

**Land Value Capture for Mass Transit Finance:  
Strengthening the Land Use – Transportation Connection**

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## Abstract

Land value capture (LVC) is a compelling though often ambiguous strategy for financing transit projects to improve accessibility, catalyze agglomeration cycles, and generate transit-oriented development. This paper articulates LVC as a framework of financial instruments that capture transit-induced property value gains as a revenue source. The paper synthesizes research on the political context of transit finance, conceptual frameworks of land value capture, property value impacts of transit, financial instruments, and supportive legislation to better understand the mechanisms through which LVC can contribute to stronger systems of transit and compatible land use. The key finding is that LVC is most effective in places with established transit systems, strong real estate markets, and pent-up demand for improved transit service. Research gaps in LVC performance evaluation are identified and opportunities for new applications are discussed.

## I. Introduction

More than 50 years of highway building and dispersed development have entrenched private car travel into the American landscape and lifestyle. The inefficiency of this personal transportation system has produced many negative results, including environmental degradation and traffic congestion. This transportation system requires a sprawled infrastructure which is difficult to monitor, expensive to maintain, and has generated social inequities in access to employment, housing, and services. However, the American era of the passenger car has peaked: the absolute number of vehicles, vehicles per person, per household, and per licensed driver have all declined over the past decade (Sivak, 2013). Demand for alternative transportation modes such as transit is rising; many cities are now looking to mass transit service to reduce car dependence and its harmful effects. However, reorienting the transportation system towards transit requires a significant outlay of infrastructure investment, which many governmental

authorities are unable or unwilling to prioritize.

**Land value capture (LVC)** is a transit funding scheme based on the idea that the benefits of public infrastructure are capitalized into land values, and can be captured from the usual beneficiaries, private landowners (Peterson, 2008). LVC mechanisms monetize and collect part of that land value increment as a revenue source for transit construction or operations (Mathur & Smith, 2012). The concept can be traced back to Henry George's (1879) theory of land value taxation: that because investments in public infrastructure increase land values, at least part of that increment should be recaptured from land speculators and appropriated to society as a whole (Rolon, 2008). Thus, land value capture can be thought of as a way to recover part of the publicly-funded financial benefit received by private land developers, thereby reducing the cost of providing infrastructure (ibid). By targeting land owners and developers, LVC charges *non-user* beneficiaries of transit, as opposed to charging users through increased fares (Iacono, Levinson, Zhao, & Lari, 2009).

The purpose of this paper is to articulate the contexts and mechanisms through which land value capture contributes to improved transit systems and complementary land use in the U.S. After discussing the political context of transit finance, this paper synthesizes research on transit's effects on property values, as well as conceptual approaches, financial instruments, and supportive legislation related to land value capture. Research gaps are identified and future opportunities are discussed for applying LVC to bus service to strengthen transit systems in lower density areas where rail would not be viable. While land value capture is no panacea for transforming America's car-oriented transportation system into one that is amenable to higher densities and mass transit, it maintains wide appeal as a revenue supplement for public investments.

## II. Context

The federal government's spending on transit in constant dollars declined by one third between 1980 and 1999, shifting the cost burden from the federal level onto state and local governments (Downs, 2004). In response, land value capture has become an increasingly common supplement to traditional local funding sources such as taxes and fees, user and market-based funding, and project revenue streams (Litman, 2014). Currently, land value capture is often applied to highways and other road-based infrastructure, although it is especially effective for financing transit projects because it tends to concentrate development and increase population densities, thereby reinforcing land use and travel patterns that support transit (Batt, 2001). Transit's financial viability under this scheme is made even stronger by its inherent declining costs: once a system has been built, the marginal cost of carrying additional passengers is relatively small (Downs, 2004). Some argue that transit investments no longer affect land use or prices because America is irrevocably oriented toward car travel, limiting the revenue potential of land value capture (Landis, Guhathakurta, Huang, Zhang, & Fukuji, 1995). Even before the automobile era, there was not a strong history of local development policies supporting transit. The electric trolley systems of transit's golden era, the early 1900's, were implemented by private entities to facilitate speculative development in the suburbs (ibid). However, construction of the Erie Canal and railroad networks in the 1800s were funded through creative land value capture mechanisms, and had strong influences on land development and policy (Bourne, 1995).

Looking forward, two important trends support increased use of LVC to finance transit projects. First, reduced federal funding and restricted fiscal conditions at state and local levels have forced transit agencies to explore alternative revenue sources for funding projects. Second, growing prioritization of reducing greenhouse gas emissions and vehicle-miles-travelled has

strengthened the connection between federal transportation dollars and integration of land use and transportation at the local level (Mathur, 2014b).

### III. Land Value Capture Increases Accessibility through Agglomeration

The concept of accessibility refers to the land value benefits created by transportation infrastructure, specifically to improvements in *access* as opposed to value created by construction or other improvements to the land (Medda, 2012). Accessibility measures the performance of a transportation system in terms of its ability to connect people and places, capturing both individual mobility and economic benefits (Levinson & Istrate, 2011).

Improvements in accessibility provided by transit are theoretically capitalized into the value of land, buildings, or rents, though the magnitude of capitalization varies widely, and in some contexts, may not occur at all (Landis, et al., 1995). Proximity to transit introduces accessibility benefits not only to transit users, but to retail, employment centers, and recreational or entertainment activities that attract large crowds through agglomerative and network effects, reducing transportation costs and increasing economic productivity (Smith & Gihring, 2006).

In theory, land value capture intensifies economic agglomeration, a positive feedback loop between infrastructure capacity, accessibility, demand, and development that is usually associated with spatial concentration and increased density. Iacono et al. (2009) demonstrate that transit is better suited to land value capture and agglomeration compared to highways, because transit isn't as susceptible to congestion. In a car-based transportation and land use system, congestion de-amplifies the accessibility gained from increased transportation capacity and development. In contrast, transit's positive effects on accessibility and development are not mitigated by congestion. In fact, greater demand increases the efficiency of transit systems for

connecting people and places, and generates supportive land use through denser development that reinforces the viability of original transit investments. It is truly a virtuous cycle.

#### IV. Measuring the Effects of Transit on Property Values

In order for land value capture to be a viable tool for financing transit projects, those projects must cause land values to appreciate. In cities all over the country, the positive effects of public transportation on surrounding property values has been demonstrated through a variety of mechanisms: through transit infrastructure, transit-oriented development, and even planning efforts preceding any physical change. Location theory provides a theoretical framework for explaining this effect: transit-accessible locations provide travel cost savings and competition, which are reflected in higher property bids until those savings are capitalized into the property's market value (Duncan, 2011). However, if accessibility is overshadowed by other amenities such as prestige, privacy, and open space, like in American suburbs, then transit access will not increase land values (Rolon, 2008). In fact, transit systems can depress nearby property values through nuisances such as increased noise, air pollution, and traffic. However, the benefits of accessibility tend to negate the nuisances, resulting in a net positive effect (Economics Research Associates & Spitzer & Associates, 2006).

Since contexts do vary widely, it is important to study local property markets before implementing a land value capture mechanism (Mathur, 2014a). The most important factor in capitalization of access into property values was quality of service in California rail (Landis, et al., 1995), and neighborhood income levels and housing types around rail stations in 12 cities across the U.S. (Hess & Almeida, 2007). A meta-analysis of 57 North American observations found differences in property value impacts between commercial/residential land use as well as

rail system types (Debrezion, Pels, & Rietveld, 2007). A 2013 meta-analysis with 102 observations updated and expounded on this study with 15 additional variables and international scope, and found that land value changes tend to be higher than property value changes. There was no significant difference between changes in properties' rent values versus purchase prices, and changes in land/property values after rail service stabilized were lower compared to announcement time (Mohammad, Graham, Melo, & Anderson, 2013).

In the U.S., applications and research on land value capture, as well as the interface between transit and land value, are overwhelmingly rail-centric. The effects of bus systems on property values are significantly lower compared to rail systems (Virginia Commonwealth University, 2008), and most research has focused on bus rapid transit (BRT) systems rather than conventional bus service. A study of the impacts of Pittsburgh's Martin Luther King East Busway BRT system on single-family home values found a positive relationship between station proximity and home values, with decreasing marginal effects (Victoria A. Perk & Catalá, 2009). Another study of changes in sale price per square foot of homes along Boston's Silver Line Washington Street BRT corridor found that the effect of station proximity was 7.6%: positive yet relatively small in magnitude (Perk, Catala, & Reader, 2012). The small land use response to bus systems, in terms of development and land value gains, is likely because they are perceived as impermanent services relative to rail, and are also associated with low-income, disadvantaged population groups (National Association of Realtors, 2011). Other factors driving public preference for rail over bus may include the smoother ride, more spacious vehicles, visibility of rail right-of-way and stations stops, and removal from traffic congestion (Hanson & Giuliano, 2004). This preference likely drives the research focus on bus service's interface with land on cases of bus rapid transit systems, which emulate rail.

## V. Approaches to Land Value Capture

The scope of the concept “land value capture” in transportation and economic literature varies significantly, and as a result, so does categorization of specific transportation funding mechanisms. For example, Iacono et al. (2009) and Levinson and Istrate (2011) use an inclusive model that encompasses development impact fees, transportation utility fees, and differential land value taxes. Litman (2014) limits the scope of land value capture to betterment assessments (a special tax on properties that benefit from transit service). He omits mechanisms typically considered to be forms of value capture, such as joint development, tax-increment financing, and special assessment districts, as “other” project revenue streams for transport funding.

Even general property taxes can be thought of as a form of land value capture, and many have argued that they are a benefits tax that pays for access to local services and public goods (Walters, 2012). A two-rate general property tax system, where the tax rate on land values is higher than that of improvement values, has been suggested as a means of encouraging infill development around transit: it becomes more costly for speculators to hold on to vacant land, and by displacing tax burden from buildings to land, land owners benefit by making significant capital investments (Gihring, 2001). Though the split-rate property tax scheme is an effective means of encouraging compact development, it is omitted from this paper’s discussion because its revenues end up in a jurisdiction’s general fund, and do not provide a dedicated funding source for transit projects (Rybeck, 2002). Impact fees or development exactions are also omitted, though some authors, as well as the American Association of State Highway and Transportation Officials (AASHTO), consider them to be a form of land value capture.

Impact fees are an “area-based assessment of the public cost imposed by development,” in which developers pay according to the number of trips a project generates, ensuring that they contribute to fulfilling transportation infrastructure needed to accommodate increased demand (Enoch, Potter, & Ison, 2005, p. 7). Impact fees are excluded from this analysis because they *apportions costs* of the private sector’s negative externalities to the developer. In contrast, land value capture *appropriates revenue* from the public sector’s positive externalities (land value gains due to transit improvements) to the general public. In other words, development impact fees divert costs from the general public (the typical payer) to the private sector, while land value capture diverts revenue from the private sector (the typical beneficiary) to the public sector for infrastructure finance. This difference is not trivial: a benefits-based framework boosts land value capture’s political palatability compared to regulatory approaches.

Any time local governments can justify financing transit projects by imposing a special tax or fee, whether on the general public, users of transit, or non-user beneficiaries (such as developers who suddenly have a wider market, or landowners who see significant appreciation of their asset,) then they are employing value capture. Land value gains are a specific case of accessibility benefits, and this paper focuses on three financial instruments that provide dedicated revenue for transit from property taxes or the sale/lease of land. These instruments include: 1. betterment assessments, the most common application being special assessment districts, 2. Tax-increment financing, and 3) joint development. Joint development has the longest and strongest track record for funding transit, while special assessment districts and tax increment financing have been used more frequently to fund road construction (Mathur, 2014b).

#### IV. Land Value Capture Financial Instruments

This section reviews land value capture financial instruments and relevant legislation.

**Special Assessment Districts (SADs)** are geographic areas in which property owners are charged a betterment assessment. These assessments are “special” because they are charged in addition to the general property tax in order to fund infrastructure projects. Some of the land value added by the public investment is taxed, corresponding to land rent or unearned gain (Gihring, 2001). Assessments are often determined by a formula based on a site’s floor size, site size, and/or distance from the transit system, and they can be charged once, or spread over a number of years. The public finance rationale behind this tactic is well-established, as the beneficiary pays for a public good that cannot be provided in the private market (Enoch, et al., 2005). Betterment assessments are generally imposed only once, and most countries tax 30-60% of land value gains that can be attributed to infrastructure, though the quantification of benefits and high tax rates makes betterment taxes difficult to administer (Peterson, 2008). Special assessments are an exercise of taxing powers and must be authorized by a state through enabling legislation or constitutional provision. They are a traditional mechanism for financing public infrastructure, and are enabled in all U.S states (AASHTO & U.S. DOT, 2014).

In contrast to general taxation, a special assessment district maximizes revenue by capturing the neighborhood effects of increased property values near site-specific transit investments. The betterment tax captures most value in areas with strong markets and tax administration systems (Medda, 2012). Regardless of the particular geographies, to remain equitable it is important that SADs be limited to areas where property owners benefit from transit infrastructure, and where they are also financially able to pay assessments (Mathur, 2014a)

**Tax Increment Financing (TIF):** Tax increment financing is a manipulation of the general property tax, wherein local governments can borrow against expected future property tax revenues in order to finance development of infrastructure. Unlike Special Assessment Districts, TIF requires no additional taxes or fees to be collected from landowners within specified districts. A portion of regularly assessed property taxes (over and above what was collected during the base year) is simply diverted to pay back bonds on transit projects (National Conference of State Legislatures, 1994). However, TIF involves a greater level of risk than other land value capture mechanisms because of strict collateral requirements for local governments to use general obligation bond financing. Governments must be certain that the development will generate sufficient revenue to service bond debt (Fogarty & Austin, 2011). Since its development in 1951 in the U.S, TIF is the most widely used application of Accessibility Increment Contribution (AIC), which includes all tools that use a new project's expected future revenues to finance its construction.

In the case of Pennsylvania's Transit Revitalization Incentive District (TRID) land value capture program, tax increment financing is intended to cover transit capital improvements and maintenance, and specifically not to fund gaps for private development. Government agencies may receive revenue from developments in the long-term, but must incentivize that development through payments such as tax breaks or relinquishment of tax revenue for infrastructure finance in the short-term (Shinkle, 2012). Thus, TIF is only effective where real estate markets are strong enough to support development within a reasonable time frame to generate tax increment that corresponds to infrastructure needs. Many TIF districts only include areas that need investment. This limits revenue potential, but has the benefit of avoiding resistance from residents or affected taxing authorities, who may be unwilling to share future tax increment that transit investments

generate within the district (ibid). In weak market locations where multiple sites may need redevelopment, TIF may generate more revenue if districts can be altered over time to include additional projects as the real estate market adapts (Fogarty & Austin, 2011).

TIF may have the negative effect of depriving regular taxing districts from revenue needed to meet increased service demand generated by households and businesses added to the area through TIF-supported projects (Gihring, 2009). In Chicago, a TIF mechanism was found to have the greatest capacity for generating funds. However, this capacity was dependent upon new development, and because of the wide use of TIF districts in Illinois, the scheme faces resistance from underlying tax districts (SB Friedman Development Advisors & URS, 2011). For cities or counties to utilize TIF financing in states with enabling legislation, they must undergo a complicated legislative process that involves creating a special district and a public agency to administer the program (this may be a new agency appointed by local government, or the government itself.) The agency prepares a development plan, establishes a base year for property tax, and solicits developers to ensure that increment property tax is earned during the TIF period to finance bond debt (AASHTO Center for Excellence in Project Finance & U.S. DOT, 2014).

**Joint Development (JD)** is a land value capture technique that pairs transit projects alongside higher-profit real estate, in order to cross-subsidize improved transit service and make the entire project profitable (Rolon, 2008). It is defined by the Federal Transit Administration (FTA) as a public transportation project “that integrally relates to, and often co-locates with commercial, residential, mixed-use, or other non-transit development” (Federal Transit Administration, 2014a, p. i3).

Joint development is compelling because it reinforces the viability of transit investments by providing revenue as well as complementary land use. JDs are often referred to as public-private partnerships, though this is not always the case. Governments and transit agencies can engage in JD without private partnership when they sell or lease property or development rights, or when they are directly involved in for-profit real estate development (Zhao, Das, & Larson, 2012). This activity can generate revenue through the sale or lease of developed land, and also through increased ridership due to development that supports transit (Green, Lou, & Jones, 2013). However, public entities often work together with private developers to share either costs or revenues, usually to fund and maximize the accessibility improvements provided by the transit system (Landis, Cervero, & Hall, 1991; Medda, 2012). JD thus can be conceptualized according to ownership (public or private sector) and whether revenue is generated through exchange of property rights or development rights (Zhao, et al., 2012).

The term “joint development” is often conflated with “transit-oriented development” (TOD), as they share the same goal of fostering mixed-use, compact, and economically successful activity near transit facilities. However, the FTA differentiates TOD as having a broader, neighborhood-level scope that includes several projects or parcels, while JD has a project-specific scope that makes use of property or grant funds owned by a public entity (Federal Transit Administration, 2014a). Thus, several joint developments that encourage pedestrian activity around a transit station can together be considered transit-oriented development (Medda, 2012). TOD is considered to be more effective in increasing ridership than “transit-adjacent development” (TAD), which is adjacent to transit but lacks functional connectivity to the infrastructure through appropriate land-use, station access, or site design (Cervero & Duncan, 2002, p. 6).

Among land value capture mechanisms, joint development seems to be most widely applied to transit finance in the U.S. Cervero (1994) estimates that as of 1990, 115 transit JD projects had been constructed in more than two dozen U. S cities, 85% of which were completed in the 1980s. This decade was so amenable to transit JD because of ten new rail systems, rapid suburban growth within rail corridors, resurgence of downtown real estate, and the emergence of public-private partnerships to cope with significant cuts in federal transit assistance. Prior to this, the Urban Initiatives program (authorized under the Surface Transportation Assistance Act of 1978) allowed federal funds to be used for real estate developments tied to transit service. The program was discontinued in 1981, but in its three years, 47 projects were funded in 43 urban areas, though similar projects continued to be eligible for funding under regular transit programs (Weiner, 2013). Local governments in most states have home rule authority to enter into joint development agreements with private developers without special legislation. However, state agencies such as departments of transportation need specific authority to engage in joint development agreements (AASHTO & U.S. DOT, 2014).

Currently, joint development is the most straightforward land value capture strategy to apply. Through an agreement with the private sector, it does not require quantification of transit's benefits (like with benefits assessments), and does not raise equity issues through general or special taxation or fees (Medda, 2012). Another benefit of JD is that the timeline of implementation and revenue collection is flexible: some mechanisms, such as land banking, are planned and implemented before transit improvements, while others like density bonuses or special lease agreements can begin later on. Meanwhile, contributions and revenues from the private sector can be structured as continuous payment streams or one-time payments that account for the net present value of future benefits (Zhao, et al., 2012).

Green et al. (2013) analyze successful cases of transit agencies generating revenue through land development in Washington D.C, Dallas, Hong Kong, and Tokyo. In 2004, New York City was the nation's leader in the number of joint development projects to support transit, mainly through density bonuses provided to developers, though the Washington D.C. Metropolitan Area Transit Authority collected the most revenue. Joint development projects are relatively common in Asian cities, such as Hong Kong's "rail-property" model, Taiwanese cities' "land consolidation" model, and Tokyo's "land readjustment" model. These cases are successful because of high population densities, strong property markets, and favorable political/regulatory climates for joint development (Zhao, et al., 2012). Four conditions have been noted for successful JD transit projects: a healthy local real estate market, an entrepreneurial public agency, coordination across agencies, and recognition that the benefits of TOD extend beyond just generating revenue, but to long-term accessibility through compatible land use and transit systems (Landis, et al., 1991).

## VI. Supportive Legislation

In light of reduced federal funding for transit, the FTA encourages state and local governments to generate their own revenue sources for transit. Because land value capture strategies are developed and implemented at the local level, federal involvement is likely to remain limited, though federal policies can affect a local government's ability to use land value capture strategies for transit projects, especially when federal funding is an important component of those projects (Wise, 2010). The FTA has no separate program for value capture, but it supports schemes such as joint development through its planning and capital assistance programs, as well as by allowing property previously acquired with FTA funds to be used for

joint development (Federal Transit Administration, 2014b). A survey of 55 transit agencies undertaken by the U.S. Government Accountability Office found that over half (32) used joint development as a transit funding source, while 17 used special assessment districts and 13 used tax-increment financing (Wise, 2010). Though this survey represents a small sample of the over 800 transit agencies that report to the National Transit database (National Transit Database Program, 2013), it indicates joint development's relative prominence in transit finance compared to other land value capture mechanisms.

Two important acts of the 1990s affecting transit and transit-oriented developments were the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and Transportation Equity Act of 1998 (TEA-21), which through the subsidiary Mass Transit Program (MTP) have allowed for more flexible use of funds for transportation planning and investment (Doherty, 2004; Transit Cooperative Research Program, 2002). The emphasis on federal transportation spending shifted from highways to a variety of modes, especially those, like transit, that are less harmful to the environment and make use of the private sector through Metropolitan Planning Organizations (MPOs) (National Conference of State Legislatures, 1994). This legislation does not support land value capture directly, though it enabled flexible spending that has been supportive of transit projects and innovative funding schemes.

Several programs have recently developed at the federal level that support TOD projects funded through a variety of mechanisms, including land value capture. The 2005 federal surface transportation spending bill SAFETEA boosted transit joint developments by expanding the scope of capital projects eligible for funds to include intercity bus and rail stations that incorporate private commercial and residential development that enhance the transit's effectiveness and transit provide revenue (ibid). The surface transportation fund reauthorization

bill MAP-21 includes \$10 million for a TOD pilot project for states and local governments. The FTA's New Starts major capital investments program has since 1991 considered joint development factors in assessing funding applications, including existing land use, sprawl containment, as well as transit corridor policies and zoning regulations (Renne, Bartholomew, Wontor, & McDaniel, 2011). This has led to some projects being approved because they score high on land use criteria, as the FTA currently assigns land use factors 50% of the weight in project justification analyses (ibid).

The Transportation Infrastructure Finance and Innovation Act Program (TIFIA) of 1998 has established a federal credit program available to transportation projects that are capable of generating their own revenue through user fees or dedicated funding sources. This scheme is meant to leverage private capital to fill market gaps or complement existing funding. Most projects funded through TIFIA have been entirely or primarily based on highways that pledge toll revenue to repay direct loans, though there have been bus and rail transit projects funded in Denver, San Francisco, Los Angeles, Portland, Dallas, Chicago, Minneapolis, New Jersey, Las Vegas, Washington D.C, and Seattle. Eligible transit projects can apply credit assistance toward design and construction of stations, tracks, or other transit-related infrastructure. To be eligible, transit project costs must exceed \$50 million, and must have a dedicated revenue source to repay the TIFIA loan, such as user fees or dedicated sales taxes, tax increment finance, fuel taxes, and systems gross revenue pledges (Federal Transit Administration, 2014c). The Transbay Transit Center in San Francisco, CA is the first TIFIA-supported transit project that uses land value capture revenue to repay TIFIA loans. The land value capture mechanisms include dedicated tax increment revenues from the sale and development of state-owned land surrounding the Transit Center, as well as passenger facilities charges from the Transit Center's initial primary tenant, AC

Transit. Other local LVC funding sources include lease and interest income, as well as transfer of development rights. Denver's Union Station is also using LVC mechanisms including TIF, a levy on property tax revenues, and lodger's tax revenue (Federal Highway Administration, 2014).

Several states have been leaders in funding planning, zoning, and other administrative efforts that support joint development transit projects. California's Transit Village Development Planning Act of 1994 allows local governments to grant 25% density bonuses to developments meeting TOD criteria in transit village districts, which are also eligible for state-funded transit. The New Jersey DOT's Transit Village Initiative and Connecticut's Transit-Oriented Development Pilot Program have also successfully promoted Transit-oriented development planning and zoning (Renne, et al., 2011).

At the local level, municipal governments can remove barriers to land value capture through zoning and community public finance (Boarnet & Crane, 1998). For example, municipalities in Southern California that are more dependent on sales tax revenue have more commercial zoning near commuter rail stations, and these municipalities prefer commercial development over high density residential development because of the potential to generate sales tax revenue (ibid). In the San Francisco Bay Area, the Metropolitan Transportation Commission's Transportation for Livable Communities provides grants from the federal TEA-21 funds, incentivizing local governments to locate compact housing developments within 1/3 mile of transit, as well as pedestrian amenities. There is a similar program within the San Mateo County Association of Governments (Transit Cooperative Research Program, 2002).

## Moving Forward: Issues and Opportunities

In the national context of transit's increased privatization and reduced funding levels, land value capture offers a valuable opportunity to supplement revenue and finance capital projects. However, many believe that transit capital subsidies have encouraged local governments to build wasteful rail systems in corridors where passenger densities are insufficient (Small & Voerhoef, 2007). Studies in Seattle Washington and Ontario Canada have found that capital subsidy programs introduced inefficiency by increasing the rate at which transit vehicles are scrapped, decreasing their lifespans by half in some cases. Other studies have found that subsidies in general increase costs, even after controlling for reverse causation that higher costs require greater subsidies. This was found to be due to higher wages and lower productivity of labor, and also through expanding service to low-density areas (ibid).

Land value capture supports transit investments while compromising with subsidy critics by drawing financial support solely from value created by the transit system itself, leaving enough land increment behind for the private sector to encourage continued investment in property development. Examples of successful, new connections between transit systems and land use show that "public investment in transit improvements does not induce development as much as shape it," because market forces are necessary catalysts for transit-oriented development and economic agglomeration (Gihring, 2009, p. 14). Land value capture mechanisms may be effective tools for concentrating those market forces within particular districts to make transit systems more viable and kick-start the cycle of economic agglomeration.

A white paper synthesizing recent literature on land value capture with interviews of six public transport systems in globally prominent cities found that to shift toward incorporating more land value capture mechanisms for funding transit, several key issues need to be addressed

(Salon, 2014). First, institutional missions and cultures must have more systemic and long-term focus, balancing the immediate demand for transit service provision with an eye toward expanding the system's capacity over time. Secondly, financial or operational crises often motivate significant action. Lastly, the willingness of the public varies for accepting new or existing taxes for transit, and their support is essential to the success of land value capture (ibid).

Rail and bus transit systems differ significantly in their development and land use impacts, as well as their costs. Rail has more significant land use development impacts than bus transit service, and is particularly effective in large, growing cities in terms of reducing congestion and consumer costs as well as traffic crash rates. In contrast, bus transit has minimal if any influence on development despite its transit primacy in the U.S, comprising 60% of trips on public transportation in 2005 (Virginia Commonwealth University, 2008). Rail transit service has high fixed costs, and is most cost effective in corridors where there is already high transit demand and high costs for constructing road and parking facilities (Litman, 2004). Statistical cost studies indicate that average capacity cost is higher for rail at first, but declines below costs for bus systems if sufficient passenger densities are reached – one study found this to be 400 passengers for subways (Small & Voerhoef, 2007).

Land value capture techniques that impose additional tax burden on particular sectors of society bring up issues of equity and fairness. Unlike other state and local approaches to transportation finance, such as sales tax, land value capture aims to minimize tax burden of existing wealth flows in the community, as it is capturing the land value added by the project it is funding. The Organization for Economic Cooperation and Development (OECD) categorizes land value capture mechanisms into three groups, according to who contributes payments: the provider of infrastructure, the developer of the vicinity of infrastructure, or the property owner of

benefited areas (Rolon, 2008). Mathur (2014a) describes a theoretical framework for evaluating fairness in transportation finance, involving horizontal and vertical equity. Horizontal equity refers to equal distribution of costs or benefits (economic, social, and environmental) resulting from public actions. Vertical equity refers to the ability to pay, and thus calls for the rich to pay more than the poor for public goods and services. Other equity evaluation frameworks have been proposed by Litman (2014), Zhao et al. (2012), and Rolon (2008), which also include costs, revenues, service impacts, and implementation factors.

Reviews of land value capture have focused on quantifying land value increment to property owners according to transit proximity and other place-based characteristics, as described in section IV of this paper. Aside from these studies, the literature is dominated by theoretical papers regarding the efficiency, equity, and political/administrative barriers to implementing land value capture mechanisms, either generally or as applied with qualitative methods to a set of case studies. There is a research gap in evaluating the financial performance of existing land value capture programs and policies, as well as opportunities they created for new development. While inherently reductionist, meta-analysis or systematic review of outcomes such as ridership, level of service, property tax increment, returns on investment, and debt service would contribute quantitative rigor, which is currently lacking in our understanding of the efficacy of land value capture in financing transit projects across the country.

## Conclusion

This paper has reviewed the political context, economic rationale, financial instruments, and legislation that have driven increased interest in using land value capture for financing transit projects in the U.S. While land value capture is no panacea for transforming America's car-

oriented transportation system into one that is amenable to higher densities and mass transit, it maintains wide appeal as a revenue supplement for public investments. Land value capture does not involve direct subsidy, but instead channels a portion of private wealth accumulation toward infrastructure capacity, intensifying a process of economic agglomeration and accessibility that benefits society as a whole. The concept of land value capture is not cohesive in economic and transportation literature; in some discussions its scope has grown to encompass all place-based taxes or fees, such as employer payroll taxes or developer impact fees. This paper has articulated a framework of financial instruments that use land value increment as the currency for transit-induced benefits in the form of increased property taxes, sale or lease of land, or sale of development rights.

Over the past several decades, land value capture has been applied to strengthen transit systems in cities across the country. It has shown to be most successful in areas with established transit systems and pent-up demand for denser real estate development. In order for land value capture schemes to generate significant revenue for transit projects from the private sector, property owners, developers, and residents must be supportive. However, in most places across the U.S, the potential accessibility benefits of transit are small and not recognized by the public, which is why successful application of land value capture to transit has mostly been confined to large cities with established transit systems. Among land value capture mechanisms, joint development has the most extensive and successful project history, as it only requires favorable conditions in the real estate market and institutional capacity within transit authorities to oversee transactions. Tax increment financing requires strong confidence that transit investments will catalyze private development and increased property values in the future, while special

assessment districts transfers some of this risk onto property owners by burdening them with additional assessments outright.

While the literature on land value capture theory and applications is extensive, there are several significant research gaps. Quantitative evaluation of LVC financial performance across transit projects is lacking, and would contribute an empirical perspective to the qualitative analyses of case studies that dominate the literature. Additionally, the application of land value capture to bus systems is a relatively unexplored but promising avenue for supporting transit systems. Because required start-up costs and population densities for viable bus systems are lower than for rail, they are feasible in a greater number of places for strengthening transit systems and supportive land use. Development impacts are smaller for bus service than for rail, and thus land value capture revenue would not be as significant. However, bus-based land value capture holds promise for catalyzing agglomeration economies in more places that will spur denser, transit-oriented development, and ultimately better transit service.

## **Bibliography**

- AASHTO, & U.S. DOT. (2014). Transportation Funding & Financing Retrieved 11/22/2014, from [http://www.transportation-finance.org/funding\\_financing/legislation\\_regulations/state\\_local\\_legislation/other\\_enabling\\_legislation/](http://www.transportation-finance.org/funding_financing/legislation_regulations/state_local_legislation/other_enabling_legislation/)
- Batt, H. W. (2001). Value Capture as a Policy Tool in Transportation Economics: An Exploration in Public Finance in the Tradition of Henry George. *American Journal of Economics and Sociology*, 60(1), 195-228. doi: 10.1111/1536-7150.00061
- Boarnet, M. G., & Crane, R. (1998). Public Finance and Transit-Oriented Planning: New Evidence from Southern California. *Journal of Planning Education and Research*, 17(3), 206-219. doi: 10.1177/0739456x9801700302
- Bourne, R. (1995). *American of the Move: A History of Waterways, Railways, and Highways*. Golden CO: Fulcrum Publishing.
- Cervero, R. (1994). Rail Transit and Joint Development: Land Market Impacts in Washington, D.C. and Atlanta. *Journal of the American Planning Association*, 60(1), 83-94. doi: 10.1080/01944369408975554
- Cervero, R., & Duncan, M. (2002). Benefits of proximity to rail on housing markets: Experiences in Santa Clara County. *Journal of Public Transportation*, 5(1).

- Debrezion, G., Pels, E., & Rietveld, P. (2007). The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-analysis. *The Journal of Real Estate Finance and Economics*, 35(2), 161-180. doi: 10.1007/s11146-007-9032-z
- Doherty, M. (2004). Funding public transport development through land value capture programs. *Institute for Sustainable Futures*.
- Downs, A. (2004). *Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion*. Washington, D.C: Brookings Institution Press.
- Duncan, M. (2011). The Impact of Transit-oriented Development on Housing Prices in San Diego, CA. *Urban Studies*, 48(1), 101-127. doi: 10.1177/0042098009359958
- Economics Research Associates, & Spitzer & Associates. (2006). Task I – Literature Review of Rail's Impact on Development and Property Value *Transit Station Area Market Study*. Austin, TX: Capital Metropolitan Transportation Authority.
- Enoch, M., Potter, S., & Ison, S. (2005). A strategic approach to financing public transport through property values. *Public Money and Management*, 25(3), 147-154.
- Federal Highway Administration. (2014). TIFIA Project Profiles Retrieved November 10 2014, from [http://www.fhwa.dot.gov/ipd/tifia/projects\\_project\\_profiles/tifia\\_portfolio.aspx](http://www.fhwa.dot.gov/ipd/tifia/projects_project_profiles/tifia_portfolio.aspx)
- Federal Transit Administration. (2014a). Federal Transit Administration Guidance on Joint Development *FTA Circular*. Retrieved from [http://www.fta.dot.gov/documents/FTA\\_C\\_7050\\_1\\_Guidance\\_on\\_Joint\\_Development\\_Circular.pdf](http://www.fta.dot.gov/documents/FTA_C_7050_1_Guidance_on_Joint_Development_Circular.pdf)
- Federal Transit Administration. (2014b). Joint Development Retrieved November 10 2014, from <http://www.fta.dot.gov/grants/16124.html>
- Federal Transit Administration. (2014c). Transportation Infrastructure Finance and Innovation Act (TIFIA) Program Retrieved November 10 2011, from <http://www.fta.dot.gov/grants/12861.html>
- Fogarty, N., & Austin, M. (2011). *Transit Revitalization Investment Districts: Opportunities and Challenges for Implementation*. Pittsburgh, PA: Pittsburgh Community Reinvestment Group.
- Gihring, T. A. (2001). Applying value capture in the Seattle region. *Planning Practice and Research*, 16(3-4), 307-320.
- Gihring, T. A. (2009). *The Value Capture Approach To Stimulating Transit Oriented Development And Financing Transit Station Area Improvements: Victoria Transport Policy Institute*.
- Green, F., Lou, Y., & Jones, S. (2013). *Investment Practices of Transit Service Providers in Land Development*. Paper presented at the International Conference on Urban Public Transportation Systems, Paris, France.
- Hanson, S., & Giuliano, G. (2004). *The geography of urban transportation*: Guilford Press.
- Hess, D. B., & Almeida, T. M. (2007). Impact of Proximity to Light Rail Rapid Transit on Station-area Property Values in Buffalo, New York. *Urban Studies*, 44(5-6), 1041-1068. doi: 10.1080/00420980701256005
- Iacono, M., Levinson, D., Zhao, Z. J., & Lari, A. (2009). *Value Capture for Transportation Finance: Report to the Minnesota Legislature*. Minneapolis, MN: Center for Transportation Studies.
- Landis, J., Cervero, R., & Hall, P. (1991). Transit joint development in the USA: an inventory and policy assessment. *Environment and Planning C: Government and Policy*, 9(4), 431-452.

- Landis, J., Guhathakurta, S., Huang, W., Zhang, M., & Fukuji, B. (1995). Rail transit investments, real estate values, and land use change: a comparative analysis of five California rail transit systems. *Institute of Urban and Regional Development Monograph Series*. Retrieved from <http://escholarship.org/uc/item/4hh7f652>
- Levinson, D. M., & Istrate, E. (2011). Access for Value: Financing Transportation through Land Value Capture *Metropolitan Infrastructure Initiatives*. Washington, D.C.: Brookings Institute.
- Litman, T. (2004). Rail transit in America. *A Comprehensive Evaluation of Benefits*. Victoria Transport Policy Institute.
- Litman, T. (2014). Evaluating public transportation local funding options. *Journal of Public Transportation*, 17(1).
- Mathur, S. (2014a). Funding Public Transportation Through Special Assessment Districts: Addressing the Equity Concerns. *Public Works Management & Policy*. doi: 10.1177/1087724x14550252
- Mathur, S. (2014b). *Innovation in public transport finance : property value capture / by Shishir Mathur*: Burlington, VT : Ashgate, [2014].
- Mathur, S., & Smith, A. (2012). A Decision-Support Framework For Using Value Capture to Fund Public Transit: Lessons From Project-Specific Analyses: Mineta Transportation Institute
- Medda, F. (2012). Land value capture finance for transport accessibility: a review. *Journal of Transport Geography*, 25, 154-161. doi: 10.1016/j.jtrangeo.2012.07.013
- Mohammad, S. I., Graham, D. J., Melo, P. C., & Anderson, R. J. (2013). A meta-analysis of the impact of rail projects on land and property values. *Transportation Research Part A: Policy and Practice*, 50(0), 158-170. doi: <http://dx.doi.org/10.1016/j.tra.2013.01.013>
- National Association of Realtors. (2011). Public Transit Boosts Property Values, If Conditions are Right. *Transportation and Real Estate: Making the Connections*. Retrieved from Reconnecting America website: <http://www.reconnectingamerica.org/assets/Uploads/cpatransport2.pdf>
- National Conference of State Legislatures. (1994). *Eight Ways to Finance Transit: A Policymakers Guide*. Washington, DC.
- National Transit Database Program. (2013). Transit Profiles: 2012 Summary Report.
- Perk, V. A., & Catalá, M. (2009). Land Use Impacts of Bus Rapid Transit: Effects of BRT Station Proximity on Property Values along the Pittsburgh Martin Luther King, Jr. East Busway. Retrieved from [http://www.nbrti.org/docs/pdf/Property%20Value%20Impacts%20of%20BRT\\_NBRTI.pdf](http://www.nbrti.org/docs/pdf/Property%20Value%20Impacts%20of%20BRT_NBRTI.pdf)
- Perk, V. A., Catala, M., & Reader, S. (2012). Land Use Impacts of Bus Rapid Transit: Phase II— Effects of BRT Station Proximity on Property Values along the Boston Silver Line Washington Street Corridor.
- Peterson, G. E. (2008). Unlocking Land Values to Finance Urban Infrastructure: Land-based financing options for cities. *Gridlines*, (40). Retrieved from <http://www.ppiaf.org/sites/ppiaf.org/files/publication/Gridlines-40-Unlocking%20Land%20Values%20-%20GPeterson.pdf>
- Renne, J. L., Bartholomew, K., Wontor, P., & McDaniel, J. B. (2011). Transit-oriented and joint development : case studies and legal issues. *Legal Research Digest (Transit Cooperative Research Program)*.(36).

- Rolon, A. (2008). Evaluation of Value Capture Mechanisms from Linkage Capture to Special Assessment Districts. *Transportation Research Record: Journal of the Transportation Research Board*, 2079(-1), 127-135. doi: 10.3141/2079-16
- Rybeck, R. (2002). Using Value Capture to Finance Infrastructure & Encourage Compact Development. Washington, DC: Transportation Research Board.
- Salon, D. (2014). *Localtion Value Capture Opporutnities for Urban Public Transport Finance*. Paper presented at the Transit Leadership Summit, London, UK.  
<http://library.rpa.org/pdf/TLS-2014-Research-Paper-Value-Capture.pdf>
- SB Friedman Development Advisors, & URS. (2011). Transportation Value Capture Analysis for the CMPA Region.
- Shinkle, D. (2012). Transit-Oriented Development in the States. Washington, D.C.: National Conference of State Legislatures.
- Sivak, M. (2013). Has motorization in the US peaked? Part 2: use of light-duty vehicles.
- Small, K. A., & Voerhoef, E. T. (2007). *Urban Transportation Economics*. New York, NY: Routledge.
- Smith, J. J., & Gihring, T. A. (2006). Financing transit systems through value capture. *American Journal of Economics and Sociology*, 65(3), 751-786.
- Transit Cooperative Research Program. (2002). Transit-Oriented Development and Joint Development in the United States: A Literature Review. *Research Results Digest*(52).
- Virginia Commonwealth University. (2008). Implementation Strategies for Successful Bus TOD Projects.
- Walters, L. C. (2012). *Land Value Capture in Policy and Practice*. Paper presented at the Annual World Bank Conference on Land and Poverty, Washington, D.C.  
[http://www.landandpoverty.com/agenda/pdfs/paper/walters\\_full\\_paper.pdf](http://www.landandpoverty.com/agenda/pdfs/paper/walters_full_paper.pdf)
- Weiner, E. (2013). *Urban Transportation Planning in the United States: History, Policy, and Practice* (4 ed.). New York: Springer Science+Business Media.
- Wise, D. (2010). Public Transportation: Federal Role in Value Capture Strategies for Transit is Limited, but Additional Guidance Could Help Clarify Policies *Highlights*. Washington, D.C.: United States Government Accountability Office.
- Zhao, Z. J., Das, K. V., & Larson, K. (2012). Joint development as a value capture strategy in transportation finance. *Journal of Transport and Land Use*, 5(1), 5-17.