

The financialisation of urban infrastructure: A framework of analysis

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Abstract

The literature on the financialisation of urban infrastructure typically traces how an infrastructure asset's balance sheet is (re)engineered to create a financial asset. What the literature neglects are the processes by which an asset generates urban flows. Attention to these processes, we argue, not only gives better insight into the processes of financialisation of infrastructure but also exposes how the act of financing affects the operations of cities through its influence on the performance of infrastructure assets. The argument presented in the article is informed by case studies of infrastructure investments revealed in interviews conducted in New York, London and Sydney. This material is drawn on to generate a framework for understanding the relationships between infrastructure investing and the infrastructure-enabled flows of a city. This framework has three dimensions through which the financialisation process is seen to be mediated. These are capital structure, organisational structure and regulatory structure. The article argues that these mezzanine-level conceptualisations enable us to explore the to-and-fro between financing and operating cities. A key proposition is that the physical flows of a city are basic not only to the design and enactment of an investment instrument but also to its financial viability. The realisation of this relationship has changed the way investors approach infrastructure assets as investment products. Implications for urban management are drawn.

Keywords

built environment, finance/financialisation, infrastructure, organisation, privatisation

摘要

关于城市基础设施金融化的文献通常会追溯基础设施资产的资产负债表是如何（重新）设计来创造金融资产的。文献忽视的是资产产生城市流动的过程。我们认为，关注这些过程不仅可以更好地洞察基础设施金融化的过程，还可以揭示融资行为如何通过影响基础设施资产的表现来影响城市的运营。本文提出的观点来自在纽约、伦敦和悉尼开展的访谈中揭示的基础设施投资案例研究。这一资料是为了理解基础设施投资与城市基础设施支持流程之间的关系而收集的。我们提出的框架有三个维度：资本结构、组织结构和监管结构，金融化过程被看作是受其调解的一个过程。文章认为，这些夹层级的概念理解使我们能够探索城市融资和运营之间的来回。本文一个关键的主张是：城市的物质流动不仅是设计和制定投资工具的基础，也是其财务可行性的基础。这种关系的实现改变了投资者将基础设施资产作为投资产品的方式。我们也讨论了相关研究结果对城市管理的启示。

关键词

建成环境、金融/金融化、基础设施、组织、私有化

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Introduction

'We are [a] human revenue stream; we are being made tenants in our own land, defined by the string of fees we pay to exist here', says James Meek in his polemical rant, *Private Island* (Meek, 2014: 23). The book is often cited in academic research as an account of the privatisation of Britain's public utilities and services (e.g. Davis and Williams, 2017; Loftus and Budds, 2016; Morgan, 2015) probably because it encapsulates the populist left view that says British infrastructure services were better and cheaper before Thatcher's and Blair's privatisation moves and that infrastructure services today have been financially engineered to generate profitable revenue streams for asset owners from abroad (as the British say, quaintly) rather than serve the urban populace. The fight for more efficient and equitably supplied urban infrastructure services, according to Meek and his followers, becomes a campaign for re-nationalisation, the minimisation of user fees and re-capitalisation via sovereign debt.

Fortunately there are alternate progressive accounts. Most recently, in charting the new political landscape of urban infrastructure provision, O'Brien and Pike (2017) examine the complex processes of financialisation – including privatisation – and identify the new hybrid forms of governance and multifaceted capital and organisational structures that are in play. At stake, say O'Brien and Pike, is coherence in the economic, social and environmental outcomes of cities, hence the need for 'emergent conceptual frameworks' capable of interrogating and informing new relationships between

cities, 'institutional ensembles' and 'public and private infrastructure funding and financing mechanisms and practices' (O'Brien and Pike, 2017: 248). Importantly, this multi-layered agenda doesn't involve political acceptance (or rejection) of the presence of private capital in urban infrastructure provisions. Rather it involves examining the nature and direction of this presence so that actions can be devised to ensure efficiency and equity outcomes in urban infrastructure services.

Then there is the question of the significance of the geographical subject – in this case, the city – in recent work on urban infrastructure financing. Close readings of, for example, Peck and Whiteside (2016), Christophers (2015a), Ashton et al. (2012) and Aalbers (2017) see the unfolding of contemporary political economy as their primary theme, with the city as context; rather than the primary theme being an explanation of urban process and politics with political economy more as background. Tellingly, in a *Dialogues* response, Christophers (2015b: 231) acknowledges that his approach to finance is from a 'political economy perspective', rather than from a human geography or spatial perspective. In this article we are wary of assigning primary explanatory status to processes framed by political economy understandings, with the functions and processes of cities and their urban economies doing little more than giving political economy a performance stage. We see that privileging a political economy perspective in our examination of urban infrastructure finance would deflect close inspection of the relationships between urban infrastructure assets

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and the urban structures and flows that constitute a city; and thereby neglect attention to the critical power of infrastructure to generate the urban flows (of labour, capital, materials, information and so on) that privatised infrastructure operators monetise and engineer into financial assets. Our approach, then, is to foreground the relationships that arise from the intersection of urban geography and urban economy so that the particularities of political economy that pervade the city and its economy become prominent as a consequence. Murphy (2015), Halbert and Attuyer (2016) and Savini and Aalbers (2016) exemplify the priority we seek, that the project be framed by geography's heuristics rather than political economy's, our commitment to a progressive politics notwithstanding. Put another way, we privilege an understanding of the functioning of the city and its economy in the first instance in order to see what is rendered for political analysis and financial conceptualisation; not the other way around. Then we reiterate Christophers' (2015b) call for closer attention to the technicalities of finance – and here can be added the need for wariness about the argument that finance has embedded obfuscation practices as a matter of course (see Pryke, 2017).

Accounting for changes in the urban infrastructure sector therefore requires that we understand the changing practices of finance and their transactional details, and recognise that an important recent history is now able to be written. The logic of privatisation of public utilities in the late 20th century came from simple calculations showing the prospect of steady yields from enforced consumption of services from monopoly providers with reliable historical public records showing the utilities' capex, opex and revenue profiles. In the early 2000s (pre-GFC), however, the attraction of urban infrastructure assets to investors came from the ease of securitisation, whereby bill

payments with little cyclical fluctuation could be synthesised into financial products based on contractualised entitlements to earnings. This liquefaction of infrastructure assets overcame a crucial barrier to their being seen as an asset class (alongside alternate classes like private equity, real estate and hedge funds); while the metrification of the new infrastructure-based financial products (via, say, performance indices and third party ratings) meant that the financial representation of the sector relied less (if at all) on the urban processes that generated revenue streams or asset value uplift and more on the qualities of predicted earnings compared (via financial indicators) to competing asset classes. Investment product based on revenue from parking meters or airport trolleys thus became comparable to product based on the earnings from the operation of giant power grids. Moreover investment returns on otherwise proven stable assets, like water systems, were boosted by gearing arrangements, taxation avoidance and value stripping (see Allen and Pryke, 2013), as the investment community seduced itself with accounts of infrastructure as an investment class characterised by elements which were overwhelmingly financial. Post-GFC, conceptualisation of infrastructure as an investable asset has shifted dramatically, driven by costly exposure of the flimsiness of investment products found not to have the security of genuine assets and proven revenues. Major investor attention has re-focused on the physical characteristics of the urban infrastructure asset. This revision has seen infrastructure (with real estate) rebadged as a 'real asset' class of investment and has involved shortening the transactional distance between investor and asset operation and the re-emergence of earnings transparency within closely intermediated deals. A fund taking equity in a port, for instance, seeks evidence of actual sea traffic, and in an electricity network of both the physical

condition of the network and details of biller contracts – actions which seem so obviously necessary but which were evaded in much pre-GFC arms-length infrastructure investing. The physical basis for earnings is no longer a back story to spreadsheets showing a securitised flow of funds or leveraged capital gain opportunity.

Yet the lesson learned by the investment community over this quarter of a century – that there is a difference between the generation of real value and the financial harvesting of revenue streams or asset price inflation – has yet to be mimicked in economic and urban geography scholarship. Our research needs to be attentive to what it is that generates revenue when infrastructure assets are put to work, and how the need to generate revenue requires a city to be operated in particular ways. However, this research is novel and difficult to enact successfully given the hurdles that need clearing: mastery of new financial and engineering knowledge; availability of data in a newly categorised asset class where much material is designated commercial-in-confidence; access to informants within firms and institutions and government departments without histories of public engagement and wary of external surveillance; and negotiation of highly charged political fields associated with controversial brownfields privatisations and high-impact new-build ventures. This article reports on research that attempts to scale these hurdles. The objective of the article is – responding to the call from O'Brien and Pike (2017) – the development of a framework for scoping and categorising the dimensions of research into privately-financed urban infrastructure. Our interpretation of the task involves three things: foregrounding the urban spatial economy; freeing the analysis from the pre-determinations of traditional political economy approaches, especially in respect to the contribution of public capital; and responding to Christophers' (2015b) call

for competency in analysis of the new forms of financial practice.

We report on our research in the following five sections. The next section appraises the existing literature on financialisation, especially in the context of fiscal crisis, given that much of the impetus for the presence of private capital in urban infrastructure comes from the financial retreat of the state from large project development due to rising levels of state debt and diminished capacity to service new borrowing. Then there is a section on methodology which explains our data collection and observations. The next section develops an argument as to how urban infrastructure is made investable, a key transformation process that has major implications for the city as an economic, social and environmental entity. This is then followed by a three-part section – on capital structure, organisational structure and regulation – which devises a framework for thinking about and analysing private finance in urban infrastructure. Then a concluding section reflects on the importance of a better contribution from urban studies scholars to what has become a primary public policy concern in nations and cities around the world.

Financialisation and fiscal crisis

Financialisation rather than privatisation underpins the transformation of infrastructure into an investable asset class. Financialisation has many definitions, most of which focus on the preponderance of financial practices in determining the ways economic value is created and circulated. Aalbers (2017: 3), for instance, sees financialisation as 'the increasing dominance of financial actors, markets, practices, measurements and narratives, at various scales, resulting in a structural transformation of economies, firms (including financial institutions), states and households'. Peck and Whiteside (2016: 237) are similarly

expansive. Beyond pointing to intensity and scope, however, we see the need for better understanding of financialisation as *process*, which also involves recognising important subtleties that are at play. Fields (2017) explores some of these across a range of economic and urban geography applications. Here we seek to add to the subtleties of the financialisation concept for use in the analysis of the financialisation of the urban infrastructure investment sector in later sections.

We start with one form of financialisation process which is when an *existing* enterprise (broadly defined) undergoes reformation so as to raise returns on equity (or shareholder value) above average market rates of return through raised attention to financial management practices. Examples include the manipulation of balance sheets in stressed corporations in the US (Clark and Wrigley, 1997), the rise of BHP Ltd to become the world's largest minerals corporation (O'Neill, 2001), the closure of the Vaux Brewery in the north of England (Pike, 2006) and the take-up by financial capital of opportunities arising from digitisation in the music industry (Leyshon, 2014). A contrasting form of financialisation is the design of a *new* enterprise so as to maximise opportunities for raised rates of return through financial logics that underpin rather than re-frame a venture's structures and operations. Examples include US mortgage lending schemes in the early 2000s (Ashton, 2009; Crump et al., 2008), the management of value along supply chains in new retailing formats (Baud and Durand, 2012) and the attention to revenue capture in 'new-economy' companies in the US (Lazonick, 2010). Importantly, because nothing is ever neatly predictable, Dymski (1996) provides a valuable roadmap for understanding financialising practices from the transformation of older enterprises to the formation of new ways of creating and managing economic value.

This article draws on this historical stylisation of financialisation scholarship to highlight a two-format transformation of urban infrastructure from a public utility into an investable asset. The first is the transfer of existing or brownfield infrastructure assets into private, for-profit enterprises and the second is the development of new urban infrastructure items to explicitly address investor appetite for stable products yielding above average returns. These relatively discrete formats for financialisation of urban infrastructure are referred to frequently in the sections that follow.

A further literature is also relevant. This is the ongoing analysis of the fiscal crisis of the state. The impact of the now longstanding crisis of the post-Keynesian state is examined in general by Birch and Siemiatycki (2015), where the close links between fiscal stress of the state and the marketisation and assetisation of state property and pursuit are analysed. A useful longer historical account is provided by Palley (2013), who shows the role of finance in the transfer of earnings from households to private capital in the late 20th century (for the roots of fiscal crisis, see O'Connor, 1973), and then the role of finance in providing new ways for state activity to be funded. Here we note that while the complex links between fiscal crisis and private finance are beyond the scope of this article, fiscal crisis is an irremovable component of infrastructure's financialisation. As such it is given as much attention as possible in what follows.

On methodology

This article's general claims about urban infrastructure investment are informed by fieldwork conducted in Sydney, New York and London between 2013 and 2015, and by supplementary data collection and data base analysis. The broader project involved the collection of case study evidence of

infrastructure financing to describe the links between the creation of investable infrastructure products and the operation of major urban infrastructure assets. Three activities were involved in the project. First, detailed observations of infrastructure investing were made from the Preqin data base on infrastructure investment (see www.preqin.com). This is a subscriber-only service using submitted data. It contains profiles of over 500 fund managers, over 1100 infrastructure funds and details of infrastructure financing deals including their size, project configuration, industry, geographic region, investors and service providers such as investment consultants, placement agents and law firms. Analysis of the Preqin data showed London and New York as the premier locations for the management of investable infrastructure assets, and Sydney (behind Paris) as the fourth most significant location (Preqin Ltd., 2016). Second, deals profiled in the Preqin data base were analysed to show changes through time in the infrastructure sector. Third, the data base was used to identify a list of key informants who were invited to in-depth interviews. A total of 23 interviews were conducted across the three cities, resulting in a research data base of over 40 separate projects. This data base contains details of financial arrangements, financial success, urban outcomes and regulatory responses. Reporting on specific cases is the basis for other publications. Here, analyses of the data base and interview transcripts are brought together to generate an overarching argument.

Access to the Preqin data base and thereby to senior decision makers in the infrastructure investment sector enabled detailed, sophisticated and up-to-date insights into the sector. The process for drawing out generalisations from interview-sourced data, observations and discussions was a deliberate one and follows the well-used advice in Clark (1998), which refers to

close dialogue interviewing. Central to Clark's article is his analysis of Kaldor's exposition of the use of 'stylised facts' as a means of ordering empirical observations for the purpose of general theory building. While Clark worries how robust stylised facts are in knowledge building he argues for their use in corporate research as a pragmatic way of tapping the insights of key players given through the interview process. Fittingly, Clark's assessment of close dialogue interviews arises from his work in the geography of finance, especially in relation to the development of Anglo-American pension-fund investment strategies. What Clark seeks is research technique that better represents 'the partial scope and diversity of economic life' without abandoning the need to 'make sense ... of broader, higher-tier processes of economic change' (Clark, 1998: 74). The details of economic life need recognition, says Clark, which creates the opportunity for genuine intellectual curiosity freed from what Clark sees as the unadventurous and limiting commitment to abstract theory within orthodox economics. While there is surety in theorising a world comprised of ordered relationships and discernible pathways, Clark asks how we confront the 'complex task of fashioning knowledge in its specific settings'. In response he urges 'a sense of scepticism that works both ways: from theory to close dialogue and from close dialogue back to theory' (Clark, 1998: 78).

This, then, is the strategy adopted in the project and reported in this article. Our close dialogue interviews provide a range of interpretable claims. Many are made credible by our knowledge of deal making from the Preqin data base, and most of the deals identified in the data base are reported to a degree in financial media. Yet there is a need for an interpretive framework to understand important trends and generalizable relationships that are developing in urban infrastructure financing. This article proposes the

three-fold dimensions of a framework and in so doing suggests not just a mechanism for sifting the empirical observations into some sort of repeatable generalisations, but for generating general knowledge claims, or theory, about urban infrastructure investing.

Making infrastructure investable

Public understanding of the interplay between urban-economic processes and a city's infrastructure assets is not yet fully developed. Certainly there is recognition of the importance of observing and better understanding the systematic, repeated movements (as opposed to forms and structures) in the operation of a city. Amin and Thrift (2002: 17ff) in particular elevate the significance of a city's 'repetition and regularities' in its composition, although they emphasise the role of soft technologies like transit timetables and the rhythms of night life rather than the obvious role played by large infrastructure assets. More recently, Scott and Storper (2015) recognise the role infrastructure plays as a 'generative space' – alongside production spaces and special spaces – in a city's urban-land relations and agglomeration processes, with the city as the vehicle for holding together the 'complex congeries of human activities' (Scott and Storper, 2015: 6), rather than, say, a broader set of political economy processes. They see the city:

... as a concrete, localized, scalar articulation within the space economy as a whole, identifiable by reason of its polarization, its specialized land uses, its relatively dense networks of interaction (including its daily and weekly rhythms of life), and the ways in which it shapes not just economic processes (such as the formation of land, housing and labour prices) but also socialization dynamics, mentalities and cultures. (Scott and Storper, 2015: 7)

This formulation is important for two reasons. One is its elevation of infrastructure as

a 'generative space' for shaping not just economic processes but a range of other non-economic urban processes and events. The second is its exposure of the intense politics that surrounds infrastructure provision and operation. Urban politics cannot exist somewhere outside actual urban events or in a post-event space available for academic analysis and commentary. In the case of infrastructure, a politics of land use, cost apportionment, value generation, value distribution and regulation is always in play.

Private finance intensifies urban politics. We attempt to tease out this politics in an article elsewhere (O'Neill, 2017). Here we seek a way of analysing and understanding the presence of private finance in the infrastructure sector via a framework which dissects the complex array of organisations and arrangements involved with urban infrastructure finance in order to better understand new circumstances for accessing infrastructure services. As we note above, central to the presence of private capital in urban infrastructure investment is the translation of an asset's operational characteristics into financial terms and contracts. This is a two-stage process. First, there is the metrification of the asset so that use of the infrastructure services it generates can be apportioned: say to an individual cost centre such as a household's water bill, a car driver's e-toll account or a level of government which makes payment to the asset operator in return for contracted services or use availability (such as via a public-private partnership, or PPP). Second, and crucially, the revenue stream is encased in property rights including rights over revenue and over the fixed assets and thoroughfares that enable the infrastructure services to be generated. Securing the revenue stream by a property contract enables many things: determination of the value of the asset in financial terms; comparison of the value of the asset and its yield with other assets and classes of assets;

and sale of the asset as a financial product, meaning it has been imbued with some degree of liquidity. In other words, the infrastructure asset is able to be understood and valued solely in financial terms, meaning it takes on an assessable risk profile and can be compared with financial products in other asset classes (see Pike and Pollard, 2010).

Once financialised, therefore, the asset becomes as much a financial asset as a physical asset for the production of urban services; and as a financial asset it necessarily becomes embedded in a set of capital, organisational and regulatory structures. We emphasise this embeddedness because we see that there is more to the financialisation process than the linear translation of the asset into an investment product. The evolution of this trilogy of structures is the subject of discussion below. For now, we can observe that the existence of a financialised infrastructure asset, like any financial asset, makes it available for capitalisation, meaning it can take a formal position on a balance sheet to offset debt and equity financing. Critically, the power of a financialised infrastructure asset to attract debt and equity capital depends on the life cycle stage of the asset and on the role the asset performs in the urban situation.

Figure 1 captures a classification in use by infrastructure investors to describe assets according to life cycle stage and susceptibility to market and GDP fluctuation. The stable, assured 'brownfields asset' shown in the figure, say a water utility or a concession to operate a proven public transport facility, is able to offer guaranteed returns over long time periods within a highly regulated environment that protects the asset's monopoly position. In such circumstances, controllers of the financialised asset are able to adopt a highly leveraged capital structure with long term debt contracts freeing up equity capital for use elsewhere. Compared to such a

brownfields asset, the 'core-plus asset' shown in Figure 1 is exposed to variable demand. An electricity generation plant in an industrial city and a freight-dependent toll road are examples. The owner of a core-plus asset will be forced to endure cyclical downturns when returns are diminished, meaning a preference for higher equity ratios given that highly leveraged debt positions would regularly become vulnerable to cash shortages. Finally, the returns from the 'merchant asset' shown in Figure 1 are not just subject to economic cycles, but also require entrepreneurial investments through time in order to unlock property values, adjust to changes in technology and consumption preferences and so on. Seaports and airports are examples. Merchant assets, then, have a range of more flexible capital structures and gearing options.

An important part of the financialisation process for infrastructure is the stabilisation of returns and the protection of these returns from competition. In the case of many urban infrastructure assets, this protection flows from an asset's monopoly status. Understandably, the infrastructure investor has a keen interest in the establishment of regulatory conditions that shore-up long term, privileged access to customers, provide first-offer options on market expansion opportunities and impede new market entrants. So there is a close relationship between the stabilisation of capital structures in the infrastructure sector and the presence of strong state-business alliances, a stability which is then enhanced by innovative organisational practices and structures designed expressly to pursue monopolisation objectives. We return to these in the section which follows.

As we have argued, there is a necessary match between the generation of urban flows by infrastructure and the generation of the revenues underpinning an investment product or contractual obligation. This

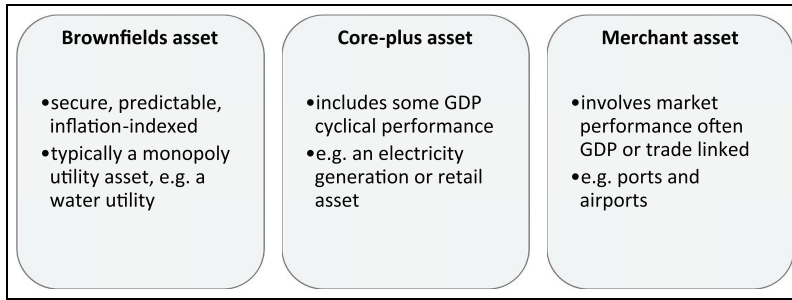


Figure 1. The range of financialised infrastructure assets.

relationship between an urban flow and a revenue flow is the driver of the financialisation of an infrastructure asset. So analysis of the financialisation of infrastructure means that the urban flows involved need understanding. We provide a detailed analysis elsewhere (O'Neill, 2010, 2017). In summary, we see that urban flows result from interconnected processes. Some flows involve *structuring* processes, which is the spatial ordering and grouping of otherwise disordered urban practices into manageable entities so that infrastructure services can be delivered efficiently. Examples are the orderly assembly of commuters on railway stations or at bus stops, and the reconfiguration of local roads to align with junctions that feed traffic onto motorways so as to maximise speed and capacity. Then there are urban flows that are *sequenced* by infrastructure. Water, energy, telecommunications and transport systems all assign priorities in servicing a city's neighbourhoods and business districts. In the transport sector, for example, households and businesses learn to read these priorities so as to schedule their daily movements with as little disruption as possible. A further ordering of flows of people and things between urban centres is an extension of a city's structured and sequenced flows.

How to analyse the way finance is mediated for infrastructure investing

The discussion in the previous section attempts to explain how urban flows, once they are ordered, can be tolled to generate funding streams for assignment to private infrastructure investors. The order that infrastructure generates in cities is the essential condition for infrastructure's financialisation, enabling urban flows to be colonised by financial circuits of capital. In this section we propose a way to talk about the things circumscribing finance as it engages the passageways and flows of our cities (O'Neill, 2013). Influenced heavily by the work of Ronald Coase¹ and Morag Torrance, our approach to the economic geography of urban infrastructure financing is by means of a framework consisting of three dimensions. We draw particularly on Torrance (2009), where we find a rich discussion of the play-out of organisation, capital structure and regulation on institutional infrastructure investment, although we take a slightly different approach, preferring to identify sets of *practices* under these three headings rather than the sets of *players* referred to by Torrance (see Torrance, 2009: Figure 1). Nonetheless, we see our analysis

as drawing heavily from the relational approach to infrastructure investment that permeates her research.

Organisational structure, capital structure and regulatory structure, then, define the possibilities and constraints for finance as it pursues a selective ordering of a city's movements capable of generating competitive returns. The three dimensions can also guide our monitoring of how and why infrastructure operations shift through time, why they vary from one place to another and how they might function differently.

As we demonstrate below, the three dimensions each have integrity as analytical categories and so address the need for a more discerning, robust knowledge-generation process relating to urban infrastructure provision. That said, it needs to be recognised that the three dimensions function with a high degree of overlap. One dimension is always partial without the presence of the other two, such are the complexities of infrastructure financing and operation in actually existing cities. The framework therefore (and following Coase) forces attention to historical and political associations and interactions and invites multidisciplinary interrogation. A by-product is resistance to claims from the world of finance (and, intriguingly, from some political economists) that finance operates according to a set of detached self-referential precepts. Another is the opportunity to examine the tendencies of different modes of infrastructure financing to generate stable (or volatile) operational outcomes because of shifts in organisational presence and form, the nature and makeup of circuits of capital and the directions of social and economic regulation more generally. Stability thus depends on the success of engineering across the dimensions of organisation, finance and regulation.

Finally, the framework we propose is a concerted attempt to look beyond the

public/private binary that pervades discussion of urban infrastructure in popular political economy (again, see Meek, 2014). Instead, the focus is on the matters that drive infrastructure's actual operation, including the rationale for behaviour that comes from an organisation's constitution, the logic of a financing arrangement and the possibilities that are created and constrained by rules and contracts. To be clear, we acknowledge that there are public and private sector interests in each of the three dimensions and in their interplay; but, *a priori*, neither the public or the private sector is afforded a pre-eminent position. What the framework provides, though, is the opportunity to monitor the roll-out and operation of infrastructure and to assess the contributions from the public and private sectors at each stage, rather than skewing the analysis from the outset through normative assumptions about the way private and public sectors should be involved. Moreover, we think this forthright positioning of the public and the private generates ways of thinking and analysing that translate readily into policy action because they intersect with actual contemporary practices rather than memories of days long gone. We now turn to discussions of the three dimensions.

a. Organisational structure

A founder of competition theory, Edward Chamberlin (1965 [1933]), showed how the forces of competition in a market co-exist with the anti-competitive forces of monopolisation, with enterprises framing strategies according to their possession of market power and their anticipation of the market power of others. Market structure is therefore neither natural or incontestable, with its various idealised forms (monopoly, oligopoly, pure competition etc.) only stable through time under rare settings. Classifying

Table 1. Significant organisational forms in the infrastructure sector.

Organisational forms	Defining features
Direct investors	Holding sufficient equity to control the asset.
Closed funds	Holding a portfolio of assets selected to match returns expectations of investors committed to a fixed term before return of capital.
Open funds	Managing a dynamic portfolio of assets without a specified closure date for a changing investor base with varying investment time frames.
Platforms	Involving asset sharing across otherwise discrete investor organisations usually established because of the expensive nature of the asset or because of complementarities among assets otherwise under separate control.
Vertically integrated corporations	Targeting the control of an infrastructure supply chain from fixed asset through to consumer services with equity ownership interests diluted by share market listing.
Merchant banks (as savings aggregators)	Managing a sub-portfolio of infrastructure assets in order to meet long term liabilities to savers and depositors.
Sovereign wealth funds (as savings aggregators)	Managing a sub-portfolio of infrastructure assets in order to meet long term targets set by central banks or treasuries, with targets calculated on the basis of known public sector pension liabilities.
Pension and superannuation funds	Managing a sub-portfolio of infrastructure assets in order to meet industry sector or large employer pension liabilities.

the 20th-century public sector infrastructure utilities as monopolies, therefore, requires understanding of how the state (through the supply of cheap capital, exclusive access to a consumer base and restrictions on competition) gave utilities uncontested control over markets; and, it is worth recalling, enabled the distribution of economic rents to utility managers and unionised staff via high charges, public subsidies and, often, poor service. OECD governments moved quickly from the 1980s to break up and privatise the utilities, and in most cases we observed the dissolvable nature of the so-called ‘natural’ monopoly characteristics of the utilities. Central to the break-ups was not so much a shift in ownership – although this was a common component – but an acceptance by governments and regulators of new *organisational* forms for infrastructure ownership and control. Some early mover acquirers of infrastructure created novel organisational forms explicitly for the capture and harvesting of returns from newly privatised assets,

and we saw the proliferation of highly specialised (and contract-dense) structured investment vehicles (SIVs) and closed private funds as a consequence. In many cases these were designed to enable private equity investors to use hyper-gearing to extract windfall profits via the acquisition of under-priced, low-debt assets and their break-up and on-sale for the generation of easy capital gains. We can also observe that many of these specialist vehicles contained premeditated exit pathways for precipitating additional distributional flows (typically capital gains) in place of actions serving longer term city-shaping objectives.

Yet, more stable, stakeholder-serving organisational forms now have emerged, especially after the global financial crisis exposed the financial fragility of many SIV formats, and in response to the diversity that has arisen from differences in the size and nature of assets and in the sources of finance for infrastructure investment. Table 1, drawing from our interview and case study

material, shows examples of significant organisational forms in the infrastructure sector, and their defining features. The list reveals the need to see the links between organisational structure and investment strategy, especially in relation to expectations of investors of the size and timing of future returns, and from assets having a mix of risk and return profiles.

The table reveals the main entities that now dominate infrastructure investing, and shows the close links between the position of the investor on a value chain and the practices thereby adopted. Large funds, faced with investment horizons defined by low rates of return, are shifting to 'open' or listed structures as investors become sensitive to the benefits that custodianship of assets can bring. The best performing pension and sovereign wealth funds are similarly motivated by the benefits of closer asset management (Clark and Monk, 2015). Publicly-listed corporations from engineering and construction backgrounds have spawned infrastructure investment and management divisions as a way of harvesting both the low-risk revenues produced when assets migrate from project management to operational phases and the capital gains produced by the asset-price inflation generated by the quantitative easing policies of reserve banks (Fratzscher et al., 2018).

Finally, we see the consolidation of a large professional services corps around these new organisational forms. This corps or agglomeration has formalised the infrastructure sector's graduation to an asset class with the installation of standardised practices and specialist services, including a vocabulary of technical jargon, calculative practices, data bases, a body of law, conference circuits and so on. In these examples we can see, in Coasian terms, how organisational structure is an expression of how lead firms balance what they can do in-house with what is best sourced from external

providers.² Certainly, the infrastructure sector has experienced volatility in organisational structure, but there is evidence of stabilisation around organisational formats that help management take strong control over ownership, operations and regulatory arrangements, with formats that align better with management's desire to invest in an asset's enduring qualities rather than in its appeal to window-shopping investors.

b. Capital structure

The evolution of organisational structures to house the transactions needed for the penetration of private finance into the urban infrastructure sector is paralleled by innovations in the sector's capital flow structures. By capital structure we mean the mix of finance that is assembled to meet the credit needs of an infrastructure asset during its years of functioning, composed in ways to produce an investment asset with the yield expectations of the asset class. In its simplest manifestation, assembling a capital structure for infrastructure investment requires, first, convening an equity base involving those investors willing to park financial capital in an asset (or in an asset under construction) in return for a share of distributed profits (including capital gains) when or if the asset is exited. Second, assembling a capital structure involves credit contracts whereby finance is provided to meet construction and operating costs, particularly during the start-up phase. These contracts are typically for limited periods in exchange for interest payments. In large projects, especially those involving extended construction or staged construction periods, a hierarchy of obligations to credit providers will be established involving a mix of shorter and longer term lenders with varying degrees of recourse, leading to some lenders being classed as subordinate to others.

Like inputs to any enterprise, then, securing finance for an infrastructure asset involves putting together a supply process designed to maximise factor productivity while minimising transactions costs. In infrastructure, financing needs vary widely through time especially during construction phases, and when there are strains on liquidity caused, say, by falls in patronage during an economic downturn. For reasons such as these, refinancing debt (short and long term) is common in the infrastructure sector. From a lender's standpoint, though, the need to minimise the risk involved in lending and re-financing means debt contracts include not just matters of recourse but also requirements for ongoing audits of risk with measures (such as cash sweeps) to ensure the financial viability of the asset and therefore of the lending contract. Often ratings agencies are involved in these determinations. Managing capital structure is thus a difficult but necessary component of urban infrastructure management.

Three features of capital structure are relevant to infrastructure provision. The first is that capital structure in the infrastructure sector has become a nervous settlement between the quite different interests of equity and debt capital providers. Equity providers demand control over an asset so as to diminish risk and generate above-market returns through time; while debt providers seek assurances that returns (revenues) from the venture are managed to meet debt holders' less-volatile expectations and ensure final payouts. Equity holders, say via an open fund investing in a metro system, may have a long term view of the asset and prioritise maintenance and customer goodwill to ensure a growing user base, while a debt provider might urge the management of the system to maximise revenues over the (perhaps shorter) period for which a debt contract has currency. This type of tension can be exacerbated when governments hold equity

positions in an asset, for example after a partial privatisation event.

Tensions between equity and debt providers in the infrastructure investment class are also intensified by quantitative easing – now seen by most as ensuring cheap debt finance to the infrastructure sector for many years to come – with key equity providers (or general partners, GPs) to a financialised asset keen to substitute cheaper debt for equity capital, and so leverage higher returns, without eroding legal control over the asset.³ Debt providers, of course, become concerned when leverage heightens risk. The development of a capital structure where there is debt-equity rapprochement, then, becomes a key process in the financialisation of an infrastructure asset, with major negotiations required each time a significant re-financing event takes place.

This gives rise to the second feature of capital structure arrangements: that both savings aggregators (typically banks and private funds) and savings pool managers (typically pension and sovereign wealth funds) have become confident enough in their skills and trusting enough of fellow large players to take positions on each side of the equity/debt divide. There is much yet to be known about the implications of the fluidity between equity and debt positions in financing infrastructure assets.

The third feature is the emergence of user revenues as the primary source of funding for infrastructure investment. While taxation revenues, delivered direct (hypothecated) or via availability concessions, remain a significant funding source for urban infrastructure, regulated user fees and tolling have become central to the commercial viability of brownfields privatisations and underpin risk minimisation and revenue assurance in greenfields projects. There is an issue here involving the application of new technologies in collection processes and the socio-cultural circumstances for their acceptance.

Certainly, efficient revenue collection technologies, like tollway e-tags and transit swipe cards, enhance the financial qualities of an asset. There is evidence also that they mollify revenue pressures from seasonal and economic cycle effects as charges 'disappear' into monthly household budgets via automatic debiting (Finkelstein, 2009). A further concern over the rise of user fees is the pressure in asset design to maximise revenue outcomes. An example is traffic engineering to maximise peak flows on a tolled motorway in order to harvest price premiums rather than to pursue urban shaping objectives which might involve reducing the size and intensity of these flows.

Two public sector fiscal incapacities bear directly on the presence of private equity and debt finance in urban infrastructure. One is the difficulty of debt-raising by governments with distressed balance sheets, meaning greater reliance on private finance especially for the construction phase of new assets. The other is the burden on budgets of the operating deficits of many infrastructure assets. For public transport provision, for example, each new transport asset adds cumulatively to the structural component of fiscal deficits due to typically poor farebox revenues. A privatisation cycle then ensues. Short term fiscal relief can come from the sell-off of the more financially viable portions of a public transport system, for example the busier bus routes, transit lines and ferry services, typically via PPPs, with the investor purchasing a concession agreement to supply prescribed services in return for fixed, regular government payments, in effect like a government bond issue. Cost savings through operating efficiencies and higher revenues through improved patronage are then available to the investor as a way of improving returns.

Clearly, there is much more to be said about capital structures in the infrastructure sector, of the potential for structures to

stabilise, and of the opportunities for governments to create new avenues for the entry of private sector finance through PPPs, alternate funding streams and direct equity investments and risk assignment, such as through providing private access to lower-rate government borrowing instruments. Certainly, as we have noted, there are equity and sustainability concerns arising from the new ways infrastructure services are delivered. The point for now is to acknowledge that a stable form of capital structure has emerged, one that is capable of underpinning long term urban infrastructure investment, operating outside the fiscal dominion of the state and not subject to its present-day fragilities.

c. Regulation

We think it is impossible to overestimate the influence of regulation on infrastructure finance, especially because of the influence of regulation on infrastructure's organisational and capital structures. By regulation (drawing on Clark, 1992) we refer to the range of rules, decisions and enforced practices that circumscribe the location, construction and operation of an infrastructure asset. What is observable in the infrastructure sector – noting once more that published evidence and argument about regulation in the sector is thin to date – is a process of regulation that typifies an immature industrial or investment sector. This means there are tendencies for negotiated, bespoke regulatory solutions rather than the codified and supervised rules and practices that pervade more historic economic sectors. Certainly, the regulatory domain confronted by finance in the infrastructure sector hasn't delivered the stable structures we have identified in respect to organisation and, to a degree, capital structure. That said, there are various state experiments such as the templated PPP initiatives in Ontario, British Columbia, Alberta and Quebec (Siemiatycki

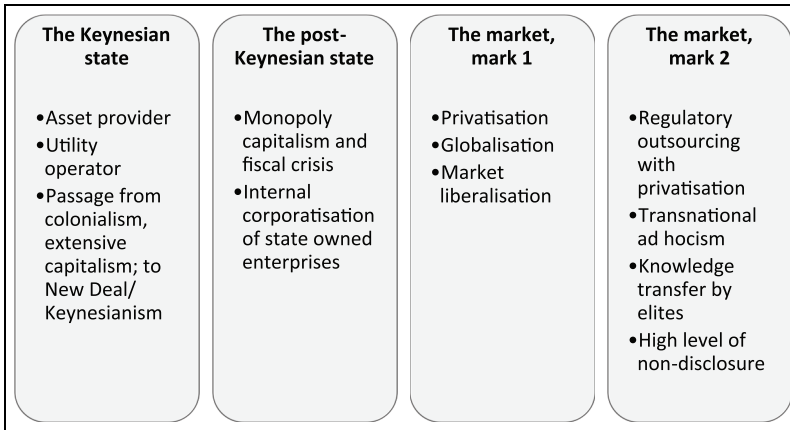


Figure 2. Evolution of the regulatory regime for the infrastructure investment sector.

and Farooqi 2012), and across the UK more generally (as PFIs; see O'Brien and Pike, 2015). Yet these practices have migrated little beyond their domestic territories, with evidence of only modest international learning and no moves as yet towards transnational standardisation. A consequence is that local investor and government expenditure on regulatory processes remains very high, a result of the ad hoc nature of the regulatory process, the lack of formalisation of decision making and the minimal level of intra-industry transfer and learning. Figure 2, again based on our interviews and case studies, summarises characteristics of the regulatory terrain for infrastructure, and how these have evolved.

Helm and Tindall (2009) expose the need for strong regulatory frameworks in infrastructure investing because of the presence of complex contractual conditions between the state and the infrastructure investor. The authors see parties to an infrastructure investment relationship as having substantial interest in the *strength* of the transactional contracts. For the state, there is the need to ensure an asset performs over its life course and that consumer charges are fair and acceptable, especially given the role of the state in shoring up the monopoly positions

typically expected by infrastructure owners and operators. For the investor, there is the need for regulated conditions that guarantee a rate of return sufficient to cover operating costs and to ensure that the life of the infrastructure asset or concession is sufficient to amortise sunk costs without balance sheet distress. There is also the need for ownership assurance, including of property and access rights (O'Neill, 2013), a primary risk-management issue given the high level of uncertainty surrounding the operation of a large urban infrastructure asset over many decades (see also Stern, 2012). Typically, then, contracts are the vehicle for specifications of ownership rights, including property rights, competition obligations and exclusions, and maintenance and performance expectations. Yet, given the peculiar nature of the infrastructure sector, and the unlikelihood of being able to import pre-existing regulatory devices and processes from other sectors or jurisdictions, infrastructure contracts between governments and investors have invariably been constructed on an individualised (and expensive) basis.

It is noteworthy, too, that the persistence of one-off regulatory arrangements in the infrastructure sector feeds a well-remunerated pool of expert lawyers,

financial advisers and related professional services providers, and that there is evidence of significant knowledge transfer internally and informally within these professional groups. Yet these practices have not yet evolved into the standardised and transparent regulatory systems that pervade other economic sectors via global ISO product standards, national product regulations, international trade agreements, financial standards and practices legislation and agreements and so on. Instead, rules and practices for the infrastructure sector are installed and transacted by what Cutler (for the defence and security sector) sees as a tendency to be:

... shaped by private actors, institutions and processes that operate transnationally, linking local and global orders through complex laws and regulatory arrangements [where] private governance arrangements are legitimised through their claims to possess expert knowledge and authority. (Cutler, 2010: 157)

Clearly research is needed to guide public understanding of infrastructure investment regulation, and Clark (1992) is an important general reference. He examines the role of administrative and non-parliamentary agencies in negotiating new forms of economic activity in the US during the 1980s when the influence of nationally-orientated New Deal institutions was diminishing. There are strong parallels with the infrastructure sector: while this sector is thinly regulated across national and international jurisdictions, the transactions that constitute the sector through actual investment events and asset operations are heavily regulated by the administrative agencies of the state through their processing and approvals roles. These agencies are professionally-staffed, formal rules-based organisations with high-level capacity to negotiate conditions and rights for the private ownership and operation of large infrastructure assets. While the process of

negotiation is time-consuming and expensive in terms of human resources, the agencies take responsibility for knowing and interpreting relevant rules and procedures as circumstances change, for prescribing individualised regulatory conditions to each infrastructure approval and for maintaining consistency in approach from one approval to another. The process is bureaucratic and probably inefficient, but it does generate acceptable outcomes for the parties involved. In contrast, moves to standardisation are impeded by the difficulty of identifying, specifying and mandating common standards across jurisdictions, particularly in federal systems like the US and Australia where state laws and regulatory practices change significantly across borders. Moreover, drawing again on Clark (1992), administrators and investors are always uneasy about court referrals for cost, time and inconvenience reasons and where judicial certainty is limited by the absence of public governance codes for the sector. The combined effect of these characteristics is that regulatory conditions for infrastructure assets remain in the hands of negotiators and interpreters (see Clark, 1992: 621) in a contested process where the contributions of professional elites cannot be overstated.

The regulatory process for private infrastructure investment, then, generates a regulatory fix, but not without ongoing problems. The transactions costs for each regulatory negotiation are very high, obviously. There are concerns too that agreed outcomes are typically subject to non-disclosure agreements between the parties so the public – its parliament, the academy, public discourse, the media – is excluded from participating in the formation or oversight of regulations governing infrastructure provision. Importantly, concerns were expressed recently by the UK's National Audit Office over the presence of non-disclosure clauses and undisclosed agreements found in the Audit Office's overview

of the private finance initiative (PFI) (National Audit Office, 2015), suggesting that current bespoke arrangements are by no means an acceptable long term way to guarantee protection of the public interest now that private infrastructure investment has become common. The combined effect, then, of the high cost of deal making and the risks that might come with re-opening privately agreed contracts is a reluctance to change conditions governing the operation of the asset and how its revenue base is secured even when the dynamics and needs of the host city are changing.

Conclusions

Before we conclude, we make an assessment of our contribution. Our objective has been to reposition the financialisation of urban infrastructure as the concern of urban scholarship because of its presence as an urban process rather than a political economy process in the first instance, without abandoning a commitment to progressive politics. This has involved a fraught research exercise where we have attempted to take information from private industry data bases and from interviews with corporate elites employed to maximise returns on capital invested in the infrastructure sector so that we could construct generalisations for critical discussion with an urban studies audience. In Clark's (1998: 78) words, we have attempted to navigate the to-and-fro from theory to close dialogue and from close dialogue back to theory, without generating 'theory-enslaved stylized facts' (Clark, 1998: 79), on one hand, and without creating little more than a trends map for an investment magazine, on the other. We are confident that we have made a start, but there is much more work to be done.

In summary, then, we have shown how infrastructure is a package of organisational types, capital structures and regulations that

create the circumstances and conditions for the entry of finance into the world of infrastructure. Without this package in place, private finance would not become involved. The issue then – in the context of distressed public sector balance sheets – is what circumstances and conditions will generate the appropriate level and type of private finance that is needed. We have explored some of the options that are emerging, and made some assessments of the directions that hold promise and the concerns that need monitoring. We now make five conclusions to our overall discussion.

The first is a reiteration of an appeal for shift in political attitudes towards the presence of private finance in the infrastructure sector. At the very least, fiscal disability at all levels of government across the OECD world precludes both capital raising for investment in new and replacement infrastructure and growth in operational expenses as we observe in public transport operation. There is also now a proven capacity for private operators of infrastructure systems to generate efficiency savings, patronage/consumption optimisation and services innovation to degrees no longer accomplishable, it seems, by public sector agencies. Instead of arguments for reversion to a mid-20th-century provisioning model whose desirability has become largely fantasised, there needs to be a politics of support for financial practices which show how to realise opportunities that come with engagements with private finance, acknowledge the importance of revenue raising configurations of services provision and embrace private sector-led innovations and efficiency improvements. As Mike Raco argues for urban planning in general, what we need is:

... an approach that emphasises the hybridities that characterise actually existing policies [and therefore] provides the discursive and intellectual space to develop alternative and broader

ranging conceptions of development processes and practices. (Raco, 2005: 344)

Of course, positive reception to private infrastructure investment is a difficult task, with many of the wider purposes of infrastructure at risk in this act of conversion. There is the need to ensure the shared outputs of infrastructure operation, the positive externalities, are distributed rather than blocked or corralled; a duty which is as yet unable to be assigned to the private sector with any confidence. What is required, then, is a framework capable of dealing with all this hybridity without being trapped by the political intransigence that comes when the debate is framed within a public sector/private sector binary, while remaining intensely political about the social and environmental outcomes which are being sought from an ongoing presence of desirable urban infrastructure. Such a framework needs close and careful preparation, as we have tried to demonstrate.

A second conclusion is the understanding that there is no such thing as finance as purely finance. Finance always comes with heft, and in this article we have analysed the hefty categories of organisation, capital structure and regulation that fill out real-world flows of finance. It is through these three domains that finance is delivered to the infrastructure sector. A consequence is that detailed conversations and negotiations around organisation, capital structure and regulation must be part of the process through which private finance enters the infrastructure sector. This makes infrastructure finance an immensely complex thing. Not engaging with this complexity, however, privileges private capital's claim on infrastructure operation as a discrete portfolio of revenue-raising ventures. Broader, more inclusive ideas about infrastructure's worth necessarily drive attention to organisation, capital structure and regulation, but not just

as ways of better knowing infrastructure and its financing directions but as tools for shaping what these directions might be.

A third conclusion concerns the political opportunity that comes with the heft of infrastructure finance. Certainly the complexities we have discussed generate expensive obstructions to infrastructure planning and operation. At the same time they turn the act of infrastructure financing into a pivotal act of urban planning by opening a substantial field of powers and processes for decision making that will impact on spatial organisation and governance for long time periods. At a time when there is concern about urban planning lacking the levers for generating effective outcomes, consciousness about modes of private infrastructure financing can re-jig a privatisation trend into a process of betterment across a range of economic, social and environmental portfolios.

Yet possessing decision making powers with which to broker concessions is insufficient. The better opportunity comes from understanding a key truth: that the private infrastructure investor seeks an urban configuration through which the infrastructure investment can become profitable. This brings into the negotiation room (see Le Heron, 2013) discussions about the processes that give a city its structure and shape, and then its daily flows and rhythms. Planners and investors together, therefore, need to give elevated consideration to the repetition and regularities of a city's flows, with infrastructure being a generative act with highly significant economic, social and environmental outcomes. In Scott and Storper's (2015: 6) language, as we cite above, we need to conceive of the city as 'complex congeries of human activities'. Negotiating private finance into urban infrastructure is necessarily a negotiation of what flows will be invested in and propagated and what flows are minimised or shut down. Educated,

informed, clever understandings are much needed in these negotiations.

A fourth conclusion follows which is that negotiations around infrastructure finance require a financial literacy where negotiators not only understand what is being talked about, but where they are equipped with a language of engagement that enables negotiations to traverse the terrains of inclusiveness and sustainability. The language of infrastructure finance then needs to be enriched with ways to talk about aspirations for good cities without resort to the limiting discourse of the financier and the narrow view of the city it demands. Fainstein (2016) shows the difficult political terrain that needs to be navigated if new forms of infrastructure financing can be deployed in effective and fair ways.

Finally, we point to some next steps for developing the framework. This article has attempted to lay out the dimensions through which finance and urban infrastructure intersect but it does this in a general way so as to suggest ways of talking systematically about this intersection. This conceptualisation now needs to be translated into specific understandings about how new modes of urban infrastructure financing shape our cities. Specific explorations of the role of organisational and capital structure and of regulatory environment are needed, not just to expand our understanding of the financialisation of urban infrastructure but to guide intervention possibilities for more sustainable, just outcomes. Here we point also to the need for an empirical and conceptual focus beyond the OECD boundaries which define our work here. Certainly there are formal barriers to institutional investment in the non-OECD world: our informants tell us that ratings agencies use the borders of the OECD community as hard boundaries to the assessable world of infrastructure investing, and that fund managers are reluctant to invest in the non-OECD world

as a consequence. Yet different organisational, capital and regulatory structures for infrastructure investment are evolving outside the OECD (see Mohan and Tan-Mullins, 2019) and these need understanding given their importance in the evolution of cities outside the rich world.

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Notes

1. Although his work is not contemporaneous to this article, we are inspired by Ronald Coase's grounded, political and thoroughly empirical approach to utilities and public goods. Coase was very much concerned with the processes of negotiation over the economic problem rather than the search for higher order abstractions that typified his peers. Coase's interest in the nature of public and monopoly goods came from close observations of their development: the rise of a broadcasting service (Coase, 1947) and a national electricity grid (Coase, 1950), the tensions between regulators and utility operators (Coase, 1939), the justifications for monopoly postal services (Coase, 1961), the rationale for price setting in utilities (Coase, 1970) and, famously, the complexities of the provision of lighthouse services for coastal shipping and ports (Coase, 1974). One can see across these writings Coase's curiosity about the influences of institutional structure on economy;

in particular, the ways economic transactions pertaining to what we now call infrastructure are framed by organisational and regulatory circumstances (Coase, 1937).

2. For calculative practices, see Engelen (2009); Millo and MacKenzie (2009). For institutional practices and resources, see Clark (1997); Clark and Evans (1998); Clark and Monk (2015). For the business of talk see Boden (1994).
3. An example is the UK water utilities, where significant capital gain accrued to first movers through the simple act of replacing equity capital with debt (Armitage, 2012).

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