debate is still focused on the Global North, with some notable exceptions (e.g., Chattopadhyay, 2012; Halbert & Rouanet, 2014).

The first of these categories is the most prominent among current contributions. Institutional change is detailed exemplarily in recent work on the role of local governments in preparing the ground for financialized urban development (Ashton, Doussard, & Weber, 2014; Weber, 2010), while the same authors outline the significance of financial engineering for externalizing market risk to cities (Ashton, Doussard, & Weber, 2012). Allen and Pryke (2013) outline the effects of these practices on the political process, and how ring-fencing depoliticizes critical urban issues. O'Neill (2013) emphasizes the role of the state as a guarantor of property rights when financialization of infrastructure is to occur. The real estate sector appears particularly prone to the inroads of financialization, as evidenced by the subprime loan meltdown of 2007–08 (Gotham, 2009). The emergence and diffusion of increasing financial innovations, such as real estate investment trusts (REIT), collateralized debt obligations (CDO), collateralized mortgage obligations (CMO), tax increment financing (TIF) and municipal bonds emphasizes the need to create 'liquidity out of spatial fixity' not only in the real estate sector (Gotham, 2009, p. 357); and shows how this changes the playing field for urban development per se (Clark, Larsen, & Hansen, 2015; Harvey, 2010; Leyshon & Thrift, 2007).

The category of social change mostly elaborates on the changing real estate market and how this affects the social fabric of the city. Much of the research on gentrification draws on political economy perspectives, but largely overlooks financialization as a frame of reference, although Slater's (2017) work on planetary rent gaps is a notable exception. The logic and consequences of investment shifting from 'use value' to 'exchange value' -based decisions are portrayed by Sayer (2012). Wyly et al. extensively explore the connection between exclusion, subprime lending practices and class-monopoly rent in US cities (Wyly, Moos, Foxcroft, & Kabahizi, 2008; Wyly, Moos, & Hammel, 2012; Wyly, Moos, Hammel, & Kabahizi, 2009). Other work emphasizes the impacts of financialization on everyday life (French & Kneale, 2009; Martin, 2002), while Bojadzijev (2015) focuses on housing struggles, migration and their connections to financialization in the context of Berlin. In sum, this literature makes an important contribution towards understanding the social impacts of financialization, while at the same time exposing the real estate sector as the singular vehicle for the analysis of these impacts. Thus, it points towards the analysis of an as-yet-overlooked entry points of financialization into the urban.

Research on changing cultural practices mostly emphasizes the emergence of a shareholder-value maximization credo (Froud, Haslam, Johal, & Williams, 2000; Pike, 2006), and the resulting eternal reshuffling of asset ownership that divides those in the know from those who fail to conceive of the significance of the mechanisms that are black-boxed in modern finance (Eturk, Froud, Johal, Leaver, & Williams, 2007). This pushes to the fore questions regarding the transparency of these practices (Clark & O'Connor, 1997), where local cultural evaluation and determination of risk in the process of anchoring global financial capital becomes of central significance (Halbert & Rouanet, 2014).

Many environmental debates on financialization and urbanization settle around questions of sustainability and climate change (Sullivan, 2013). Christian Limbach (2013) outlines the potential of climate bonds for a sustainability transition in German energy supply, while 'green finance' emerges as a lucrative investment vehicle in the latest financial innovations around the bundling of energy-efficient housing within green investment products (BerlinHyp, 2016; Zademach, 2015).

As other reviewers on the discourse of financialization have noted (Clark et al., 2015; French et al., 2011; Leyshon & Thrift, 2007; Rutland, 2010), the current focus is predominantly on the institutional frameworks that enable financialization, and their relationships with the real estate sector. In terms of spatial scales, the national level, the corporation and the household/individual predominate (French et al., 2011). Consequently, if our main interest lies in the spatial effects of

financialization on the urban, we conclude that it remains underexposed, therefore justifying a more holistic debate on the spatial impacts of these practices beyond real estate. French et al. (2011). conclude that 'space and place are accorded only a passive role in many accounts of financialization, so that geography is implicitly subordinated either to the status of mere empirical surface, or that of abstract spatial container of socio-economic relations' (p. 17).

FROM BUILT ENVIRONMENT TO INFRASTRUCTURE

As we learned above, the spatial dimension of financialization has as yet many blind spots. To elucidate these issues, we must develop theoretical tools that allow the bridging of scales, namely the connection of complex global financial practices and their translation into spatial urban patterns and experiences. A common denominator when discussing the way in which global financial capital becomes anchored in the city – and thus an embodiment of financialization – is the term 'built environment'. This section explores the shortcomings of this term as a spatial concept, and how an alternative concept, namely that of infrastructure, might be able to expose the spatial impacts of financialization more thoroughly.

In this context, the term 'built environment' becomes prominent through David Harvey's conceptualization of a 'vast, humanly created resource system, comprising use values embedded in the physical landscape which can be utilized for production, exchange and consumption' (Harvey, 2006, p. 233). Clark et al. (2015) expand on this conception of built environment and explicate its changing significance – from secure, long-term investment haven to full exposure to volatile market practices. Yet here, as in most other cases, the conceptualization of built environment remains merely an empirical surface, which French et al. (2011) aim to challenge. Even Harvey (2006) continues to complicate the notion of built environment, expanding on the networked nature of the concept:

> but since the usefulness of individual elements depends, to large degree, upon the usefulness of surrounding elements, complex patterns of depreciation and appreciation (with ramifications for value relations) are set in motion by individual acts of renewal, replacement or transformation. The spillover effects of individual investment decisions are localized in space. Similarly, disinvestment in one part of the built environment is likely to depreciate surrounding property values. (p. 234)

Even if this expands on what we conceive of as built environments and their importance for a city, it still fails to address other dimensions of impact besides investment valuation. It is here that the shortcomings of the concept become most apparent, and where a different conceptualization – of how financial capital becomes anchored in space – proves useful. Recent developments in sociology and geography focus on the concept of infrastructure as a vehicle for connecting spatial dynamics with complex processes. We contend that this particular approach proves especially useful in the context of financialization.

According to Matthew Gandy, 'the term infrastructure has been used since the 1920s to refer to the basic physical and organizational structures such as roads, power lines, and water mains needed for the material and organizational aspects of modernity' (Gandy, 2011, p. 58). Studies associated with infrastructure cover a wide area, from engineering aspects of creation and maintenance to governance and administrative challenges such as planning and legitimization. More recent studies in sociology and geography expand the use of the term to explore the wider impacts of the underlying material structure of modern societies. This includes exploration of both vertical and horizontal spatial dimensions, questions of accessibility and visibility, spatial fragmentation, disruption, as well as non-material infrastructures (Gandy, 2011).

Within sociology, the term 'infrastructure' is most closely associated with science and technology studies (STS), most prominently in the work of Susan Leigh Star and Karen Ruhleder

(Star, 1999; Star & Ruhleder, 1994, 1995). Hillary Angelo and Craig Calhoun aim to steer away from the technology-centred definition used in STS and extend it to the material structures underpinning modern societies. For them, infrastructure is an enabling condition that is 'material, durable, multifunctional and powerfully shaping' (Angelo & Calhoun, 2013, p. 3). They also expand on the infrastructural dimensions introduced by Star, as follows, contending that infrastructure: '(1) lays out paths and pathways for what does and doesn't happen; (2) is investment and endowment; (3) enables and constrains; (4) makes habits; (5) mediates; (6) makes patterns; and (7) is asset and vulnerability' (p. 1).

This definition integrates well with the wealth of recent developments in urban geography, in which many researchers began to embrace an infrastructural perspective on current urban issues (cf. Gandy, 2011; Graham, 2010; Graham & Macfarlane, 2015; Heynen, Kaika, & Swyngedouw, 2006; McFarlane, 2008; Monstadt, 2009; Simone, 2004). Note that much of this debate emanates directly from the longstanding discourse on splintering urbanism within the field (cf. Coutard, 2008; Graham & Marvin, 2002). Their work exposes how such structures shape and dominate our cities on a multitude of spatial dimensions, and explores issues such as disruptions and their repercussions (Graham, 2010), sites of contestation and repurposing of infrastructures from their originally intended uses (Chattopadhyay, 2012), our own metabolic dependencies in relation to urban space (Heynen et al., 2006; McFarlane, 2008), and the pacing and channelling of urban rhythms and everyday experiences (Graham & McFarlane, 2015; Graham & Thrift, 2007).

Another valuable insight of these efforts is in identifying differing political implications of infrastructures in the Global North and South. The literature discusses several issues in this regard: infrastructure in the North appears largely invisible and black-boxed, and obscures the ever larger scales of social organization (cf. Graham, 2010), whereas in the Global South, it is often a constant subject of contestation (cf. Coutard & Rutherford, 2015; Shamir, 2013), blurring the lines between public and private (cf. McFarlane, 2008), and identifying the imaginaries that superimpose Western notions of infrastructure provision that cease to work under globalization in contemporary megacities (cf. Bakker, 2013; Gandy, 2008).

In step with these developments in urban geography is an increasing use of the concept of assemblage both as descriptive tool and as a foundation for theory creation in a Deleuzian and Guattarian sense (Latour, 1993; McFarlane, 2011; Sassen, 2006; Shamir, 2013). This development is widely debated in both Anglophone and continental urban geography, and reflects the tensions between current research trends on the micro- and meso-scales and the political economy approaches at the macro-scale (Brenner, Madden, & Wachsmuth, 2011; Färber, 2014; McFarlane, 2011; Robinson, 2011; Simone, 2011). As important and relevant as that discussion is, this paper will eschew the term and its ambiguities in favour of the concept presented below.

While some authors expand their understanding of infrastructure beyond the material into the body and political structures (cf. McFarlane & Rutherford, 2008; Simone, 2004), we will remain with the material dimension because it is most directly related to the concept of built environment that we wish to expand upon. If we are to return to how financialization engages with infrastructural issues, we must conclude that the concept of infrastructure is as yet somewhat undertheorized. Efforts have been made by O'Neill (2013) to rectify this situation, because he identifies infrastructure as its own category, with particular properties that differ markedly from other subjects of financialization processes. More recently O'Neill (2018) outlined how the underlying flows occurring within urban infrastructures are central to their successful financialization. He emphasizes three dimensions through which this process is mediated: capital structure, organizational structure and regulatory structure. Ahlers and Merme (2016) detail the changing dynamics in the water infrastructure sector under financialization writ large and warn of the long-term consequences of interest-driven, undemocratic processes that are increasingly implemented.

In order to develop a fixed understanding of infrastructures as a subject of financialization, we consider them as the material structures upon which current forms of social organization and interaction rest; and as being characterized by the following dimensions: (1) Infrastructures both enable and constrain; they make certain connections and patterns possible, whereas they divide and separate in other places. (2) Furthermore, they establish path dependencies by committing inert resources to particular tracks of development. (3) They also act as mediators by facilitating how we interact with our external environment and each other. (4) They are both investment and endowment as they represent sunk costs and a fertile environment of opportunities. (5) Infrastructures are also assets and vulnerabilities because they allow for ever more complex forms of social organization, while also creating exposure to disruptions and standstill. (6) Finally, they create and maintain habits by establishing and reinforcing patterns of daily practices and processes (Angelo & Calhoun, 2013; Monstadt, 2009; Star, 1999). These dimensions are, of course, not exhaustive, but they represent a perspective on how an infrastructural lens might allow one to cut across scales; how we could connect concepts such as Harvey's spatial fix to the formation of specific material structures and examine their impacts on urban societies; and how, in turn, these societies shape their infrastructures reciprocally (Harvey, 2006). Infrastructure is thus crucial for exploring the ever-changing nature of cities, and it establishes the opportunity to contribute in a meaningful way to understanding cities under financialization. The following section will explore how we can connect urban infrastructures with the changing financial practices that shape them.

FINANCIAL ECOLOGIES OF URBAN INFRASTRUCTURE

Building on the theoretical concept developed in the previous section, we will elaborate on how infrastructure acts as a conduit between cities and financialization. Both Kathryn Furlong and Jochen Monstadt draw on the theoretical developments in STS and urban geography in a similar vein, and show how the approach to infrastructures can help understand the reciprocal relationship between contemporary urbanization and its underlying material structures (Furlong, 2011; Monstadt, 2009). Furlong argues for the increasing malleability of what we perceive of as fixed, black-boxed infrastructure, and how this development affects existing socio-technological and socio-environmental relationships. Monstadt argues in the same vein, and elaborates how, if taken separately, the current state of theory development is insufficient to overcome the challenges of ensuring more sustainable development of urban infrastructure. Nonetheless, in combining the discourses, Monstadt derives a convincing conceptualization of a political ecology of networked urban infrastructures by outlining two avenues of inquest for empirical projects. First, the study of urban infrastructure regimes, which focuses on 'stable urban configurations of institutions, techniques, and artifacts' (Monstadt, 2009, p. 1937); and second, the study of the governance of urban infrastructure, which concentrates on how we 'develop, govern and renew our networked urban infrastructures' (p. 1938). His concept of relating the study of infrastructures to the urban proves especially useful not only in the context of answering environmental questions but also when examining the impacts of financialization on urban infrastructure and its inherent sustainability. Monstadt's approach also directly relates to the concept of financial ecologies, advocated by French et al. (2011) to help refocus the analysis of financialization on its spatial implications.

Note that, in both cases, 'ecology' refers to Andrew Abbott's use of the term, where he contends, that "'Ecology" […] names a social structure that is less unified than a machine or an organism, but that is considerably more unified than is a social world made up of the autonomous, atomic beings of classical liberalism' (Abbott, 2005, p. 248). In particular, the concept of ecology involves 'three components: actors, locations, and a relation associating the one with the other' (p. 248). In any city of sufficient size, we find a political ecology, composed of

local politicians; their parties, political clubs and networks; the local parliament, municipal administration, etc. The concept of ecologies routes back to the studies by the Chicago School, on urban phenomena (cf. Park, Burgess, & McKenzie, 1925). The concept has also been adopted within STS, where Star and Ruhleder (1995) and Nardi and O'Day (1999) discuss the role of ecologies vis-à-vis traditional systemic approaches. Within the realm of urban studies, the term is often associated with the concept of political ecologies as a means to analyse socioecological relations (Swyngedouw & Heynen, 2003).

For Abbott, ecologies interact in a system, therefore he speaks of 'linked ecologies' (Abbott, 2005, p. 248). In combination with the concept of ecology, Abbott introduces two mechanisms or forms of interlinkages between ecologies: 'hinges', referring to a strategy that provides 'results to allies' in a linked ecology (p. 255), and works in more than one ecology; and 'avatars', meaning a 'copy or colony' of actors from one ecology within another one (p. 245, abstract).

French et al. (2011), with explicit reference to Abbott (2005) and Nardi and O'Day (1999), define financial ecology as components of an overarching system.

> The financial ecology approach, therefore, argues that like all systems the financial system is made up of smaller, constitutive ecologies. These consist of certain arrangements that emerge and that are more or less reproduceable over time. These processes unfold across space and evolve in relation to geographical difference so that distinctive ecologies of financial knowledge, practices and subjectivities emerge in different places. (p. 15)

For them, the concept of financial ecologies helps explain how places are connected to financial networks.

We can integrate these arguments into a working definition of financial ecologies: they are a social structure in which actors, locations and their relations form geographically distinct constellations of knowledge, practices and subjectivities that enable the provision of financial services. These smaller, partially localized financial ecologies form links with other financial ecologies, constituting the wider financial system.

Applying this concept to urban infrastructure development, we can derive a financial ecology of urban infrastructure. This allows one to show how actors, locations and their relationships form particular arrangements of knowledge, practices and subjectivities conducive to the creation and maintenance of urban infrastructures. These are in turn interlinked with the wider financial system, while producing specific local outcomes that reverberate in the urban contexts in which they are embedded. This approach provides a conceptual model for understanding how financialization affects the development, governance and maintenance of urban infrastructure, and the spatial patterns that result. In this manner we can connect complex financialization processes with urban constellations and their long-term impacts. The following section will explore this concept by example of the changing financial ecology of urban infrastructure in the UK.[1]

THE CHANGING FINANCIAL ECOLOGY OF INFRASTRUCTURE IN THE UK

The current situation

As a significant consequence of the financial meltdown of 2007–08, austerity policies became widely adopted within affected countries. Particularly tough measures were adopted in the UK, where the 2010 budget proposed cutbacks equivalent to 4.5% of projected gross domestic product (GDP), severely affecting public life across a broad swathe of measures. Local councils were particularly hard hit, as they effectively lost 60p out of every £1 the government provided between 2010 and 2020 (Local Government Association, 2019). Among the changes proposed to reduce government spending was the introduction of municipal bonds as a new means to finance infrastructure development. These changes to the public financing of infrastructure

provision further affect the changing dynamic of infrastructure investment in a climate of struggling public–private partnerships, common knowledge asymmetry between public offices and specialized infrastructure funds, and a general re-evaluation of the attractiveness of infrastructure investment per se (Ashton et al., 2012; Gandy, 2004). These developments have direct implications for the quantity and quality of infrastructure investments, and stand in stark contrast to the Organisation for Economic Co-operation and Development's (OECD) recent intervention to abate the effects of austerity on infrastructure development and increase public spending while favourable interest rates prevail (OECD, 2016). This is especially important because much of the UK's infrastructure is in poor condition, especially roads, energy and flood management (Institution of Civil Engineers, 2014). The current state of the infrastructure and the lack of investment therein is often referred to as the 'infrastructure gap' (cf. Barwell, 2018; KPMG, 2019; Merna, 2019). As a consequence, the government has formulated the ambitious National Infrastructure Assessment (National Infrastructure Commission, 2018) to fill this void, laying out a widespread investment strategy heavily focused on private sector investment.

These pressures on municipalities, to do more with less, have led to the creation of an entirely new UK-wide structure for infrastructure financing by means of creating a Municipal Bonds Agency (UKMBA) to help facilitate the establishment of a municipal debt market (LGA, 2014). The main aim, by its own definition, is to provide access to loans at lower rates than those traditionally provided by the Public Works Loan Board (PWLB), whose interest rates were hiked significantly after the crisis (cf. O'Brien & Pike, 2015). This is to be achieved by issuing municipal bonds to capital markets, and by increasing their attractiveness to investors by pooling borrowing requirements and actively engaging in risk management by establishing a robust credit assessment process (UKMBA, 2015). Beyond this, the UKMBA helps facilitate inter-council borrowing, provides expertise to councils in negotiations with lenders and further aims to act as an aggregator for councils to qualify for European Investment Bank (EIB) loans. The agency itself is owned by the councils and the Local Government Association (LGA). The legal and financial risks of borrowing from the capital markets are to be mitigated by a joint and several guarantee from signatory local authorities, of other signatories' borrowing, and by a proprietary credit process to establish borrowing metrics (UKMBA, 2015). So far, 57 local authorities (out of a total of 433) have signed up as shareholders of the agency (Public Finance, 2016). Note that not all councils are eligible for bond issuances: they are vetted for the state of their finances, and only 'first class, highly rated councils' can participate (Public Finance, 2016, p. 1). The establishment of a municipal bond market, however, has proven to be a more complicated endeavour than was first anticipated: in January 2016, *The Financial Times* reported: 'Multibillion-pound municipal bond market stuck at zero' (Moore, 2016, p. 1). This still holds true today in August 2019. Improving interest rates at the directly competing PWLB, together with underestimated administrative and legal complexities, appear to be the main reasons for the delay of a first bond issuance since the first initiative in 2014.[2] Furthermore, investors are still hesitant when considering the credit quality of councils, as few ratings have been made public, and the ongoing political situation introduces yet more uncertainty into the markets.[3] Brexit could have one positive side effect for the UKMBA, though if the UK loses access to the EIB for infrastructure financing and an institutional void results, the UKMBA is likely to rise in significance.[4] Despite the slow take-up, the municipal bond market in the UK is something that both government and investors want to establish urgently to ensure that structural changes to public finance still allow for reasonable funding of local councils, and to establish new investment opportunities for long-term investors such as pension funds.

On the receiving end of these evolving dynamics between the PWLB and UKMBA are the local councils with their legal obligations to provide infrastructural services. The persistent pressure on councils to provide locally sourced revenue towards infrastructure investments has led towards a skewed investment strategy where cheap PWLB loans were used to invest in

commercial real estate, often outside their own jurisdictions, to cross-finance the maintenance of services. This effectively turns councils into property companies and builds a significant credit bubble with disaster looming on the horizon as traditional retail markets continue to decline (Plender, 2017). This practice has become so concerning that the National Audit Office (NAO) has taken up the issue (Marrs, 2019).

On the side of the investors, a central point of friction lies between the lifespan of the average infrastructure project and the often significantly shorter time horizon of financial calculus and resulting portfolio strategies of even infrastructure investors.[5] Allen and Pryke (2013) provide interesting evidence on how the Maquarie Group's model of infrastructure financing during their stint as owners of Thames Water affected their balance sheet (2013). Besides these changes in infrastructure investment strategies, a more general caution towards the infrastructure sector is born out of late 1990s' privatization experiences and a general desire to avoid the politicization of potential investment sites.[6] The situation around the Heathrow Airport expansion is just one prominent example. This has led to a blanket ban by many investors on UK infrastructure assets, citing a '"negative" and "hostile" political and regulatory environment' (Plimmer & Ford, 2019, p. 1) The emergence of project finance, individual highly financialized infrastructure projects that develop their own financing schemes, are also closely tied to investor interests. These are often cherry-picked as those infrastructural projects that yield high returns and fit current portfolio strategies, while being subject to little public scrutiny, weak regulatory oversight, and often questionably skewed financing schemes.[7] A prominent example is the Thames Tideway Tunnel, a £4.2 billion super-sewer development in London, the entire justification for which is drawn into question and has been described as 'a concrete tunnel for extracting rents, a pure financial asset' (Loftus & March, 2019, p. 14).

The financial ecology of urban infrastructure

Having developed an understanding of the current key dynamics in the UK infrastructure–finance nexus, we can apply the concept of financial ecologies and derive a description of the financial ecology of urban infrastructure in the UK. We use the introduction of the UKMBA as a key vantage point from which to portray the changing dynamics within the financial ecology of urban infrastructure.

The first step is to identify the key actors within the ecology; the presented material helps one to pinpoint these: the UKMBA, local councils, the PWLB, investors and the current government pose the core group of actors, with rating agencies, regulators, the EIB and other banking institutions forming a second order of actors. The wider press and the public itself play only a minor role in the financial ecology. All these actors operate in different locations and relate to each other based on their own logics. The following will try to detail these relationships.

Applying Abbott's concept of linked ecologies, and examining the financial and political–administrative ecologies separately, the UKMBA constitutes a form of avatar of the financial industry within the political–municipal sector. To create a market (for bonds) and new financial instruments might be seen as hinges; that is, an effective strategy of the wider financial ecology that should now also operate in the city's political–administrative ecology. One might interpret the hinges as spreading innovation. However, as strategies, they may serve entirely different ends, depending on which ecology is examined. In the political–administrative ecology, the municipal bonds strategy serves as a strategy of avoidance, to avoid a political discussion and consensus-finding about a city's investments in urban infrastructure. In the financial ecology, municipal bonds are another measure for the leverage of returns and the distribution of risks. In particular, with municipal bonds, the communities share and take over the risks that the financial ecology is required to manage.

Further applying the concept of ecologies, we clearly identify a re-forging of its inner dynamics. Austerity is setting the framework within which this financial ecology morphs towards

a more market-oriented mechanism for financing urban infrastructure. This is further amplified by official government policies such as the National Infrastructure Assessment. The PWLB, as traditionally the central institution for financing urban infrastructure projects, is being supplemented by the UKMBA as a competing institution, which pursues the same aims via a different logic. The UKMBA introduces new actors into the ecology of urban infrastructure development and, more importantly, changes the dynamics of how these actors relate to each other. A significant difference is the shift of scales within the multilevel governance of cities: PWLB loans are largely top-down processes directed from a centralized government institution towards the borrowing councils, keeping a large degree of the financial knowledge and responsibility at the top level, whereas the newly proposed model turns this approach around and locates market exposure and financial responsibility at the local level. Here, not all councils are equally well equipped to handle the increased demands for financial knowledge.

This places local councils at the centre of the ecology. The shift of scales now firmly locates exposure to market volatility at the local level, which is again amplified by increased requirements for financial knowledge at the same level. This dynamic has led to new practices at the local level, where cross-financing involving commercial real estate investments outside of a council's own jurisdiction amplifies market exposure and increases overall complexity in the council's operations. Additionally, the UKMBA's joint and several guarantee adds to this increase in complexity, as it further fragments council interests beyond its own borders. On the upside, the UKMBA provides access to much-needed financial knowledge at the local level.

Investors' interests are dominated by a mixed market logic of maximizing returns on investment while finding safe havens for long-term investments, a strategy based around the development of strong hinges. Under the current configuration of the ecology, investors favour project finance for infrastructure investments to reduce overall complexity in their portfolios. This logic has to be negotiated with the administrative and political burdens of local councils, which have to adapt infrastructural projects to increase attractiveness. The UKMBA assumes the central role in translating between these realms, and faces problems on both sides: it fails to provide adequate public ratings – the common coin of risk evaluation – to market actors, while it also struggles to overcome local institutional and political complexity to prepare the ground for the new mechanism. The interesting aspect here is that the UKMBA assumes the role of communicating and translating risk in both directions. That is, both market risks and systemic risk on the one hand, while also negotiating political risk. It is thus central in establishing knowledge of these risks on both sides, thus reshaping the actors' subjectivities and potentially influencing their resulting practices.

An important aspect of the financial ecology perspective is that we not only consider occurrences of investment, but also changes that are not tied to the flow of capital. The UK faces an immense gap in infrastructure funding, and the UKMBA – as one of the main strategies to fill it – has, to date, failed to perform. This failure contributes towards the widening of the infrastructural gap, adding more pressure on the financial ecology's trajectory. External dynamics such as the ongoing Brexit negotiations foster an insecure investment environment that also questions the future relationship towards key institutions such as the EIB. All these dynamics, taken together, mean that the financial ecology of urban infrastructure in the UK is in a fluid state, in which the lack of political intervention fails to establish a predictable trajectory. This is particularly significant for infrastructure development, as the main requirement for long-term investment and development is stability and predictability.

CONCLUSIONS

Having established an understanding of the financial ecology's configuration and inner dynamics, we can use the infrastructural perspective outlined previously to identify potential spatial effects.

The following presents a list of these effects, allocated to their corresponding infrastructural dimensions:

- Constraining effects of lack of investment in infrastructure: while the financial ecology still enables infrastructure investment up to a certain level, its current configuration, characterized by the infrastructural gap, has immediate spatial consequences: flood risks keep increasing, the transport sector struggles with overburdened systems and modernization projects such as decarbonization efforts are stifled, setting up a plethora of long-term problems for the future. Many of these consequences are as yet unfelt, which is largely due to the long timeframes on which the ecology operates and the institutional debts we owe to previous generations of practice.
- Path dependencies with new patterns of interdependence: councils' investments in commercial real estate create massive path dependencies, as they often dominate a council's balance sheet and tie its operation of services directly to property market volatility. Going down this path of cross-financing services exposes councils to increasing spatial fragmentation of its interests and exacerbates the complexity of its operations.
- New spatial alliances and patterns of mediation between actors: similarly, the UKMBA's joint and several guarantee increases interdependence between signatory councils and widens the realm of financial concern far beyond a council's own borders. This not only increases complexity but also widens the inequality between the 'first class, highly rated councils' and the rest (Public Finance, 2016, p. 1). These new spatial alliances begin to influence how councils evaluate their own position and capabilities, thus increasingly mediating their perception.
- Investment patterns promoting fragmented infrastructure solutions: the increasing desire of investors to establish effective hinges, paired with regulatory weakness within the financial ecology, bolsters the development of project finance based infrastructure investments. This promotes fragmented infrastructure solutions that cater towards investor needs rather than meeting the facts on the ground and providing optimal long-term solutions.
- Vulnerability of local infrastructure to market volatility: as much as infrastructure is an asset, it is also a major vulnerability that is capable of disrupting cities extensively. In the case of the changing financial ecology of urban infrastructure, we have shown how particular constructs favoured by the financial ecology expose local infrastructures to market volatility. A systemic breakdown of markets could then directly translate to the local level, where large utility companies often operate under similar moral hazards as the banks that were bailed out during the last financial crisis.
- New habits and practices in council operations: we can identify changes in local councils, which partake in the aforementioned property investment schemes: they acquire new knowledge and implement changes to long-standing practices, slowly changing the habits of council operations and with it solidifying the market oriented trajectory of the financial ecology itself.

This list of effects is of course not exhaustive and serves as a starting point for discussing the merits of moving the focus of financialization research more towards the study of infrastructures. By using financial ecologies as an analytical tool and infrastructure as a perspective, we showed how the financial ecology of urban infrastructure in the UK creates spatial effects within cities. Thus, the paper directly answers calls from the discourse on financialization to examine its spatial effects more closely, and provides an analytical tool to explore these effects in different contexts (cf. French et al., 2011). Beyond this, it widens the discussion of financialization within the

infrastructure discourse by outlining the spatial complexity of infrastructure and tying it to the configuration of financial ecologies.

The changing financial ecology of urban infrastructure in the UK provides glimpses of one future for urban infrastructure under prevailing austerity. New vehicles for infrastructure investment imply repercussions that are directly related to the localization of risk, the exposure of fundamental infrastructures to market volatility, as well as growing exposure to an exchange-value-based market logic in the creation, operation, and governance of public utilities. As councils struggle to finance infrastructure projects and maintenance, sunk investments continually depreciate, seriously harming the installed base for future investments. Pathways towards more sustainable forms of development remain out of bounds and constrain the future potential of societal and environmental change by maintaining habits, patterns, and practices. All the while, vulnerability is increased, not only to market risks but also to continued high risk of flooding, fire and other threats associated with climate change. Infrastructure is the central pillar underpinning the operation of modern societies, and its financialization seriously affects how these societies constitute themselves in our cities.

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NOTE

[1] The discussion is based on the analysis of primary documents, a thoroughly reviewed collection of secondary sources and supplemented with 12 expert interviews conducted between 2015 and 2018.
[2] Interview: Administration 2, personal interview, 23 September 2016. See also in the supplemental data online.
[3] Interview: Finance 1, personal interview, 1 March 2017.
[4] Interview: Finance 2, personal interview, 16 January 2018.
[5] Interview: Finance 3, personal interview, 7 September 2016.
[6] Interview: Finance 2, personal interview, 16 January 2018.
[7] Interview: Finance 2, personal interview, 16 January 2018.

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