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Joint development as a value capture strategy for public transit finance

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Abstract: Synthesizing relevant experiences in US and some Asian countries, this article reviews joint development as a value capture strategy for funding public transit. The review starts from the concept of joint development in transportation, its rationale, and the extent of use. We then provide a classification of joint development models with respect to ownerships and transaction methods. These models are illustrated with case examples from multiple countries. After that, we assess the efficacy of joint development with a set of criteria for transportation finance evaluation, including economic efficiency, social equity, revenue adequacy & sustainability, and political & administrative feasibility. Finally, we conclude and provide recommendations for policy consideration.

Keywords: Value capture; Transportation finance; Joint development

1 Introduction

Transportation systems play a central role in enhancing the productivity and quality of life. In the United States, funding for streets, highways, and public transit is provided through the joint efforts of federal, state and local governments, with taxation and user fees as primary revenue sources, supplemented by loans, bonds and public-private-partnerships (Board 2006). In recent decades, the amount of resources allocated to construct, operate and maintain transportation systems has not grown in proportion to increasing needs, leading to concerns about the adequacy and effectiveness of the transportation finance system as it currently exists. A 2007 report by the National Surface Transportation Policy and Revenue Study Commission, *Transportation for Tomorrow*, suggests that an annual expenditure of at least $225 billion for the next 50 years will be required to upgrade our existing transportation system to a state of good repair; however, present spending is only about 40 percent of this amount (Transportation Research Board 2007). This growing gap has highlighted the necessity of either significantly altering the present system or finding viable options to replace it. One such option that has been increasingly discussed in the United States is value capture (Rybeck 2004; Smith and Gihring 2006), which aims to capture the value of benefits received by property owners or developers as a result of infrastructure improvements, and to use these revenues to fund such improvements (Phu 2007; Stopher 1993). Some studies have demonstrated the method's suitability for financing urban transportation improvements that might otherwise be funded by local general revenues such as property taxes or regressive local sales taxes (Wachs 2003). A 2009 research report by the University of Minnesota identifies eight common value capture strategies, including land value taxes (LVT), tax increment finance (TIF), special assessment districts (SAD), transportation utility fees (TUF), development impact fees, negotiated exactions, joint development, and air rights (Iacono *et al.* 2009).

The focus of this article is on joint development, which is a formal arrangement between the public sector and private entities such that the private entities share some costs of infrastructure improvement or contribute some benefits back to the public sector based on a mutual recognition of the benefits of such infrastructure improvement (Landis *et al.* 1991). Joint development has been used in the United States and in other countries. The majority of the literature on value capture focuses on a single case or only on cases from a single region. Hence information about value capture remains scattered, unorganized, and sometimes confusing, resulting in little knowledge accumulation. To facilitate public discussion and policy consideration of issues related to value capture, this article reviews joint development practices in public transit fi-

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nance, synthesizing relevant experiences in the United States and some Asian countries. A caveat of this study is that it does not provide original quantitative analysis, which will be needed in future research in order to better evaluate the efficacy of joint development.

The article starts from the concept of joint development in transportation, its rationale, and the extent of its use. We then develop a classification of joint development models with respect to ownership and transaction methods, and illustrate these models with case examples from multiple countries. We review the efficacy of joint development in four categories of transportation-finance evaluation criteria, including economic efficiency, social equity, revenue adequacy and sustainability, and political and administrative feasibility. Finally, we draw conclusions and provide recommendations for policy consideration.

2 Joint development concepts and rationale

The National Council for Urban Economic Development defines joint development as a public-private partnership designed to decrease the costs of constructing or operating public transportation improvements through creative public-private financing arrangements (National Council for Urban Economic Development 1989). Focusing on public transit, Landis et al. define joint development as any formal agreement or arrangement between a public transit agency and a private individual or organization that involves either private sector paying to the public sector or private sector sharing capital costs with the public sector, in mutual recognition of the enhanced real-estate development potential created by using a public transit facility (Landis *et al.* 1991). The Sedway Kotin Mouchly Group defines joint development as real-estate transactions involving the development of private projects using publicly owned land or air rights (Sedway Kotin Mouchly Group 1996). Varying in scope and method of collaboration, these definitions reflect various forms of joint development in transportation projects.

Theoretically, joint development may be applicable to all types of transportation improvement that lead to higher property values or enhanced development potential. However, most examples in the literature pertain to public transit or urban roads in high-density development areas, where land value impacts are easier to identify. The literature shows that public transit—especially high-speed rail—tends to significantly increase property values around stations, while other areas may suffer from negative effects such as pollution, noise or negative spillover due to redistribution of economic activities (Cervero and Duncan 2002). Although debate about whether public transit projects necessarily add value to land continues, successful cases of joint development in transit have shown that, at least under certain circumstances, public transit improvements may create significant value that can be recognized by the private sector and, upon recognition, may be partially recaptured through a variety of joint development mechanisms. This article focuses on transit-related joint development mechanisms that can be used to capture such value and the effects that they may have, should such value be created and recognized.

Joint development projects are sometimes referred to as public-private partnerships, but this description is not accurate in all cases. Some types of joint development are public-private partnerships, for example, when the private sector is involved in a contractual relationship to jointly finance public transportation. The Federal Highway Administration defines public-private partnerships as "contractual agreement[s] formed between public and private sector partners, which allow more private sector participation than is traditional" (US Department of Transportation 2004). In the past, public transportation projects in the United States have been primarily funded by the public sector with governmental revenues, while the private sector's role has been largely limited to design or construction contracts on a fee-for-service basis. Deep cuts in federal transportation grants and state transportation funding, however, have forced public agencies to seek out financial resources from the private sector to meet the growing need for transportation investment (Cervero 1992). Options to increase private contribution, such as joint development, are viewed as important ways to decrease project costs, mitigate public risk, and increase the quality of transportation infrastructure (US Department of Transportation 2004). Other types of joint development, however, are not necessarily public-private partnerships; for example, when governments sell or lease property or development rights to obtain revenues, when public authorities directly engage in profit-making real estate development, or when private sector stakeholders are involved only through direct exchanges such as paying for adjustments of density standards or usage rights (Center for Transit Oriented Development 2008).

Joint development is a value capture strategy because private benefits created through infrastructure improvements are partially captured through specific joint development arrangements to support the initial cost of the improvements. In this sense, successful joint development projects may help alleviate funding shortages and may improve market efficiency by better linking costs and benefits of transportation improvements.

3 Extent of use of joint development

The use of joint development in the United States dates back to the Pacific Railroad Act of 1862, which provided land grants to the Union Pacific and Central Pacific Railroads for the construction of the transcontinental railroad. Each railroad was given 400-foot rights of way plus ten square miles for every mile of track built. The federal government expected the railroads to sell their acquired land to pay for the transcontinental railroad's construction. However, railroads later turned to government bonds to pay for the railroad's construction (Cox 2009).

As of 2010, regulatory barriers and public opposition have prevented the widespread use of joint development strategies in the United States, although twenty-three states have enacted legislation authorizing some types of public-private partnership. It was not until the passage of the Intermodal Surface Transportation Equity Act (ISTEA) in 1991 that joint development strategies were permitted for federal-aid highway projects, and other restrictions remain a significant barrier. Additionally, many states limit the number of joint development projects or place constraints on the volume of development (US Department of Transportation 2004). Despite these limitations, several public entities have employed joint development with varying levels of success. In 2004, New York City led the nation in the number of transit-related joint development projects, primarily in the form of density bonuses provided to developers. On a dollar basis, the Washington Metropolitan Area Transit Authority (WMATA) collected the most revenue or offloaded the most cost (Cervero *et al.* 2004). In addition to New York City and Washington, D.C., our literature review shows that other cities such as Portland, Oregon and Philadelphia, Pennsylvania also use a variety of joint development models.

In recent years, joint development applications have become increasingly important in financing transit capital projects such as high-speed rail or bus rapid transit, as well as in guiding long-term land use patterns. In 2009, the American Recovery and Reinvestment Act (ARRA) appropriated $8 billion for "High-Speed Rail Corridors and Intercity Passenger Rail Service" (American Public Transportation Association 2011).[1] ARRA also established policy principles encouraging state and local governments to consider transit-oriented development approaches, including joint development, at or near stations to help support station costs and achieve higher levels of ridership. Some states had set up related bills even earlier. For example, the Florida Department of Transportation developed a "Vision Plan" in 2006 for a statewide high-speed rail system with the potential for $3.5 billion in joint development at station sites (Florida Department of Transportation 2006).

Outside the United States, joint development projects are common in Asian cities. Some widely discussed examples of joint development include Hong Kong's "rail-property (R+P)" model (Cervero and Murakami 2008; Hong and Lam 1998), the "land consolidation" model used in several Taiwanese cities (Lam and Tsui 1998) and Tokyo's "land readjustment" model (Farrell *et al.* 1994; Kuranami *et al.* 2000; Tsukada and Kuranami 1990). The success of these cases is due in part to their unique regional contexts, including high population densities, booming property markets, and favorable political, legal, or regulatory environmental toward joint development. Some of these models are not directly applicable to the United States context. Nonetheless, such international examples contribute significantly to knowledge building on joint development and can broaden the horizon for policy considerations in the United States.

4 Joint development mechanisms by ownership and benefit types

As a general concept, joint development can include many different models that can be distinguished with respect to transportation modes, organizational structures, funding allocations or physical arrangements. To facilitate the search for related policy tools, in this article, we organize joint development models in two dimensions: (1) whether related properties or sites for joint development are owned by the public or private sector, and (2) whether the transactions are based on property or development rights (Iacono *et al.* 2009). We believe it is important to distinguish ownership features because public and private property ownership may give rise to different joint development arrangements. We also distinguish benefit types as the base of joint development mechanisms following the value capture framework established in the recent Minnesota report (Iacono *et al.* 2009). Along these two dimensions, Table 1 presents multiple joint development models illustrated by selected case studies from cities in the United States and Asia. The table also includes fund usage of these joint development examples, either for cost sharing or for revenue sharing. We do not use fund usage as a major way to category joint development models, because cost sharing and revenue sharing are increasingly interconnected, as the public sector may borrow money (for example, through municipal

[1] We thank an anonymous reviewer for pointing out this important public policy trend.

bonds) and then use future revenue sharing to pay back initial costs.

4.1 Joint development based on public ownership

Transactions involving publicly owned property

The public sector may sell or lease public-owned properties for funding where the transportation agency owns land adjacent to its facilities but does not need the property for immediate use, or where the parcel is not being utilized to its full potential. The sale of property provides a one-time lump sum payment which may be used for immediate infrastructure development or capital improvements. Alternatively, leasing publicly owned property provides a steady stream of income over the duration of the lease to offset operating costs or capital improvements (Jhonson and Hoel 1985). Leasing also gives the public agency the freedom to renegotiate rent payments based on any future increases in property value. Public agencies may also proactively purchase land in anticipation of a planned infrastructure project, "banking" the land until prices appreciate before selling or leasing it for profits. These profits are used, in turn, to fund public transportation facilities (Transit Cooperative Research Program 2002). While the lower purchase price of land is the primary benefit of this model, other benefits include the fact that the required parcels may be more easily assembled and the government has more control over the timing, pace and character of future development surrounding transportation infrastructure (Transit Cooperative Research Program 2002). Two typical examples of these approaches in the United States are found in Washington, D.C., and Philadelphia.

Land banking by WMATA (Washington, D.C.) The Washington Metropolitan Area Transit Authority (WMATA) uses several models of joint development to generate revenue for the purposes of maintaining and expanding the agency's transit infrastructure, encouraging transit-oriented development, and increasing transit ridership (Washington Metropolitan Area Transit Authority 2008). Specifically, the agency leases and sells its property on or adjacent to transit infrastructure, leases or sells development rights associated with its property, shares the operational costs of ventilation and heating systems in transit stations, and charges "connections fees" for retailers who want to connect their retail spaces to transit stations. The agency receives payments from the private sector for property and development rights in several forms, including one-time lump sum payments for the purchase of property or development rights, annual lease payments, financial contributions to station construction costs, and connection fees from retailers (Cervero *et al.* 2004; Massey 1999). These joint development projects had generated over $60 million for WMATA's operating budget by 1999, and almost $150 million by 2003 (Cervero and Bernick 1997).

Commercial space leasing by SEPTA (Philadelphia) In Philadelphia, the Southeastern Pennsylvania Transportation Authority (SEPTA) has entered into many cost-sharing arrangements. For example, Philadelphia leases commercial spaces in suburban rail stations at favorable rates and, in return, the private developers maintain and upgrade public concourses and passageways. Philadelphia transit officials estimated they had attracted $2.4 million in private investments for station rehabilitation by 1990 (Cervero 1994).

Transactions involving development rights

In these methods, a public agency owns land adjacent to its facilities, and it sells, leases, or awards associated development rights to encourage development of a site and to generate revenues. The money received by the agency is used for public transportation investments, operations and maintenance. When development rights are leased or sold, private firms may use the rights to develop commercial, industrial or residential facilities. Unless there is a profit-sharing agreement in place between the public and private entities, the private entity retains the revenue generated from such development. Hong Kong used this strategy through their R+P model. The transactions have not only been able to sustain infrastructure costs but also yield a net return on investment (Cervero and Murakami 2008; Hong and Lam 1998). When development rights are awarded, private entities are given the right to recover costs through real estate development in exchange for developing transit infrastructure. A typical example in the United States is seen in Portland, Oregon. (Center for Transit Oriented Development 2008).

Rail-property (R+P) model (Hong Kong) The Metropolitan Transit Railway Corporation (MTRC) of Hong Kong uses a joint development method they call the *rail-property (R+P) model*. Using this model, the MTRC purchases development rights from the Hong Kong Government (the majority shareholder of the MTRC) at a "before rail" price, and sells these rights to a selected developer at an "after rail" price—which is significantly higher. The difference between the "before rail" and "after rail" prices covers the cost of railway investments. In this way, the MTRC takes advantage of market-driven property appreciation to finance railway services. The R+P model

Table 1: Mechanisms of joint development.

Joint Development Method		Examples	Fund Usage	
			Cost-sharing	Revenue-sharing
Public Ownership:				
Property	Sale for funding	Land-banking by WMATA (Washington, D.C.)	X	
	Lease for funding	Commercial space lease by SEPTA (Philadelphia)		X
Development rights	Sale for funding	Development rights sale (Hong Kong)	X	
	Lease for funding	Development rights lease, Washington, D.C. Rail-property model (Hong Kong)	X X	
	Exchange for private contributions	Development rights award (Portland) Development rights award (Taipei)	X X	
Private Ownership:				
Property	Exaction through joint development	Land readjustment (Tokyo) Land acquisition (Taipei) Land consolidation (Taipei)	X X X	
Development rights	Usage adjustments in exchange for private contributions	Comprehensive plan change (Taipei) Commercial-industrial mixed use (Taipei)	X X	X
	Density bonus in exchange for private contributions	Density bonus program (New York City)	X	X

was used in the development of Maritime Square, which was planned and managed by the MTRC as a part of the Tsing Yi Station. The MTRC procured 50-year development rights for the site and sold the rights at a substantial premium to underwrite the costs of building the station. A private sector developer then used the development rights to build residential towers and a shopping center adjacent to the rail station (Cervero and Murakami 2008; Hong and Lam 1998).

Development rights award (Portland, OR) The Red Line/Airport MAX light rail extension in Portland, Oregon, was built by Bechtel and Trammel Crow (a private development team) in exchange for the development rights around Cascade Station. The project involved cooperation between the development team, the Port Authority of Portland, the City of Portland, the Portland Development Commission and TriMet (Portland's transit agency). As per the joint development agreement, originally crafted in 1999, the development team agreed to take responsibility for the repayment of $28 million in bonds related to the construction of a portion of the light rail in exchange for the right to develop 120 acres surrounding the project (Center for Transit Oriented Development 2008). The development consisted mainly of retail and office space in the surrounding area. Development stalled for almost four years between 2001 and 2005 due to the real estate downturn after September 11, 2001. However, since 2005, the area has witnessed significant new development, including several major retailers, office and hotel projects (Center for Transit Oriented Development 2008).

4.2 Joint development based on private ownership

Transactions involving privately owned property

A public entity, or a developer working with a public entity, may exact land from private property owners who, in exchange, receive benefits in the form of property improvements. This model is used extensively in Japan to acquire land for rail projects and real estate development (Farrell *et al.* 1994; Kuranami *et al.* 2000; Tsukada and Kuranami 1990). In Taiwan, such examples including *land acquisition* and *land consolidation* approaches (Lam and Tsui 1998). In the United States, there are few joint development examples in this cate-

gory, probably due to the more extensive restrictions on governmental exaction.

Land readjustment (Tokyo) The *land readjustment model* of joint development is widely employed in Japan. In this model, a public or private developer organizes property owners into a cooperative, which authorizes the developer to develop the property, returning smaller but fully serviced parcels to landowners when the development, including transportation infrastructure projects, is complete. The developer retains a portion of the new property parcels as compensation for their development services. Tokyo Corporation, a private railway operator and real estate developer, completed the Tama Denen Toshi development, a planned community serviced by a rail line, using the land readjustment model. Tokyo Corporation and its affiliated companies then promoted the area's development by selling land, constructing housing, and attracting shopping centers and schools. The project is viewed as one of the most successful land development initiatives undertaken by a private Japanese company, requiring no direct government subsidy (Farrell *et al.* 1994; Kuranami *et al.* 2000; Tsukada and Kuranami 1990).

Land acquisition and land consolidation (Taipei) Several cities in Taiwan have used exaction approaches including *land acquisition* and *land consolidation*. In these models, private property owners donate a portion of their property to a public entity. The agency improves the acquired properties by providing, for example, sewer, water, or other utility service. When the improvements are complete, the public entity returns a predetermined percentage of the land (40% in Taipei City) to the original property owners. The land retained by the public entity is used to develop various infrastructure facilities such as roads or transit. Alternatively, the land may also be retained to raise money for future infrastructure development (Lam and Tsui 1998).

Transactions involving development rights

In some cases, private property owners may be willing to contribute in exchange for improved development rights—for example, through zoning changes. Two typical examples are usage adjustments in Taipei, Taiwan, and density bonuses in New York City.

Usage adjustments (Taipei) Taiwan uses a *comprehensive plan change* approach in Taipei and Kaoshiung, where the cities' comprehensive plans permit developers to apply for zoning changes that increase revenue potential by, for example, changing the approved land use from residential to commercial. In exchange, the developers are required to contribute funds or share the costs of transportation infrastructure (Lam and Tsui 1998). For example, a developer may contribute 30 percent of its property and 12 percent of project costs to the city, in exchange for a high-density development permit. The government uses these property gains to offset infrastructure costs in the area. Alternatively, developers may also petition for the establishment of *industrial-commercial mixed-use districts*, a joint development model wherein special permits allow the high-intensity use of urban and non-urban land. These permits require a contribution of land as well as cost sharing. For example, a developer may be required to contribute 30 percent of their land within a mixed-use district to the government, plus 12 percent of the infrastructure-related development costs (Lam and Tsui 1998).

Density bonuses (New York City) The primary form of joint development in the City of New York is the Density Bonus Program, started in 1972. The city offers zoning bonuses to developers that agree to improve subway entrances and to incorporate entrances in other developments. These bonuses may increase a developer's Floor Area Ratio (FAR), or the amount of square footage they can develop, by up to 20 percent, allowing the developer to add several floors to a new building and significantly increase its revenue potential. Typical improvements include pedestrian passageway upgrades, air circulation enhancements, landscaping investments or the removal of accessibility barriers for people with disabilities (Cervero *et al.* 2004). Such arrangements allow the City of New York to save money on subway construction and in return allow the developers to build at densities that would usually not be permitted in the zone (Massey 1999).

5 Evaluating joint development as a transit finance strategy

This study seeks to provide a systematic evaluation of the efficacy of joint development as a value capture strategy for public transit finance. In public finance literature, revenue or finance options are often evaluated with a common set of criteria such as efficiency, equity, adequacy and transparency (Mikesell 2006; Musgrave and Musgrave 1989). Such practices have been employed to evaluate transportation finance options. For example, the 2006 report by the National Cooperative Highway Research Program (NCHRP), *Future Options to Meet Highway and Transit Needs*, utilizes the following criteria: equity, economic efficiency, yield, cost/administrative

feasibility, technical feasibility and political acceptability (National Cooperative Highway Research Program 2006). In this article, we organize relevant criteria into four categories: (1) economic efficiency; (2) social equity; (3) revenue adequacy and sustainability; and (4) political and administrative feasibility. These criteria are illustrated with sample research questions in Table 2. Using this framework to synthesize related literature and experiences about joint development, we hope to identify key policy issues that are relevant to joint development, to highlight key research questions for further empirical inquiry, and to provide a common ground for comparing joint development with other transportation finance options.

5.1 Economic efficiency

The increased land value associated with proximity to transit development to support transit improvements, joint development links the costs of infrastructure development to the windfall benefits realized by private property owners or developers (Doherty 2004; Hagman and Misczynski 1978; Stopher 1993). Unlike typical governmental taxation schemes that may distort consumer behavior and thus reduce economic efficiency, joint development may improve economic efficiently by providing more accurate price signals for societal marginal costs and benefits of transit improvement through internalizing its positive externalities.

Joint development models may have advantages over traditional project delivery due to the interaction of cost sharing and benefit sharing. On one hand, joint development reduces public-sector inputs through collaboration with the private sector. By tapping into private sector resources, the public sector can share project-related risk, access private financing, take advantage of private sector expertise and innovation, or achieve scale economies, all of which reduce public-sector investment in infrastructure and allow the construction of projects that would not have been implemented otherwise (US Department of Transportation 2004). For example, the proceeds of joint development agreements in Hong Kong have not only paid for the entire cost of projects, but have generated additional funds used to retire pre-existing debt (Cervero and Murakami 2008; Hong and Lam 1998). On the other hand, joint development may promote local economic development, because infrastructure improvements increase commercial activity through enhanced accessibility and agglomeration economies. In Washington, D.C., and Atlanta, joint development projects around transit stations have generated higher fare revenue by increasing transit trips as a result of the services clustered in the area Cervero (1992). Areas with joint development projects have also been found to have lower vacancy rates, higher average building densities, and larger shares of regional growth than equivalent areas without joint development projects Cervero (1994). The corresponding increase in employment, business growth, and improved accessibility facilitate economic development. WMATA's joint development projects represent public-private investment of $4 billion, which has created 25000 jobs in the Washington area and triggered $15 billion of new, unrelated private development (Massey 1999; Transit Cooperative Research Program 2002).

Nevertheless, joint development tends to be associated with higher transaction costs. The planning and coordination necessary for a successful joint development project require a significant time investment both in setting appropriate policies before a project is to begin, and in managing the implementation phase. This is particularly relevant where the public and private sectors have not previously collaborated on joint development projects. When partnerships are new, they may increase workloads in the public sector, as employees seek to put in place procedures that guarantee a project's timeliness, efficiency and safety. Alternatively, the private sector may also struggle to understand the joint development bidding and project coordination processes, lengthening the time required to negotiate, plan and execute these projects (US Department of Transportation 2004). Lack of planning or communication between project partners can result in project failure. For example, the Bangkok elevated rail and transit system was not completed because neither partner met predetermined expectations (Kuranami *et al.* 2000).

5.2 Social equity

We evaluate equity from three perspectives. First, we apply the *benefit-received principle* to assess the extent to which individual payments are related to the benefits that are received by them. Second, we apply the *ability-to-pay principle* to examine how the burden joint development contributions is distributed across groups with different income levels. Finally, we discuss *geographic equity issues* associated with individuals living in different locations.

The benefit-received principle The benefit-received principle dictates that those who benefit from a public project should pay for it. Economists assume that joint development is a relatively equitable financing mechanism, since joint development projects are structured through a market-driven process that requires the public and private sectors to come to an agreement as to what benefits and costs will be traded. Private developers receive benefits that they agree are in proportion to their contribution to the project. Those who do not want to

Table 2: Evaluation criteria for transportation finance strategy.

Criterion		Sample Questions
Economic efficiency		• Is the cost to contributors related to the benefit they receive? • Will it provide price signals or incentifves for travelers' behavior, priority of investment, or governmental decisions? • To what extent might it hinder economic development?
Social Equity	Benefit equity	• Is it fair to contributors in terms of the benefits they receive? • Are there issues of equity by geographic areas? • Are there concerns of inter-generational equity?
	Ability-to-pay equity	• How closely does it relate to capacity-to-pay? • Is it regressive or progressive for different income groups?
	Geographic equity	• Is there a mismatch of benefits and costs for people in different areas?
Revenue adequacy and sustainability	Adequacy	• Is the revenue base broad or narrow? • Is the (implicit) tax rate high or low? • How much revenue can it raise? • Would it be enough to replace traditional sources of revenue?
	Growth potential	• To what extent can the revenue catch up with income growth? • To what extent can the revenue catch up with inflation? • To what extent can the revenue catch up with need increases?
	Stability	• How volatile is the revenue? • Is it cyclical or counter-cyclical?
	Predictability	• Is the revenue easily predictable?
Political and administrative feasibility	Political feasibility	• Is the tax or fee visible to taxpayers or the public? • Is the tax or fee transparent in its adoption, implementation and tax burden? • Would it incur any tax exportation? • What is the common perception by developers and the public? • Are there specific obstacles in the current rule and regulations?
	Administrative feasibility	• Administrative cost: How difficult is it to manage the process? • Compliance cost: Is it difficult for the public to comply with the policy?

participate in a joint development project do not do so. However, some forms of joint development have been criticized for their distribution of benefits. For example, the Taiwanese government has encountered opposition from property owners when using its land consolidation model of joint development, primarily because land owners do not believe that they receive sufficient compensation for giving a portion of their land to the government (Lam and Tsui 1998).

There may be situations in which certain contributors disproportionately benefit from joint development. Concerns have been raised about the extent to which joint development agreements benefit the private sector at the expense of taxpayers. Some states have regulations that limit the timely distribution of information about joint development agreements, thus avoiding a full public review process and reducing overall transparency. While these arrangements are not common, localities should craft joint development agreements to ensure that the interests of both the public and private sectors are protected.

The ability-to-pay principle Evaluating equity from an "ability to pay" perspective measures the extent to which joint development is progressive, proportional or regressive by comparing effective tax burdens for different income classes. In many cases, joint development may be progressive because many properties or related development rights adjacent to transportation improvement sites may be owned or controlled by members of high-income groups, who would have gained more windfall benefits if the joint development project had been funded by the government. However, the vertical equity of a joint development project is determined by the unique circumstances of the joint development agreement. Such a project could become regressive if it disproportionately benefits private developers, or if the developers are able to pass a larger percentage of their costs on to middle- or low-income consumers.

The geographic perspective There are several geographic equity concerns regarding transit development in general, as well as specific joint development models, because such projects often produce mismatches of benefits and costs whereby people living in certain areas subsidize those living elsewhere. On one hand, most transit systems cannot generate sufficient fare revenues from direct transit users to cover their operating and maintenance costs, and thus rely upon other revenue sources such as federal grants, local property taxes or earmarked special revenues. In the case of local property taxes, for instance, the benefits of specific transit lines or stations are enjoyed mostly by users adjacent to those facilities but are supported by taxpayers across the whole jurisdiction. On the other hand, empirical studies across the United States and European counties suggest that economic benefits of rail transit investment are likely to be redistributive within a region (Banister and Berechman 2000; Cervero and Landis 1997; Hanson and Giuliano 2004). While residents in certain locations, such as traditional city centers or areas around popular stations, see great land development impacts, residents in other locations may suffer from nuisance effects such as pollution or noise, or negative economic spillovers due to the loss of economic activities to other locations.

5.3 Revenue adequacy and sustainability

Joint development has proven to be a significant source of project funding in some international cases. In Japan and Hong Kong, adjacent real estate development fully funds the cost of infrastructure development and ongoing operations (Cervero and Murakami 2008; Farrell *et al.* 1994). In Vancouver, the local transit authority plans to replicate a similar joint development model by launching a real estate division that will purchase land along new rapid transit routes, increase the intensity of the property's zoned land use, and then sell and lease the land to private real estate developers at a higher price. In doing so, they hope to produce up to $1.5 billion in revenue over the next ten years to fund the development of new transit lines (Shore 2008).

However, methods that are more commonly used in the United States—such as the lease or sale of public property, or the use of density bonuses to generate revenue—generally provide a smaller portion of total project financing (Stopher 1993). Moreover, negative public opinion in the United States may also reduce public entities' ability to use joint development as a revenue generating strategy. For example, in Washington, D.C., WMATA posits that their joint development efforts are not hampered by market demand but by the public's suspicion that joint development will not benefit taxpayers (Metropolitan Washington Council of Governments 2005). As a result of these factors, joint development is most often used as a supplemental financing source in the United States.

Besides property-based private contribution, joint development of transit projects may increase fare revenues by increasing transit ridership. In a study of nine transit joint development projects in the United States, Keefer (1983) found that every 1000 square feet of new commercial space near a rail station generated an additional six transit trips a day. This yielded an additional $11.4 million (in 1982 dollars) in annual fare

box receipts across the nine projects, ranging from $56 000 in Santa Ana, California to $5 000 000 in Philadelphia.

The predictability of revenue from joint development projects depends on the structure of the payment stream. Most joint development models require that both public and private contributions be predetermined. For example, when a public entity sells or leases property that it owns, its revenues are determined through legally enforceable lease or purchase agreements. In contrast, alternative sources such as the federal fuel tax have become more volatile as fluctuations in gasoline prices reduce demand and result in lower revenue collection (Board 2006). Moreover, a one-time lump sum payment will be relatively more predictable than a series of future lease payments. For example, some private developers have offered large one-time payments in exchange for long-term property or development rights leases. In a long-term payment structure, future payments could be jeopardized if the commercial or real estate markets weaken.

Two factors determine the revenue stability of joint development. First, the level of demand for the transportation facility may affect the amount of revenues collected, if the revenue streams are tied to ridership or traffic volume (Landis *et al.* 1991). Second, economic conditions may affect the success of surrounding real estate developments close to transportation improvements. For example, WMATA agreed to be compensated through a lease agreement that provided them a portion of profits derived from related condominium sales (Massey 1999). During the mid-1990s, real estate appreciated in value and thus the lease agreement provided a stable return on WMATA's investment. Such arrangements may yield less stable income streams during periods of economic volatility. However, the demonstrated flexibility of joint development shows that joint development revenues can be structured to keep up with inflation if the contributions from the private sector are amortized over the life of the project. Likewise, if a one-time lump sum payment is deemed desirable, the public entity should negotiate a payment that considers the time value of money and the impact of inflation.

5.4 Political and administrative feasibility

Joint development may be more politically acceptable than tax increases, as the visibility of the approach as a source of public revenue is relatively low. Nevertheless, as shown by examples in the United States and Taiwan, joint development may invoke public opposition if the fiscal arrangements are considered unfair to the general public. Opinions from scholars and practitioners are divided. Some see joint development as a cost-effective strategy that makes efficient use of public and private resources, while others view it with suspicion, in that the public and private sectors may exploit the development of transportation facilities to obtain unfairly large benefits (Metropolitan Washington Council of Governments 2005; US Department of Transportation 2004).

In addition, political feasibility heavily depends upon the structure of regional and local institutions. Joint development has been used more often in some Asian states, probably because these governments are allowed more flexibility in intervening or directly participating in the land and property market. In the United States, joint development continues to face institutional and political barriers, in part because of widespread public concerns that such deals might be structured to benefit private interests at the expense of the public (National Council for Public-Private Partnerships 2003). Political concerns may also be raised if the use of joint development alters project development planning or priorities. Private sector interest in joint development often focuses on projects with the greatest revenue potential, neglecting projects that provide smaller revenue opportunities or that entail higher risk (Kuranami *et al.* 2000). As a result, transportation infrastructure development may become inconsistent or uncoordinated across modes or systems.

Joint development is administratively challenging, as it requires a higher level of coordination between public and private partners than traditional project delivery. A lack of coordination ended the Hopewell Holdings development project to create an elevated road and train system in Bangkok, Thailand, when the public and private partners failed to meet each other's expectations (Kuranami *et al.* 2000). In most cases, however, related transaction costs are far less than the overall cost savings generated from public-private collaboration, which can reduce the amount of time necessary to complete a project and enhance the public sector's access to technical expertise (US Department of Transportation 2004). As a result, many transit authorities—including those in Washington, D.C., New York City and Atlanta—have found joint development to be a worthwhile source of revenue.

6 Conclusions and recommendations

To summarize, joint development is a formal arrangement between public and private entities in which the private sector stakeholders either pay the public sector stakeholders directly or agree to share capital costs of development with the public sector stakeholders, in mutual recognition of the enhanced real-estate development potential created by the infrastructure improvement (Landis *et al.* 1991). Joint development is

a value capture strategy because the agreement partially captures the private benefits created through infrastructure improvements.

Joint development encompasses many distinct models, which we categorize in two dimensions: (1) whether related properties or sites for joint development are owned by the public or private sector, and (2) whether the transactions are based on property or development rights. If the public sector is allowed to own or purchase adjacent off-site properties prior to transit improvement, the government may sell or lease these properties after their values have been increased by transit improvement. Alternatively, the government may lease or award development rights to the private sector in exchange for revenues or other private contributions. For privately owned properties, public sector entities may be able to acquire not only rights-of-way but also some off-site parcels through negotiated exactions. Alternatively, the government may allow the private sector to have more profitable usage of the adjacent properties in exchange for revenues or other private contributions.

We assess the efficacy of joint development with a common set of criteria for transportation finance evaluation. Joint development is, in general, economically efficient because it reduces public-sector investment in infrastructure, and it may promote local economic development due to enhanced accessibility and agglomeration economies. But it tends to involve higher transaction costs in project planning and coordination. Joint development improves benefit-received equity because it links the costs of infrastructure development to the windfall benefits of private property owners. It can be either progressive or regressive depending on specific contexts and actual arrangements. Joint development may raise concerns over geographic equity, as it may incur mismatch of benefits and costs for people living in different localities. Examples from outside the United States have shown that joint development can be a significant source of project funding. In the United States, however, joint development generally provides only a small proportion of total project financing, in part due to regulatory barriers and political opposition to use such market-oriented mechanisms in infrastructure development. Joint development is more politically acceptable than tax increases, but it may invoke public opposition if the fiscal arrangements are perceived to be unfair. The political acceptability of joint development also depends upon its regional and local institutional structure. Joint development is administratively challenging, as it requires a higher level of coordination between public and private partners than traditional project delivery mechanisms.

Overall, joint development can be a useful strategy for transit finance, but its usage and efficacy depend upon specific regional contexts and detailed arrangements. A comparison with examples in other countries indicates that the potential of joint development has not been fully realized in the United States, in part due to regulatory and political obstacles to non-traditional project finance and delivery mechanisms.

To facilitate the use of joint development in transit finance, we provide several recommendations for policy consideration and future research. First, state governments should adopt specific authorization and guidelines for the use of joint development. In many places, public agencies are still forbidden to participate in development activities cannot purchase land, or are subject to internal policies (such as parking requirements) that limit their ability to engage in joint development (Cervero *et al.* 2004). In many cases, these policies were created before joint development was widely used. They should be reviewed and revised to allow for the appropriate use of joint development.

Second, local governments should be encouraged to integrate transit joint development possibilities in their long-term comprehensive plans. A variety of joint development arrangements could be designed, following cohesive policies that maintain local land use and planning goals (Cervero 1992; Smith and Gihring 2006; Urban Land Institute with Gladstone Associates 1979). This may avoid the practice, formerly common, of governments haphazardly granting zoning exceptions and bonuses for developer-driven projects. In addition, governments should consider a long-term time horizon in using joint development to capture the value of their transportation investments, as a significant period of time may be required for the benefits of transit improvements to be fully realized. Some joint development mechanisms, for example "land banking" as used by WMATA, must be planned and implemented before transit improvement projects are initiated. Other mechanisms, such as "usage adjustments" or "density bonuses", can be initiated later. Private revenues or contributions can be structured as long-term payment streams that account for inflation, or as one-time payments that consider the time value of money in calculating future benefits.

Finally, more research is in order to understand various joint development mechanisms and their effects in different contexts. A rich body of literature already exists on the effects of transit development on land value, but much less is known about mechanisms to be used to capture these value. Policy scholars should continue to examine joint development experiences in the United States and other countries in order to identify various types of joint development, and to study their

effects in different legal, political and economic contexts. In addition, more studies should be conducted on public perceptions of transit joint development—from the policy discussion stage through implementation and after project delivery—because public understanding and acceptance are key to the successful usage of joint development in transit finance.

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