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Risking multi-billion decisions on underground railways: Land value capture, differential rent and financialization in London and Hong Kong

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ABSTRACT

Rapid urbanization has brought the needs to minimize negative transport externalities in cities to the forefront. The development of metros is a response to urban sustainability challenges, but the construction of underground infrastructure often requires massive excavation and long construction time, disrupts the economy and people's everyday living, and is highly capital intensive. As such, these multi-billion-dollar investment decisions require political vision and determination, careful traffic analysis, and the ability to raise sufficient funds to cover not only capital construction costs but also future operations and depreciation. Underground infrastructure projects must, therefore, balance the engineering aspects of a proposed project with the development of a resilient and sustainable business model. This paper is the first to develop a comparative longitudinal analysis of the finance and funding models of two underground systems (London Underground and Hong Kong's Mass Transit Railway) with a focus on the development of a conceptual framework for understanding land value capture (LVC) based on differential rents and financialization. The focus is on exploring the supply-side aspects of underground transport infrastructure including finance or capital investment and the relationship with funding or revenue streams and the creation of financially sustainable business models.

1. Introduction

Population growth has led to an increase in the intensity and density of urban living (United Nations, Department of Economic and Social Affairs, 2014). This is transforming cities and accentuating the importance of underground transport infrastructure, especially underground railways or metros. The development of metros is a response to road traffic congestion, various transport negative externalities (notably carbon emissions noise and particulate matter), land shortages and the escalating value of urban land (Loo and Banister, 2016; Loo, 2018). The construction of underground infrastructure, however, often requires massive excavation and long construction time, disrupts the economy and people's everyday living, and is highly capital intensive. As such, cities reaching a certain stage of population and income size (Loo and Cheng, 2010; Loo and Li, 2006) are often confronted with the critical but difficult decision to build a metro or to invest in other forms of transport infrastructure. These multi-billion-dollar investment decisions (versus small-scale local infrastructure, see Bryson et al, 2018) require political vision and determination, careful traffic analysis, and the ability to raise sufficient funds to cover not only the capital construction costs but also future operations and depreciation costs for long-term maintenance. Underground infrastructure projects must, therefore, balance the engineering aspects of a proposed project with the development of a resilient and sustainable business model.

With reference to underground railways or metros, what were some of the more successful business models? What lessons can we learnt from these examples? The public financing (upfront capital costs) and funding (revenue) of infrastructure reflects finance and funding conventions that have been established at a particular time and place. These conventions alter as new financing models are created over time. Guided by this historical perspective and the above research questions, this paper develops a comparative longitudinal analysis of the finance and funding models of two underground systems: the London Underground and Hong Kong's Mass Transit Railway (MTR). The focus is on exploring the supply-side aspects of underground transport infrastructure including finance or capital investment and the relationship with funding or revenue streams and the creation of financially sustainable business models. There are a number of on-going debates here including the financialization of urban land by private capital (Torrance, 2009; Theurillat et al., 2016) and alternative approaches to financing infrastructure including *land value capture* (LVC) (Bryson et al., 2017). Our focus is on understanding LVC's contribution to developing financially sustainable underground infrastructure business models that try to develop a balance between revenue flows and capital investment. *LVC is a financial tool designed to monetise the escalation in land values in the catchment area of public infrastructure projects.* Infrastructure projects increase the accessibility and connectively of land and this is reflected in the value of land around key access points to a

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transport network. Thus, underground infrastructure investments have two returns. First, a direct return measured by time saved in travelling between places reflecting the use and policy values of infrastructure projects. Second, indirect impacts that alter the value of land providing benefits to those not directly involved in financing or funding infrastructure investment. LVC tries to capture some of the latter as a contribution to the finance and funding of public sector infrastructure projects. There is an on-going debate on LVC, for example, Du and Mulley (2007) could identify no short-run impacts from a metro extension in Sunderland, UK, while Pagliara and Papa (2011) found that rail development increased land values in Naples in Italy.

Most existing studies focused on above ground rail infrastructure (including light rails) while the role played by LVC in financing and funding underground projects remains largely unknown (see a review Mohammad et al., 2013). Given the diverse geographical contexts, a longitudinal and comparative approach is needed. This paper's research design is a comparative longitudinal case study. The comparative analysis of London Underground and the MTR aims to highlight the impacts of different histories on the funding/financing of these underground systems. The methodology involved identifying and analysing primary and secondary published and unpublished sources including policy documents and reviews. A triangulation approach was used to develop the two case studies. The paper is divided into five sections. After this introduction, the second section reviews the literature on the financing of underground railways to develop a new conceptual approach for exploring LVC developed from the urban rent theory. The third section explores finance and funding and the evolution of the London underground; and the fourth section develops the analysis of the MTR. The final section is a discussion and conclusion that compares and contrasts the financing and funding of these very different underground systems.

2. Land value capture, differential rent and financialization of railway infrastructure

A distinctive feature of cities lies in their high infrastructural intensity. Railways, undergrounds, roads, airports and commercial buildings provide the infrastructure for the circulation of people, but also rely on financial infrastructure in which capital is temporarily 'fixed' into the built environment. With a typical life span of 50 years or above, the difficulty is that the returns on transport infrastructure occur over a very long-time period. Moreover, the returns on any infrastructure investment are complex and are not just financial. This explains the role public sector financing plays in infrastructure development. More recently, the application of cost-benefit analysis to mega-transport infrastructure, such as airports, highlighted the wider social and environmental impacts of such investments (Li and Loo, 2016). Kaliampakos et al. (2016) reviewed the costs and benefits of modern undergrounds in different countries including social and environmental externalities. They highlighted that underground solutions resulted in more efficient infrastructure usage, improved urban transportation capacity and increased resilience. Such wider positive benefits may be considered as justifications for the application of public subsidy.

An on-going debate in the social sciences has identified a prevailing trend since the 1970s of 'financialization'. This process has many different definitions, but the term highlights the increasing importance of financial motives, markets and financial intermediaries in shaping economies and decision-making (Epstein, 2005). Much of this debate explores the ways in which various intermediary actors (developers, property consultants and property investors) 'perform the various translations required for anchoring financial capital in the city' (Theurillat, et al., 2016: 1510). This debate has highlighted that:

> 'The shift of responsibility for essential urban services into the hands of global financial institutions has created infrastructure assets that may be in different cities, countries and continents but that may be more linked through similar internal rates of return objectives, risk management and refinancing strategies, and ultimately, stable, predictable types of returns for the investors that own the assets' (Torrance, 2009: 818)

This is very much an over-generalisation as the analysis must highlight which urban services are implicated in this process and in which countries. There must also be an analysis of strategies that are intended to mediate some of the adverse impacts of financialization (Bryson et al., 2017). In addition, the debate on financialization has a tendency to focus on financial capital and particular types of financial instrument, whilst ignoring land tenure and some of the earlier literature on urban rent, global finance and property development and investment (Bryson, 1997; Haila, 2016).

Rent is, by its very nature a social relationship; it is both an instrument and a concept and these change over time. The theory of urban rent has its origins in the third volume of Capital (Marx, 1984) and rent in this analysis was paid for the right to use a piece of land with some 'interest on fixed capital' which is 'incorporated in the land, which may constitute an addition to ground-rent' (Marx, 1984: 622). Marx distinguished between two types of rent. First, *absolute rent* results from the ability of landowners to charge rent for land, irrespective of its location or fertility. It is the minimum payment required in return for the use of a unit of land. Secondly, *differential rent* results from differences in the rates of profit obtainable from land that possesses unequal capacities including connectivity (Bryson, 1997: 1445). There are two types of differential rent. *Differential rent I* is a 'function of the advantages offered by the site of a property, and which do not depend on any action by the owner' (Larmarche, 1976: 100). This includes public sector infrastructural investment that transforms a land plot's relationship to other plots in some way by enhancing accessibility. *Differential rent II* is derived from differences in the production methods applied to a plot of land; this form of rent comes from the advantages contained within the curtilage of a plot, for example the development on a plot of a 20 storey office building compared to 10 storey building. The application of development finance to a plot results in an addition to differential rent II whereas an escalation in differential rent I is directly linked to investments in surrounding plots made by other land owners and public and private sector infrastructure investments, for example in light rail and underground transport.

This is the first paper to identify and develop the relationship between LVC and urban rent theory. We argue that the application of urban rent theory to infrastructure investments provides a conceptual framework for exploring the finance and funding of underground railways based on LVC. The focus is on differential rent I and the effect on the value of adjacent plots. These effects are unearned as they do not reflect any investment by the owners of plots that are adjacent to or within the impact reach of benefits that result from investments that create the differential rent in the first place. It is possible to argue that any uplift in the value of a plot's differential rent I reflects, to some extent, some type of compensation to property owners affected by disruptions associated with major infrastructural investments. It is important that the focus of any analysis of LVC not only explores the relationships between these two types of rent – I and II, but also begins to unravel the complexity of the former. Thus, we argue that differential rent I should be conceptually further divided into two sub-types. First, *differential rent Ia* results from infrastructural investments that enhance connectivity and accessibility. These investments are planned by the public sector and may be financed and funded by the public and/or private sector. It is these impacts that represent LVC uplift. Second, *differential rent Ib* comes from investments in adjacent plots that are often undertaken by the private sector but that influence the value of adjacent plots. This means that the value of a plot is calculated by using the following equation: