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Land Value Capture Tools: Integrating Transit and Land Use through Finance to Enable Economic Value Creation

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Abstract

Cities in the 21st century are wanting urban rail linked to Transit Oriented Development (TOD) for economic, social and environmental outcomes. However, traditional sources of funding and planning governance are failing due to the limitations of government accessed capital and even where urban rail is built, TOD's are not always created due to a lack of integrative governance. This paper shows how private finance and expertise can be both the source of rail capital and the integrative governance force required for co-operative partnership-based TOD's. We call this TFUL—transit, finance and urban land development. A range of tools for land value capture (LVC) are outlined that are used to provide TFUL outcomes though some are better than others for creating economic value in the resulting TOD's. The differences are shown to be related to the need to integrate financial capital, political capital and social capital; in particular this is due to how much private investment and expertise is incorporated into the LVC process along with the usual community and government processes. Case studies from developed and emerging cities are outlined for each of the four groups of LVC tools: Fully Public: Land-Based Levies; Partially Private: Tax Increment Financing; Partially Public: Special Improvement Districts; and Fully Private: Entrepreneur Rail Development. The conclusions drawn from this analysis support the significance of private sector involvement from the concept stage for TFUL projects to enable wider economic value creation and land value capture opportunities.

Keywords

Urban Rail, Economic Value, Land Value Capture, PPP

1. Introduction

The growth in demand for new urban rail lines in the 21st century has been dramatic in all parts of the globe, especially in China and India but also in most developed cities (Newman & Kenworthy, 2015). The patronage of existing urban rail systems has seen a significant rise in this period suggesting there is now a major market for urban rail. Whilst traditionally these projects have been predominantly government-funded across the globe they are now struggling to meet the required finances to cater for transit demand. The conventional loan and subsidy based public investments have been unable to meet the demand. Urban rail agencies have attempted to recover operational and capital costs through farebox revenue whilst at the same time undertaking network expansion, operation and maintenance. But agencies have significantly struggled to even recover operating cost as farebox revenue is inherently limited due to equity demands (Jillella et al., 2016; Newman & Kenworthy, 2015; Newman, Glazebrook, & Kenworthy, 2013; Sharma, Newman, & Matan, 2015).

The fiscal challenge for urban rail has prompted cities to find alternative funding and seek different governance frameworks to implement rail projects. The political and economic driver in creating new urban rail is not just dealing with transport problems but in providing for the demand in the associated transit-oriented urban fabric: Transit Oriented Developments (TOD's). Cities are recognizing the potential of urban rail in creating economic value through its multiple non-transport benefits that form the basis for the creation of TOD's: its impact on land values and thus its potential for influencing more intensive land development and hence urban regeneration with its associated agglomeration benefits (Banister & Thurstain-Goodwin, 2011; Capello, 2011; Newman, Davies-Slate, & Jones, 2017; Newman & Kenworthy, 2015; Sharma & Newman, 2017; Glaeser, 2011).

The gains in land value due to urban rail are widely documented and can be managed through land value capture tools to help finance urban rail (Anantsuksomsri & Tontisirin, 2015; Armstrong & Rodriguez, 2006; Cervero, 2003; Du & Mulley, 2007; Garrett, 2004; Laakso, 1992; McIntosh, Trubka & Newman, 2014; Medda & Modelewska, 2009; Mulley, 2014; Newman, Davies-Slate, & Jones, 2017; Sharma & Newman, 2017; Sharma & Newman, 2018; Yankaya, 2004). The kind of focused land development, Transit Oriented Development, that is fostered by this process is a major economic benefit both in the agglomeration economies and the savings in alternative more scattered urban forms that it replaces (Cervero, Ferrell, & Murphy, 2002; Noland et al., 2014; Trubka, Newman, & Bilsborough, 2010). The land development is also an important parameter in operational efficiencies for urban rail systems as TOD's have significantly lower car dependence and enable two-ways flows of people along corridors minimizing peak loading issues (Noland et al., 2014; Cervero, 2004).

As private investment is needed for land development and the project life

cycle of urban rail systems is generally longer than any road based system, there is a need to consider how best to involve private finance in this integrated approach to the development of transit and TOD's. There are multiple benefits when the transit, land use and finance are integrated (Giuliano, 2004; Bowman & Ambrosini, 2000; Medda, 2012; Pojani & Stead, 2015; Sharma, Newman, & Matan, 2015).

This three-dimensional integrated development approach we have called TFUL—transit, finance, and urban land development. We suggest it can simultaneously meet the demand for urban rail and for focused, well-located urban redevelopments. The TFUL approach can trigger a space for various levels of private sector investment and involvement in urban rail projects, from entrepreneur models that are predominantly private investment through to traditional land value capture that is predominantly government-based (Newman, Davies-Slate, & Jones, 2017; Mathur, 2014; Zhao, Das & Larson, 2012a). This paper will expand on these tools to show how they can be tailored to meet the needs of different combinations of public and private investment. This paper focuses on how urban rail and TOD's can be integrated using private finance but can be extended into some of the new ideas about how main roads corridors can be turned into Transit Activated Corridors (Newman et al., 2020).

This TFUL approach of integrated development is not new and was used in 19th and early 20th century rail development in Japan, Australia, Canada and America, mostly to develop green fields with linked real estate projects. As 21st century cities are now redeveloping more than spreading out into greenfields (Newman & Kenworthy, 2015), the TFUL approach can now be reinvented to achieve urban redevelopment and regeneration goals. The second rail revolution (Newman, Glazebrook, & Kenworthy, 2013) has enabled cities to create a new market for integrated TOD's and hence the demand for greater integration of private finance.

As cities are a mix of urban fabrics—walking, transit, automobile—the TFUL needs to be used in each kind of fabric area: rejuvenating central city walking fabric, rebuilding old station hubs along transit fabric and most importantly enabling automobile fabric with its car dependent, single use housing estates and shopping centers to create new multiple use TOD's in the suburbs (see The Theory of Urban Fabrics Chapter in Newman & Kenworthy, 2015; Newman, Kosonen, & Kenworthy, 2016; Newman, Davies-Slate, & Jones, 2017). Thus, the paper will pursue not just how to better integrate TFUL but how to do it in different kinds of urban fabric.

Land value capture (LVC) tools enable the TFUL approach to be implemented. Other than being a public financing option for urban rail where public funding is limited, LVC is being used by governments to help create greater urban economic value by channeling private funds directly into the dense urban centers that are desired in their urban plans. Thus, LVC Tools can be seen as an economically progressive revenue for cities with the potential to drive urban

land development into economic gains. This ensures it is an essential tool to be applied to cities. Cities around the world are using this TFUL approach; for example in India and Australia over the last years, the federal governments have actively advised cities to implement LVC to finance urban rail projects (Commonwealth of Australia, 2016; Ministry of Urban Development, 2017; Newman, Davies-Slate, & Jones, 2017).

Development of LVC tools is an evolving process and various tools have been classified based on their different timing, payment schedule, incidence (Chapman, 2017), scale and actors involved (Connolly & Wall, 2016; Medda, 2012; Peterson, 2009; Smolka, 2013; Walters, 2012; Zhao et al., 2012b).

In this paper we divide all major land value tools into four broad categories to emphasize their different character and different functions depending on the extent to which private participation and options are possible to involve in the planning process. We investigate the dynamics of land value capture tools by analyzing cases from both developed and emerging cities to investigate the most suitable tools for TFUL development for wider value creation and economic gains. We further discuss the importance of involving the private sector at various stages of the project in creating value and wider economic gains.

In the next section we discuss why there is a need for private investment in urban rail after decades of managing without it.

2. Limitations of Conventional Funding of Urban Rail

Urban rail systems have historically faced financial deficits when they are highly dependent on fare box revenue and conventional financial support from government (Sharma, Newman, & Matan, 2015; Ubbels et al., 2001). The conventional financial support for urban rail is based mostly on subsidies and loans; both of these are becoming increasingly limited (Graham & Van Dender, 2011; Ingram & Hong, 2012; Medda & Modelewska, 2009; Salon & Shewmake, 2011; Zhao et al., 2012b).

2.1. Subsidies

Proost et al. (1999, as cited in Ubbels et al., 2001) argue that subsidies work against economic efficiency and have been excessive. Subsidies impose either higher taxes, reduced spending on other public services, or both (Smith & Gihring, 2006). Transit subsidies have also been widely criticized for worsening the productivity and efficiency of transit agencies (Cropper & Bhattacharya, 2012; Pucher & Lefèvre, 1996; Pucher, Markstedt, & Hirschman, 1983).

Subsidies for transit systems are based on the notion of transit being a "service" and fare revenues cannot financially sustain the system anywhere in the world as equity considerations prevent fares being large enough for a completely user pays system. Thus, transit systems have not been extended as they cost too much for governments and hence minimal bus services have been the standard in many cities. But this has not prevented highly subsidized road systems from

being built into urban areas that have resulted in car-based urban sprawl as no alternative urban fabric is possible without its base in alternative transport systems (Brueckner, 2005; Buehler & Pucher, 2011; Parry & Small, 2009; Newman, Kosonen, & Kenworthy, 2016; Tscharaktschiew & Hirte, 2012). This is a political priority but increasingly the sheer economics of subsidizing road and rail has been forcing cities to review their political priorities.

Therefore, cities are facing hard choices: first, increase subsidies by building more rail transit into their cities and hence creating the urban forms that are in demand, or second, save transit operating subsidies by building more urban road systems which support car-based urban sprawl. This paper points to a better way where subsidies are reduced and urban rail is built by integrating it with urban land development that can pay for capital and on-going operational expenses.

2.2. Loans

Governments have to borrow money for their spending needs and their financial accreditation determines their ability to raise funds. The global economic recession of 2008, significantly restricted governments, urban enterprises and financial institutions in their lending activities (Medda, 2012). The need for investment in infrastructure however has not diminished, for instance: the USA faces an infrastructure deficit worth USD 3.6 trillion (American Society of Civil Engineers, 2013); India needs about USD 20 billion for urban rail (Planning Commission of India, 2011); China requires about USD 44 billion for constructing new urban rail lines (KPMG, 2016; Schulz & Smith, 2015); and, Australia is planning to expand urban rail in all their major cities. Rebuilding after the Covid-19 pandemic is likely to have a strong need for infrastructure, especially for electric mobility linked to renewable energy to meet Paris Agreement goals, hence the need for new investment will continue.

The current market interest rate for loans in countries against a capital-intensive urban rail project with a high-risk profile (a project based on proposed high ridership) can push public and private urban rail developers into a series of debt and fiscal deficit problems (Flyvberg, 2007; Sharma, Newman, & Matan, 2015). Most countries are therefore seeking significant partnerships with private investments for implementing such urban rail projects as the political pressures to solve transport problems continue to grow as does the awareness that urban road capacity increases are never going to solve traffic congestion (Newman & Kenworthy, 2015).

Governments are exploring the option of concessional loans of 1% or below 1% interest rates that may incentivize urban rail development and private participation. These are likely to be more easily available in a post-pandemic rebuild. But in all these loan scenarios, if the project is highly dependent on fare box revenue the risk of servicing their capital debt will still exist which will result in growing subsidies. There is evidence to show that the application of land

value capture tools can be used to service the debt for both scenarios (McIntosh, Trubka, & Newman, 2014; Sharma & Newman, 2017; Sharma & Newman, 2018).

Thus, the vicious cycle of conventional revenue and costs—loans, fare box-subsidies—seems to be economically regressive for urban rail. This may be avoided through application of LVC tools for TFUL development to unlock wider urban economic gains—as TFUL development can cover various essential urban components such as transit provision and catering to urban growth demand in an integrated and sustainable way (McIntosh, Trubka, & Newman, 2014; Newman & Kenworthy, 2015; Suzuki, Cervero, & Iuchi, 2013; Wang & Lo, 2016).

3. Why Private Investment in TFUL Creates Economic Value

Transport infrastructure is a fundamental part of the urban economic value partnership as it creates the urban fabric around which the economy is created (Glaeser & Kahn, 2004; Newman, Kosonen, & Kenworthy, 2016). The three urban fabrics each have their roles in urban economic value creation:

1) Walking city urban fabric: where major government services and private financial services are provided as well as many tourist and recreational services;

2) Transit city urban fabric (TOD's): around which increasingly the knowledge economy services of education and health and many second tier business services are created; and

3) Automobile city urban fabric: around which manufacturing and consumer services and space-hungry freight services are created and where increasing need is now seen for transit fabric.

The overlap of these city fabrics and the trend towards knowledge economy jobs in cities means that there is an increasing demand to create TOD's and this means TFUL projects, where car use is minimized allowing space efficient dense urbanism to be created (Newman, Matan, & Mcintosh, 2015). However, each of these urban fabrics requires significant private investment.

There are several ways of understanding how private sector investment creates economic value in cities. Wealth creation is essentially a process that is based on a combination of the hard infrastructure that services buildings and their needs as well as the soft infrastructure that enables opportunities for innovation and job creation (Newman, Davies-Slate, & Jones, 2017; Glaeser, 2011; Porter, 1998). The private sector do the vast majority of this city building within a framework of governance providing equity and sustainability, and a wider framework of community values. The three sectors of private, government and community, need to work in partnership to enable urban economic value creation (Newman & Kenworthy, 1999, 2015). Such economic value in cities is the major element of economic growth around the world. See **Figure 1**.

Economic value is created in a city through integrating different forms of capital that are all involved in city building:

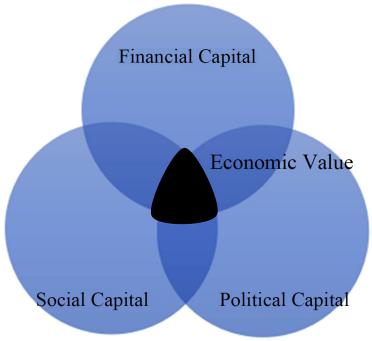

Figure 1. Economic value creation through integration of financial, social and political capital.

- **Financial capital** is necessary to build anything in a city; this depends on a range of technical assessments of how well the infrastructure will be used and what kind of demand there is for the urban development. This financial capital depends on risk assessment and demand evaluation which are also associated with social capital.
- **Social capital** comes from communities that develop trust in an urban development because they see it meets their needs and they recognize the risk if they don't have the new infrastructure and urban development. Social capital provides the ethical value and third-party political validation necessary for the difficult process of urban regeneration.
- **Political capital** is about the system of government which provides the settings and processes that either encourage or discourage the infrastructure and urban development. The political capital is a combination of the transport and town planning regulations and the way it enables the links to the other kinds of capital.

When the three kinds of capital—financial, social and political—are integrated into a partnership then the best and highest value is created. This is what we suggest is the basis of economic value and in terms of transit and TO's it can be measured in terms of resulting flows of urban activity and agglomeration benefits as the transport itself is not a benefit unless it produces these kinds of outcomes. But such economic value depends on the three other kinds of value being integrated.

Underlying the need for investment in TFUL is the need for risk management that can enable both rail investment and urban development investment together. In both investment situations there is a need for the three sectors of private, government and community to be in partnership if the full economic value of a TFUL project is to be enabled.

Governments play the most important role in risk management in these partnerships. They need to encourage an optimal land use mix through zoning and other planning processes, and they need to provide a system of operating transit that integrates with the rest of the system and with local interchanges especially the new micro-mobility "last mile" systems. They need to do the planning for

long-term project life cycle risks, and all the land assembly and statutory planning requirements of local amenity. Community is needed to ensure the TFUL provides the extra services and opportunities as well as the specific demands of local amenity as part of the bigger goals for access and new services in the TOD. Community support is ultimately the biggest part of political risk. Private sector involvement can address risk management by bringing innovation, technology, design stage efficiency, market driven land development skills, improved operational efficiency and long-term value for money through risk sharing. These skills are not readily available within government. Together, these risk management skills and processes can ensure integrated transit and TOD projects.

Figure 2 is a qualitative explanation of sharing risk for private participation in an urban rail project life cycle. The risk appetite of the private sector is higher when it is involved from the concept/development (design) stage of the project and it decreases when the participation happens during the following stages of the life cycle. This is due to the fact that the private sector would be able to decide on technology, infrastructure, cost optimization, revenue streams and others for the project life cycle during the concept and planning stage. Private participation in urban rail projects has shown efficient exploitation of non-transport revenues such as advertisement, station area development and kiosks/shops at stations along with bringing efficiency in construction and operations when involved from the design stage. Bigger projects which depend on even more land development for private investment opportunities, require even more obvious ways of incorporating private bids on how best to do it.

Involvement of the private sector at design stages can also enhance budget predictability for government. If the private sector take more life cycle risk then it is possible to secure economies of scale (GIZ, 2013; Sakamoto, Delka, & Metschies, 2010; Sharma, Newman, & Matan, 2015; The World Bank, 2016). After the design stage, optimization of cost and revenue streams becomes limited in the construction stage and even further limits opportunities in the operational stage of urban rail if private sector involvement is delayed.

In sectors like mining and energy private participation has been engaged from the concept stage for many decades, which has proven to show positive results (Cheah & Garvin, 2009). Transport has been mixed in its involvement with the private sector. Airports and seaports have become primarily private investment-based incorporating much closer integration with land development as a result. In the Modernist period of planning after the 1940's both road and rail have been primarily public within a strongly silo'ed regime of governance. Urban road provision remains heavily government based with some toll roads but few links to urban land development. Urban rail has been seen as a completely public responsibility in most developed and emerging cities with a few exceptions in Asia. However as shown below a range of mechanism are now developing to enable the same partnership approach to be applied for a TFUL development.

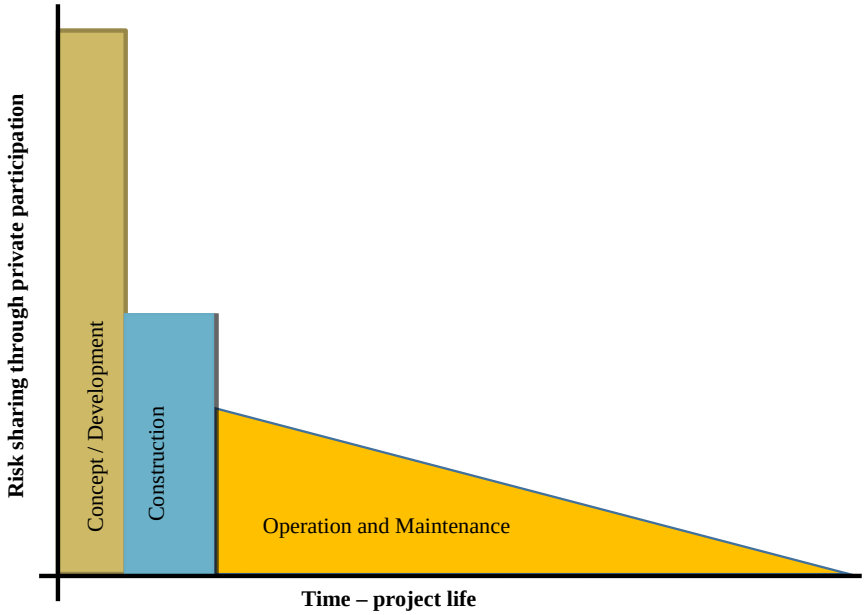

Figure 2. Urban rail project risks—sharing through private participation. Source: Authors.

In order to optimize private participation LVC tools need to be aligned with two core needs:

1) How much cities are looking for help with funding and financing of TFUL development to avoid conventional sources of finance, and

2) The extent to which cities are looking for economic outcomes in the associated TODs.

In the next section we discuss land value capture tools' potential for TFUL development with private participation by discussing how land value increases happen.

4. How Land Value Increases Due to Urban Rail

The impact of urban rail on land value is well documented (Anantsuksomsri & Tontisirin, 2015; Armstrong & Rodriguez, 2006; Cervero, 2003; Du & Mulley, 2007; Garrett, 2004; Laakso, 1992; Medda & Modelewska, 2009; Mulley, 2014; Sharma & Newman, 2017; Sharma & Newman, 2018; Yankaya, 2004). There is a large variation in how much land value increases; this is expected as the factors that cause land value to increase include: the extent to which a station precinct is now connected to an improved transport system that can save time; how much local amenity is improved around the station for walkability simply enjoying the urban experience (Gehl, 2013); and probably most of all whether other economic opportunities are created through the TOD with its access to the train line and through agglomeration processes.

Land value gain is generally estimated through quantitative price modelling (Freeman, 1979; Rosen, 1974). Hedonic price models have revealed the land value increase with respect to distance from stations at about 16% of the land value

up to 1 km from the urban rail station in Izmir, Turkey (Yankaya, 2004); 11% increase in land values from 500 m to 750 m in Helsinki, Finland (Laakso, 1992); 17% increase in land values within 800 m in San Diego, USA (Cervero, 2003); 10% increase in land values within 800 m in Massachusetts, USA (Armstrong & Rodriguez, 2006); 7% increase in land values within 1 km in Warsaw, Poland (Medda & Modelewska, 2009).

In the case of Perth, the Southern Railway increased land values in the 500 m around stations by 42% over 5 years after the announcement of the rail service (McIntosh, Trubka, & Newman, 2014); this compared to historic differences in land value around stations along older heritage lines of 18% residential value and 48% commercial value compared to non-rail urban areas. In Bangalore the value around Metro stations increased by 25% in the area going out between 500 m and 1 km and more significantly a "before" and "after" from the commencement of the metro rail operations shows a price uplift of 4.5% across the whole city; this indicates a major agglomeration economic event resulting in substantial economic value increase of USD 306 million from the metro rail's accessibility (Sharma & Newman, 2017).

The traditional approach to building urban rail based on top down supply of funding without much orientation to land development options will provide an increase in land value due to urban rail that benefits the pre-transit landowners (both government institutions and private) without the owners making any direct investment in the rail. The increased desirability of that urban rail-accessible land, stimulates changes in land use, zoning and development intensification resulting in economic improvement which can be of significance across the city (Bowes & Ihlanfeldt, 2001; Cervero & Murakami, 2009; Chapman, 2017; Mathur & Smith, 2013; Medda, 2012; Pagliara & Papa, 2011; Salon, Wu, & Shewmake, 2014; Smolka, 2013). However, the full value creation is mostly lost to the land owners who did very little to deserve such a windfall gain but happen to be in the right place to receive the gain. It is not hard to see why attempts are therefore made to try and capture some of that value to help pay for the rail infrastructure.

5. Land Value Capture Tools

LVC tools have long been applied to recover the windfall of land value uplift to fund public infrastructure (Chapman, 2017; Gihring, 2009; Ingram & Hong, 2012; Smith & Gihring, 2006; Zhao et al., 2012b). The earliest implementation dates back to the days of the Roman Empire when the citizens to be benefited by the infrastructure where charged with the construction and maintenance of public roads and aqueducts; this practice was also followed by other civilizations the world over (Smolka, 2013). The literature on land value capture tools is large, some of the recent contributions on LVC tools include Chapman, 2017; Connolly & Wall, 2016; Iacono et al., 2009; Levinson & Istrate 2011; Mathur & Smith 2012; Mathur, 2014; McIntosh et al., 2015a; Suzuki et al., 2015; Vadali, 2014; Zhao, Das, & Larson, 2012a; Zhao et al., 2012b.

As discussed in the sections above there is an important role for the private sector in enabling the best partnerships that create the most value in TFUL. If projects are fully planned and delivered by governments without involving private land development in investment partnerships then they will leak value and the opportunity to capture it will be minimal. It is not enough just to see value capture simply as a way of taxing windfall gain after it has happened. The full financial, social and political capital is not achieved in such projects.

The LVC tools are therefore set out under four groups that move from Fully Public through to Fully Private with two groups in between that are Partially Private or Partially Public. The four groups are shown in **Figure 3** to illustrate the extent to which they create economic value.

5.1. Fully Public: Land Based Levies

Governments set up land-based levies to immediately begin recouping value increases due to infrastructure construction. The tools include such levies as a Business Levy, Developer Levy, Special Area Levy and Parking Levy.

1) The Business Levy is used in various countries such as France (Le Versement Transport tax), Austria (Dienstgeberabgabe tax), the USA (employer/employment tax) and the UK (Business Rate Supplement tax) to fund transit.

The Le Versement Transport tax is paid by public or private companies in France when the company has nine or more workers located within a 10,000 inhabitant urban transport zone to fund public transport services (Pascal, 2003, as cited in Milan, 2015).

In the United Kingdom the Business Rate Supplement (BRS) tax is used by local authorities to impose a levy on business taxpayers to help finance local projects that can promote economic development like urban rail. BRS is a temporary tax imposed for a period to cover full cost of the infrastructure. The development of Crossrail in the Greater London Area is financed partially by business rate supplement (BRS). The BRS is expected to fund GBP 4.1 billion of the GBP 14.8 billion project by 2038. The tax is proposed to be increased by 15% in revaluations to take place every five years. In the first financial year 2010-11, collection surpassed the projected amount (Roukouni & Medda, 2012; Medda & Cocconcelli, 2013).

2) The Developer Levy is charged from land developers to fund the public infrastructure gap created due to the new development.

In the US, the Impact Fee is charged from the land developer as a form of developer levy. The Impact Fee is a one-time charge levied on development projects during the issue of building permits to fund new public infrastructure and services associated with new development (Vadali, 2014).

In Latin American countries developers are either asked to mitigate any shortage in supply of public services caused by their private project (Colombia, Guatemala and Argentina), referred to as an "in kind payment", or are simply offered additional development rights against a "cash payment" (in Colombia and Brazil) (Smolka, 2013).

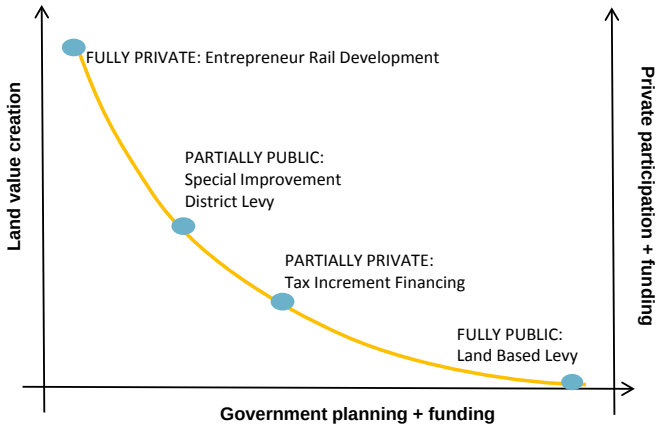

Figure 3. How land value creation varies with the extent of private involvement in TFUL partnerships. Source: Authors.

3) The Special Area Levy is used by governments to charge all land owners in a specific area to fund local transport services. These are imposed by governments rather than being partnerships as explained in the Partially Public: Special Investment Districts LVC tools section below.

Two examples of Special Area Levies and rail projects are in Milan and the Gold Coast in Australia. In Milan, such a levy was imposed on properties located up to 500 meters from local transit stations. The levy was proportional to the windfall gains on the land value to help fund the construction of the subway system (Ridley & Fawkner, 1987). In Australia, a Transport Improvement Levy of AUD 111 per year for every rateable property (245,687) in the Gold Coast City was introduced to fund the Gold Coast Light Rail (SGS Economics and Planning, 2015). In both cases most of the funding was coming from other government sources and in the case of the Gold Coast with its very wide area the imposed levy did not help with TOD's.

There is a very old form of Special Area Levy called a Betterment Tax or Contribution. Betterment Contribution charges are a form of special area levy that has been widely documented in statutory documents in the UK, Latin America, India and Australia but rarely acted on. The overall application of Betterment Contribution has been poor except in a few Latin American countries. The Indian city, Nagpur, has not been able to implement a legislated Betterment Contribution charge since 1936 due to lack of an implementation strategy and framework (Nagpur Improvement Trust, 2013). Smolka (2013) notes that most successful cases of Betterment Contribution seem to rely on rather arbitrary technical shortcuts to keep it manageable.

4) The Parking Levy. The use of Parking Levies as a government charge on parking spaces in a designated area has been used to fund transit. The levy is based on the notion of discouraging the use of cars as well as providing an alternative transit mode. These parking levies can be just imposed but if done with the involvement of community and businesses then they enable more effective economic value to be created. The City of Perth in Australia uses the Perth

Parking Levy to fund the local transit, pedestrian and cycling infrastructure system and has significant community and business support as it minimises car dependence. Perth is funding "free" local transit in the CBD through this levy (Parliament of Western Australia, 2014).

The problem with Land based levies is that they are completely governmental tools through which specific public infrastructure services are funded without private participation and hence land development is always a secondary consideration or afterthought. If the levies are imposed they will also obviously have some effect on development being driven away; so instead of development being optimized around the increased value close to desirable infrastructure, business is not being assisted but is possibly being driven away. The result will be some increase in economic value in having better transit that reduces car dependence, but less economic value in the TOD. This first set of LVC tools is thus seen by us as having the lowest economic value creation potential as it does not create the kind of partnerships needed for optimal economic value creation.

However, such levies are also probably the simplest set of tools to implement as it does not mean much change to transport and town planning agencies; the levy generates the funds for the rail and the governance remains un-integrated and does not need partnership development. For the TOD to be more integrated in planning and delivery the governance systems require another kind of process that can include private finance and expertise from the beginning rather than just putting a levy on them and it requires community and business partnerships. Fully public LVC tools that impose an LBL are not therefore really TFUL as described in this paper as the F is not providing the integration and need for partnerships.

5.2. Partially Private: Tax Increment Financing

Tax increment financing (TIF) is a tool used to fund redevelopment projects (infrastructure and community projects) based on forward hypothecation of property tax due to prospective land value increase. It simply requires governments to set up a Treasury Fund that hypothecates funding from a specific area where government rail investment is improving the area resulting in land-based rates and taxes going up (McIntosh, Trubka, & Newman, 2015b).

US cities use TIF extensively for redevelopment and infrastructure provision in urban blight areas. Blighted areas are usually characterized by dilapidated infrastructure, low income, unsanitary conditions, and a high rate of tax delinquency (Mathur & Smith, 2012). TIF has also been used to fund rail extensions and station area projects in several American cities such as Chicago and Portland. TIF is considered a "self-financing" tool as local governments do not need to put up additional fees or increase existing tax rates. In terms of private sector involvement, TIF is less likely to drive away private investment as the normal taxes are used to collect the increased value and they are simply hypothecated in later years. The Land Based Levies begin immediately in order to pay back gov-

ernment loans but TIF waits until the developments are completed and value has seeped through the land-based taxes into Treasury. It is therefore likely to create more economic value as market forces are not impeded but are tapped in the same way they are in any other part of the city.

TIF has enabled cities to issue project-specific TIF bonds to raise capital costs of the project. A USD 2 billion subway extension project (to Hudson Yards) in New York City is being financed by raising funds through municipal TIF bond sales (Demause, 2015). The city of San Francisco uses a tax increment financing approach to fund transit and local development (Clark & Mountford, 2007; Schlickman et al., 2015).

TIF is a fully government-controlled LVC tool where no extra private investment is required directly into the infrastructure. It also does not need to involve partnerships with community and businesses to enable it to happen. However, TIF does eventually flow into the infrastructure pool controlled by Treasury and can be re-used for other projects. Because the infrastructure is targeted to enable urban regeneration it is better at value creation as it is attempting to invite more private investment into the precinct being targeted and thus there is an integrative force linking transit building to urban regeneration. TIF tools thus are targeting broader economic gains from specific areas though they are somewhat remote from the process of TOD building and could indeed be marginalized in the focus on building the rail system as has happened in many cities.

One other flaw in TIF is that revenue streams are not always stable and predictable due to fluctuations in real estate values. It is possible for governments to suspend or cancel TIF districts due to budget deficits or according to local and political circumstances like in the case of California and Chicago. TIF also requires significant institutional capacity to implement due to assessment, planning and compliance processes at local levels however this is a necessary part of any attempt to create urban economic value through TFUL.

5.3. Partially Public: Special Improvement District Levies

Special Improvement District (SID) levies come historically from a local amenity-based levy set up where an area needs improving and private interests initiate or are willing to contribute a levy to improve the amenity of an area. Businesses are encouraged to tax themselves for the good of the infrastructure or amenity that they create together. Local governments simply collect the funds and manage the procurement of the disbursement to enable the improvements. This can be for security, for heritage conservation or simply providing better spaces that attract people to stay and hence create value in the area (Matan & Newman, 2016). SID levies are now being extended into whole corridors to create urban rail and urban regeneration in TOD's.

SID levies are called various things in various parts of the world. In America, Special Assessment District (SAD) fees have begun to be used in Los Angeles and Seattle to fund new rail lines. The SAD is also known as BAD or Benefit As-

sessment Districts in Los Angeles and LID or Local Improvement District in Washington DC and even a BID or Business Improvement District as they have become known in Australia. To implement a SID, SAD, BAD, LID or BID fee, governments identify specific special districts which can benefit from the planned public infrastructure in terms of land value uplift. The identified area usually comes out of a partnership from the bottom up where businesses, local governments and communities recognize the need for a new urban rail line and a new set of TOD's that could be unlocked by this. Through negotiations a partnership is established where a SID levy is agreed that can enable the whole process of urban rail and urban regeneration to proceed (Mathur & Smith, 2012). This is different to the Land-Based Levies as they are worked out in partnership based on the redevelopment potential that is assessed to be unlocked by the private investment enabling the infrastructure. They are not imposed from a remote agency and hence they create good will about urban development among the private and community partners which can contribute significantly to value creation. SID can also include special area levies and parking levies as set out in the Fully Government LVC tool but only if they are worked out in partnership with business and community to enable more significant economic value possibilities.

In the case of the South Lake Union Streetcar project in Seattle, a SID fee from 760 land parcels was estimated to provide 52 percent of the total project cost. The City of Seattle issued government bonds to raise capital and linked them with a SID fund. The city assessed a SID fee in 2004 and land owners of the SID area approved it in 2005, the street car project became operational in 2007. The assessed SID fee was based on estimated land value uplift for various land uses. The land owners were provided an option to pay a SID fee up front or in 18 years at a 4.4% interest rate. In this case the use of SID was considered as low-risk as it was applied in an established urban area with a strong real estate market (Mathur & Smith, 2012).

This raises the question of community partnerships which are also critical for economic value creation. If communities want to stop transit and density being done in their neighborhood then economic value can disappear altogether. If however they are part of a project from the beginning and help shape it to fit their needs in partnership with government and developers, then clearly economic value is optimized. In San Francisco a SID process began with the establishment of a local committee by the district's residents, business owners, tenants, schools and developers. The committee prepared a local development proposal including a financial plan and sought approval from local government authorities. The district residents were charged with elevated property taxes to fund the infrastructure. The involvement of developers in the committee from early stages was notable as they were perceived as a catalyst for the investment (Clark & Mountford, 2007).

Business Improvement Districts (BID) are common in the US and Australian cities for small area improvements. A BID is a non-profit organization for a des-

ignated commercial area involving the local land owners and these are used to enhance infrastructure and services of the commercial area to help improve local business. BID services are funded through an additional charge on land owners. There are about 72 BID's in New York City serving 84,000 businesses (City of New York, 2016). The potential to turn a BID into a larger SID with urban rail and TOD outcomes remains as a real option in many cities as the BID processes are well understood and trusted.

Most of the SID based tools are structured as public private partnerships involving community participation, sometimes called PPPC's—public private partnerships with community. In this partnership property owners and businesses self-impose a fee, in partnership with the government and community, for perceived land value gains due to the improved benefits in access or multiple non-transport services in TOD's. Thus, the financial risk is primarily borne by the beneficiaries of the project.

No BID or SID tool has ever been used to create an urban rail project in Australia but could be used in the new City Deal process outlined below.

5.4. Fully Private: Entrepreneur Rail Development

The Entrepreneur Rail model developed by us (Newman, Davies-Slate, & Jones, 2017) was created out of the need to truly integrate transit and land use through finance to create the highest value outcomes. However, it is not as though it is entirely new as historically this is how tram and train lines were developed; also "joint development" has been used for building urban rail since the 1980's wherever a major TOD was considered as a joint outcome (Newman & Kenworthy, 1999). These joint developments were set up to supplement government money through land development but they can also be used to go further and create a fully private approach.

The Entrepreneur Rail model emphasizes the important role of involving private sector expertise and approaches to redevelopment in the early stages of any new urban rail project otherwise it is not going to be possible to generate private investment or to create the economic value that is sought from developing urban regeneration-based TOD's.

Thus, the tools in this section are based on formal public-private partnership arrangements designed to implement infrastructure projects through risk-sharing but all the finance is coming from private investment. These PPP arrangements where the private sector pay for the infrastructure and make money out of the value created, are common in mining, energy, ports and airports but are not yet very common in many parts of the world like Europe, America and Australia for transit projects. They are however common in Japan and Hong Kong. In our view, this LVC tool is likely to create the most economic value.

Historically private entrepreneurs have initiated public transport in cities. The US's first omnibus started in New York City in the 1820s by private operators

who then laid down rails (in 1860's) to replace horse drawn carriages (Glaeser, 2012). The first private rail projects began in the 1840's in the UK and the earliest in the US dates back to the Pacific Railroad Act of 1862, under which government provided land grants, 400-foot rights of way plus ten square miles for every mile of track built, for the construction of the transcontinental railroad. Other private projects in history, especially in Perth, are outlined in Newman, Davies-Slate, & Jones (2017). These projects are similar to what is now known as "unsolicited bids" from the private sector. The Entrepreneur Rail Model enables partnership proposals that involve fully private investment but are still best developed with community and government involved as well.

Fully private capital and operational funding with minimal government in-kind support can be illustrated from case studies where this approach has been used including the Brightline project in Florida, Rapid Rail in Gurgaon and Tokyu Den-en-toshi Line in Tokyo.

Brightline is a privately-owned inter-city rail service and TOD project linking Miami to Fort Lauderdale and West Palm Beach using a relatively fast train (160 kph). The phase 1 of the Brightline project was opened in late 2017. The project utilizes an existing freight rail line of 312 kms and is constructing an extension to add 64 kms to Orlando. Project finance was raised through a mixture of debt, bonds and equity. Private developers have not had to seek public subsidies or grants other than federal low-interest private activity bonds which provide a risk guarantee. Such a private sector financing structure has been made feasible through the establishment of TOD's at each of the four rail stations (Renne, 2017). Brightline's economic study (The Washington Economics Group, 2014) notes that in the timeframe from 2014 to 2021 the project will result in an economic impact of approximately $6.4 billion comprised of $3.4 billion from Rail-Line Construction, $887 million from Rail-Line Operations, $1.8 billion from TOD Construction, and $284 million from TOD Operations, in the same timeframe the project will add $653 million to Federal, State & Local Tax revenue, $945 million from rail and $235 million from TODs. Therefore, Brightline is showing significant economic value creation through private investment and expertise in land development as well as developing strong partnerships with the county and local governments to enable urban development and integration with local buses. The new transit option was very popular in this highly congested corridor and tripled expected patronage in its first year. The Brightline was purchased by Virgin Rail USA in 2019 with plans to do the same kind of project in 20 cities.

In the case of Gurgaon, the urban rail project is fully privatised under a Design Build Finance Operate Transfer (DBFOT) agreement with a 99-year concession period. The private developer financed the project through private loans and equity raising. The government provided an existing right of way for the rail line, however access to the station and transport interchange facilities as well as land acquisition for stations was undertaken by the private developer. Project

revenue sources include fare-box collection, advertisement and leasing of shops within the station area, however no land development was involved. The private developer conducted an aggressive advertising campaign which resulted in 61% of the total revenue in 2014-16 through the auctioning of the naming rights for the stations (even before the stations were opened) and advertisement space on the inside and exterior of the train coaches (Deloitte Haskins & Sells, 2015). The private developer operates "free" feeder bus service to adjacent industrial hubs from stations in order to increase fare-box revenue. The feeder service benefits the commuters by providing comfortable last mile connectivity. This case shows that full private participation results in innovative revenue strategies and greater public benefit however it is very unusual not to have used land development opportunities and it remains to be seen whether the project can survive without this.

Hyderabad Metro is another Indian case but involves significant land development. It is built on a DBFOT agreement wherein a private developer was provided about 10% of the capital cost as grant (equity) from the federal government of India and the state/provisional government granted air-rights for commercial development of about 12.5 million sq. ft. over the three depots and 6 million sq. ft. at the 25 select stations. The private developer has raised capital through loans and equity. The private developer's concession period is for 35 years. The project began operations in mid-2017 and now carries 490,000 people a day on its 67 kms with 57 stations. The private developer began renting the spaces before the rail was operational and has sold much of the developable land around the stations to help pay for the infrastructure which cost US$2.6b. This case shows the private sector's active approach towards enhancing non-government revenue streams and enabling both transit and urban development in partnership.

The government owned Hong Kong Mass Transit Railway (MTR) Corporation has to run as a private corporation undertaking significant land development with private sector partnership to turn a net loss in the 1980s into profit worth USD 2 billion in 2015. The key to MTR financial success is starting the land development-based finances before the actual rail line operation (Cervero & Murakami, 2009; Mass Transit Railway, 2016; Zhao, Das, & Larson, 2012a). Such an entrepreneur approach is required in urban rail projects which necessitates private involvement.

Japan has historically used Entrepreneur Rail Model development in order to fund and build urban railways. They amalgamate irregularly formed properties that result in smaller but fully serviced urban neighborhoods that enables sale of 'extra' land to fund the associated railways. The government, as in-kind support, enables land consolidation and acquisition. This approach is known as land assembly or land adjustment. In case of Tokyu Den-en-toshi Line in Tokyo, in addition to land adjustment, the private company purchased land before announcing their plan to build the rail line and on some land parcels they

co-developed the land with landowners. A private developer promoted the area development by selling land, constructing housing, and attracting shopping centres and schools. This project was mainly implemented on a greenfield area (Bernick & Cervero, 1997; Sanders, 2015). The economic downturn in Japan resulted in additional strategies for value capture such as strategic infill urban development around train stations. Private companies have been able to raise equity from the stock market for rail projects in Japan to avoid interest on loans (Metrolinx, 2013).

The Entrepreneur Rail development cases show a larger economic value creation potential through such extensive private participation enabling comprehensive and integrated development of TODs. The cases show that urban rail projects require private involvement to enable any active and entrepreneurial approaches for creating innovative ways for creating higher value and revenue.

6. LVC Tools and Value Creation

The LVC tools demonstrate different value for different places where the political and economic options enabled different approaches. However, the consistent finding has been that the best way to create new economic value is through bringing government, private and community into transit projects in new ways. The planning and administration of transit infrastructure needs to integrate new transit technology with the best market-oriented development potential in the land areas around stations. In other words, the Fully Private model enables the highest economic value creation as it brings the F into TFUL in a creative way using the best aspects of government, private and community interests and skills.

The fully government land value capture tools are rigid in terms of their application to fund a specific infrastructure element and will make some development around stations less attractive for investment. Value capture occurs in land-based levies, tax increment financing, and special investment district levy tools to help government fund urban rail. But this capture may not lead to enough further private investment and wider value creation to enable the full economic potential of the infrastructure and its agglomeration opportunities.

As shown in **Figure 3** if government agencies continue to plan and fund urban rail as independent entities, they will have fewer and fewer opportunities to create sustainable transport and high value TODs. If governments seek greater involvement of the private sector from the start of projects, then by competitive transparent bidding it is possible to achieve greater and wider public and private economic goals through economic value creation.

In the case of Entrepreneur Rail development, the full private participation can create additional value and capture opportunities as entrepreneurial opportunities are created, such as in the case of Brightline and Japan. Therefore, for the TFUL development approach the optimal tool seems to be the Entrepreneur Rail Development model due to the private sector participation and comprehen-

sive development for wider economic gains.

However, the next best is the Special Improvement District Levy model where private and community partnerships that help drive the rail and TOD planning and delivery, are developed in specified corridors. The other tools are able to deliver urban rail but may not achieve much in the way of value creation in the associated TOD's.

The Australian Federal Government has begun a new approach called City Deals. These were originally set up to fund urban rail where the government preferred to provide just financial risk guarantees and establish partnerships with private and community sectors. Many governments reacted by saying they would prefer the traditional approach of being given cash for projects and doing it all themselves. However, with financial risk guarantees significantly more new projects can be built but they require a new approach with various levels of LVC tools and partnerships with community and private expertise and investment. City Deals mean that cities must create partnerships between the three levels of government and be based around partnerships with private investors who provide the capital that they can return through TOD and urban rail activity. City Deals also require multiple urban outcomes for inclusive, smart and sustainable cities, as well as being clear about community goals. The LVC tools can all provide some help but the Fully Private and the Partially Public tools are likely to be the only ones that can create a City Deal. Such approaches are increasingly occurring around the world (Clark & Clark, 2014).

7. Conclusion

The LVC tools vary from traditional wholly government-controlled processes that enable value to be captured but sacrifice value creation, through to entrepreneurial development where greater value creation happens with lower levels of government control but extensive partnerships. We have discussed these through various global examples in this paper. Obviously, each city and each project will have different needs and requirements that will determine the appropriate mix of public and private investment in a PPP for integrated land use and transit. The main conclusion from this paper is that the more the private sector is involved in the investment and the earlier they are involved in the process of developing a project, the more economic value creation is likely.

Private sector involvement for joint PPP development of a TFUL project from the concept stage could increase the redevelopment potential commitment from the private sector and lead the public sector to focus on their core role of governance including community engagement and partnership development. This will lead to wider agglomeration benefits and economic gains as well as many local amenity gains.

The suggested approach in this paper can contribute as a broad guidance to develop/revise transport appraisal processes. The traditional transport appraisal processes are designed to mainly consider changes (such as travel time) in the

existing transport network rather than considering the wider benefits associated with the resulting transit and walking urban form. New approaches such as Sustainable Urban Mobility Plans in Europe are now seeking ways to do this as a major input to decision-making. However, they are not facilitating ways of enabling partnerships with private development to finance such projects and hence will always struggle to achieve the best economic value outcomes.

The implementation process for TFUL is not straightforward; it will require significant dialogue between community, private and public sectors. The public sector will have to create regulations to enable such processes and they will need to frame contracting documents for TFUL that will address equity, sustainability and livability concerns of the community. Community engagement should be seen as an essential component not an optional extra as this can enable political validation as well as improving local amenity through their detailed knowledge of needs and options and hence providing the basis for partnerships with government and business.

Further research on such partnerships for a major project like urban rail and TODs can show the efficiencies and challenges in the life cycle of the project. The Australian City Deals for urban rail projects could show such partnerships required for infrastructure provision and sustainable urban growth in a city.

Further research is needed on delivery mechanisms and procurement processes for TFUL as the structures of transit planning do not easily lend themselves to enable early engagement of the private sector in creative planning and entrepreneurial investment to drive both transit and land development, and where a community partnership could also be a major driver.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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