Alternative Institutional Arrangement for Urban Transit and Intercity Railway Operations: Lessons for the U.S.

SENIOR PROJECT

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1. Abstract

Public transportation is an important part of the U.S. transportation system. After losing popularity in the U.S. during the mid-20th century, public transportation has been making a strong comeback in major metropolitan areas since the 1990s. In an effort to reduce inner-city traffic congestion, promote environmentally sustainable development patterns, rejuvenate decaying central business districts, and take advantage of all the other externalities of public transportation (i.e., reduced air pollution, a smaller urban footprint reducing sprawl, etc.), urban areas have been actively expanding their existing systems or building completely new systems. Despite the strong interest in reinvesting in public transportation and a growth in ridership in real terms, transit agencies in the U.S. have traditionally been plagued with low ridership relative to other travel modes, and limited budgets, and often have operating deficits on an annual basis. Governments at all levels, while supportive of expanding transit systems and willing to bear the operating deficits, become fiscally strained during times of economic slowdown and have had to shuffle transit investments with other public priorities. This can delay and indefinitely stop transit investments for years, costing the public the benefits of public transportation.

A look into East Asian cities, namely Tokyo, Japan, and Hong Kong reveals a different approach in funding public transportation. The model used in the two cities has been in use for decades and has resulted in public transportation systems that are extensive and well-utilized. The model, called R + P, involves transit operators acting as both the infrastructure operator and station area designer, developer, and manager. The R + P model is institutionally different from that of the U.S., and may hold lessons for U.S. policymakers when determining future financing

arrangements for public transportation. R + P may aid in the eventual goal of establishing extensive and heavily used transit systems in major U.S. metropolitan areas, and improve the quality of life for the general public.

2. Background

2.1. The Competitiveness of Transit

For the last half of the 20th Century, U.S. has dedicated a substantial portion of its transportation resources to the motor vehicle travel. While a great amount of resources have been committed to other modes of transportation, such as intra-regional transit and airline travel, as shown in Figure 1, the number of passenger-miles traveled on each mode, shown in Table 1, demonstrates the skew in utility that motor vehicle travel enjoys over other modes (Bureau of Transportation Statistics [BTS], 2012; BTS, 2014). At its peak in 2008, highways expenditures were 3.59, 4.33, 16.28, and 141.30 times higher than expenditures in transit, air, water, and rail, respectively.

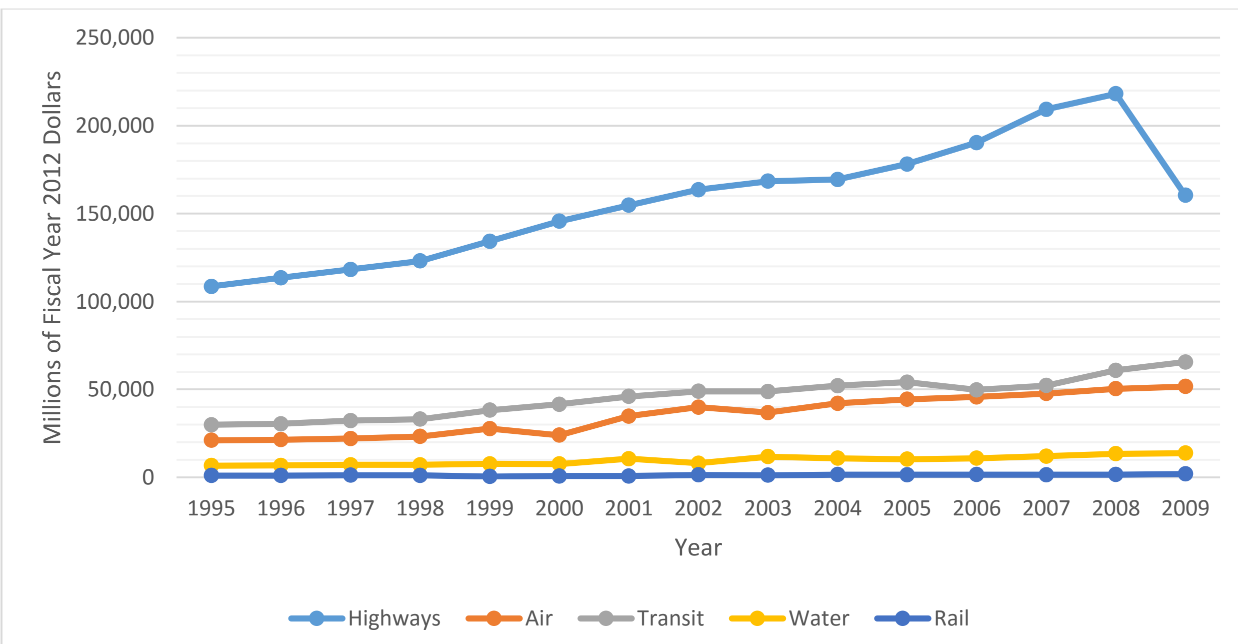

Figure 1. Transportation expenditures of all levels of government by mode. (BTS, 2012).

Mode	*Millions of Passenger-Miles Travelled in 2012*	*Percentage*
Highway	4,274,877	86.93%
Air	580,501	11.81%
Transit	55,169	1.12%
Rail	6,804	0.14%
Total	4,917,352	100.00%

Table 1. U.S. Passenger-Miles by mode (Bureau of Transportation Statistics [BTS], 2014).

In 2012, highways dominated the transportation market with over 4.27 trillion passenger-miles and 86.39 percent of the total miles traveled. Air travel made up the second largest portion of all passenger travel, with over 580 billion passenger-miles travelled or 11.81 percent of the total. Transit and rail, on the other hand, were relatively used much less. Just over 55 billion and 6.8 billion passenger-miles were travelled by transit and rail, respectively. Transit and rail collectively made up only 1.26 percent of all passenger-miles travelled. It should be noted, however, that because transit trips are largely characterized by intra-regional and intra-city trips, the average distance travelled by each passenger will be relatively less than that of highway and air users. Hence, the aggregate distance of transit users will be less. Figure 2 displays the number of unlinked transit trips over time.

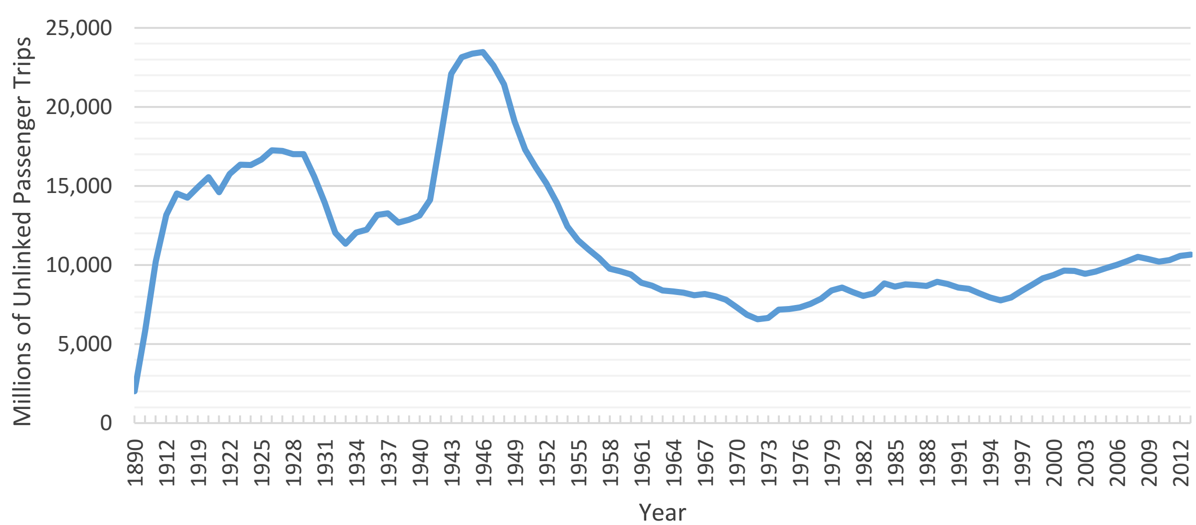

Figure 2. Unlinked Passenger Trips on Transit Modes (roadway and fixed-guideway) from 1890 to 2013 (American Public Transportation Association [APTA], 2015, pp. 20-27).

In Figure 2, transit enjoyed consistently high ridership figures in first two decades of the 20th century. Ridership troughed in the 1930s (during the Great Depression) before cresting in the early 1940s (during World War II). Ridership then slowly declined until the 1970s, and has since slowly increased. While the reasons for the patterns presented in the above figures are numerous, they can mainly be attributable to 1) large subsidies dedicated towards highway and air travel infrastructure, 2) a decentralized pattern of urban form and density in major U.S. cities that is not practicable for common transit use, and 3) a lack of uniformly good service and accessibility to transit systems (Cranor, 2011; Walker, 2010; Dimitriou, 2001; Newman & Kenworthy, 2006; Fishman, 2005, pp. 358-359). In particular, transit systems in U.S. cities are not nearly as extensive as those in cities where public transit plays a major role in transportation.

2.2. Interest in Transit Grows

Since the late 1990s, however, a small, but nonetheless significant shift in jobs and housing flows from outer suburban rings to inner city centers has been occurring in a number of U.S. metropolitan areas (Fishman, 2005, pp. 358-359). To illustrate, the New York regional core (which includes the City of New York, Hudson, Essex, and Union Counties in New Jersey) lost population (eight percent) and jobs (6.6 percent) between 1969 and 1990, while the outer suburban ring region gained population (eleven percent) and jobs (56 percent) in the same period (Fishman, 2005, p. 359). Yet, between 1990 and 2001, population growth in the regional core "matched that of the ring for the first time since World War II" (Fishman, 2005, p. 359). In terms of job gains, the core matched the suburban ring with nine percent growth between 1996 and 2001 (Fishman, 2005, p. 359). A similar shift in growth patterns has been observed in other U.S. cities such as Boston, San Francisco, Oakland, Chicago, and Los Angeles during the same period (Fishman, 2005, p. 359). While the reasons for these shifts are not explicitly known, Dutzik, Inglis, & Baxandall (2014, pp. 1-3) provides several insights, including a shift in millennial's (those born between 1983 and 2000) lifestyle preferences towards urban and walkable neighborhoods, and transportation using a variety of modes in order to save on fuel expenditures and to spend more time using portable technology devices. Cities and states are also aware of the importance of having an adequate transportation system to induce social and economic transactions of their citizenry (Harriet, Poku, & Emmanuel, 2013, p. 225). These transactions generally aggregate and contribute to economic growth and an increase in standard of living. As the former mayor of Bogotá noted, however, "[t]ransport differs from other problems developing societies face, because it gets worse rather than better with economic development" (Suzuki, Murakami, Hong, & Tamayose, 2015, p. 2). As societies develop, people's wealth and incomes increase, and their choice of travel shifts from non-motorized modes to motorized modes, in particular the automobile (Suzuki, Murakami, Hong, & Tamayose, 2015, p. 2). Since urbanized areas are by nature limited in space (Walker, 2012, p. 17), and automobiles are inherently spatially inefficient, congestion becomes a common occurrence in developed cities (Norton, 2008, p. 139). Cities and states would be interested in reducing congestion since it negatively affects economic development. In 2011, there was 38 hours of delay and 19 gallons of fuel wasted per capita in the U.S. (Schrank, Eisele, & Lomax, 2012, p. 1). Finally, it is becoming increasingly recognized by policymakers and the general public that transportation systems contribute greatly towards environmental degradation and the release of greenhouse gas emissions in the atmosphere (United States Department of Transportation [DOT], 2010, p. ES-2; Cranor, 2011).

Because of the above discussed reasons, there has been a renewed interest in investing in public transportation in the U.S. Cities such as Washington, D.C., Los Angeles, and Denver are expanding their existing transit systems, while other cities including Dallas, Salt Lake City, Phoenix, and Charlotte have recently completed brand new systems (Neff & Dickens, 2013, p. 11). Figure 3 displays the trend of passenger-miles by transit mode in the United States between 1990 and 2012.

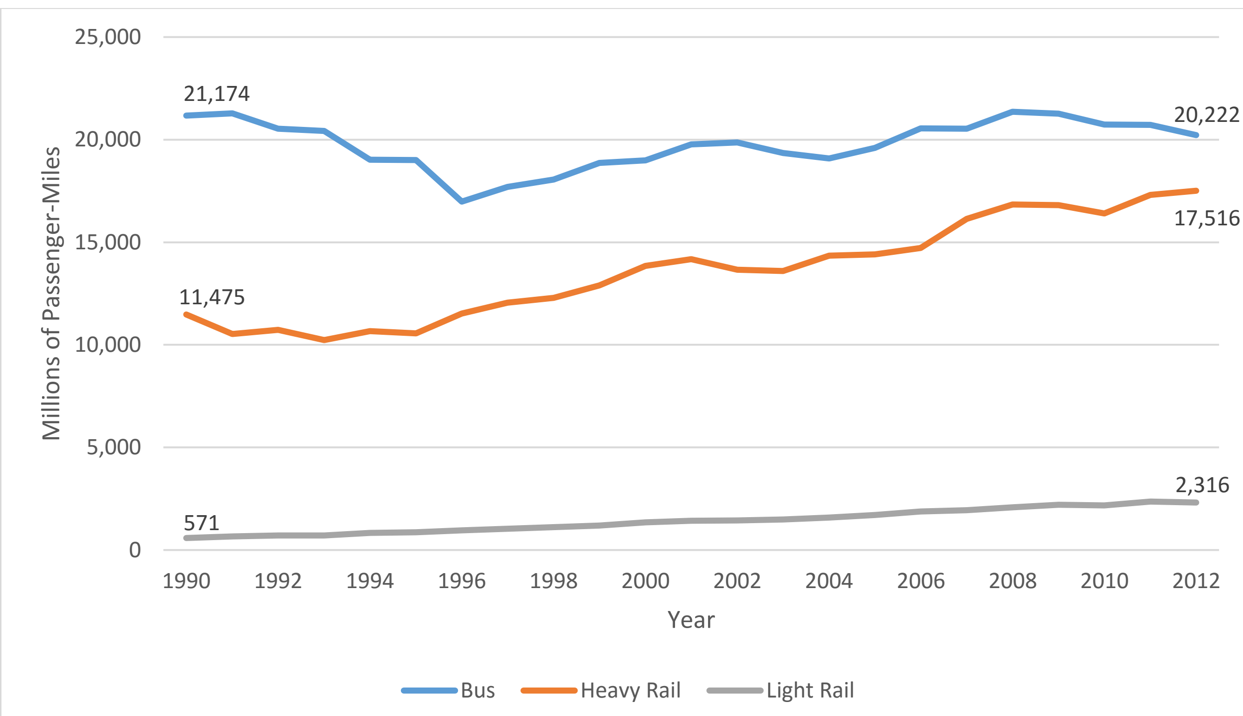

Figure 3. Passenger-miles by transit mode in the U.S. (BTS, 2014).

Minus a large dip in the mid-1990s, the utilization of buses (which includes motor buses and trolley buses) has remained relatively steady for the last 20 years at around 20 billion passenger-miles. Heavy rail, on the other hand, has experienced a remarkable increase in usage. The number of passenger-miles has increased from 11.48 billion in 1990 to 17.52 billion in 2012, representing a 53 percent increase. Light rail has also enjoyed an increase in usage, from 571 million passenger-miles to over 2.3 billion passenger-miles in 2012. This is a 306 percent increase in the number of passenger-miles. When compared to highways and air travel, the transit utilization gains are still minimal, but an independent comparison of transit modes shows that significant ridership gains have been realized.

The Government Accountability Office (GAO) reported that the increase in ridership is attributable to "population increases, periods of growth in employment, and increases in gasoline and parking prices" (2010, p. 8). Transit agency officials have noted as well that ridership increases occurred due to transit agencies "expanding and enhancing their systems, adding new service, forming local partnerships, and launching marketing campaigns to increase ridership" (GAO, p. 8). Another factor that has led to an increase in ridership over the years is an active approach by transit agencies to increase the potential number of riders working, living, and shopping near their lines by engaging in joint development and encouraging transit-oriented development (TOD) in their station areas.

The increase in ridership, however, has required transit agencies to ramp up service and invest in line improvements to accommodate the extra demand. This has resulted in an increase in operating and capital costs for transit agencies. The GAO noted that "because public transit riders do not pay for the full cost of their rides through passenger fares and revenues have not kept pace with operating costs, increased ridership has strained . . . transit system[s'] operating budget[s]" (2010, p. 13). Additionally, expansions of public transit systems, especially those that utilize dedicated rights-of-way, are known to require huge amounts of public funds (Cabanatuan, 2014; Richards, 2013). After construction, such systems typically require ongoing subsidies because farebox revenues cover only a portion of their operating costs. Figure 4 shows the percentage of each funding source for operating expenditures.

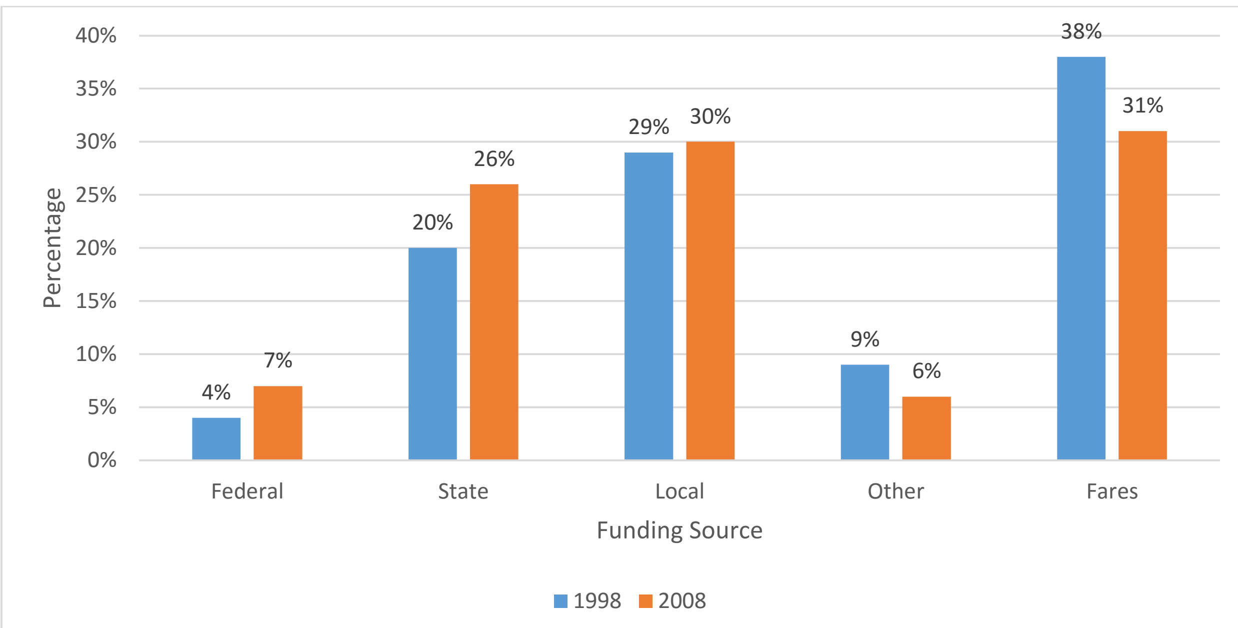

Figure 4. Funding sources for U.S. transit operations expenditures. (GAO, 2010, p. 14).

The proportions of funding increased at all government levels between 1998 and 2008, indicating a strong commitment to investing in public transit. Nevertheless, the share of funding from other sources (e.g., advertising revenue) and fare revenue decreased. With other funding sources and fare revenues covering only 47 percent and 37 percent of funding for 1998 and 2008 respectively, it seems that there is a chronic funding shortfall for transit operations. Figure 5 presents the contribution of each funding source to transit capital projects.

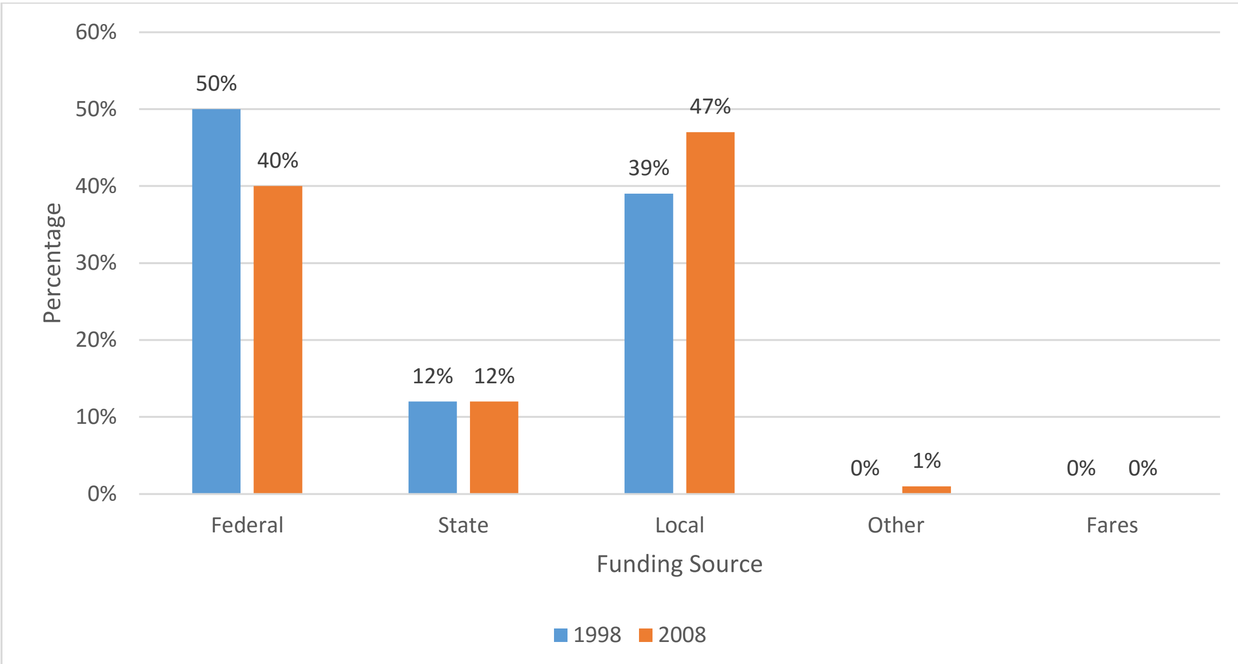

Figure 5. Funding sources for U.S. transit capital expenditures. (GAO, 2010, p. 15).

While the percentage of state funding remained static, federal funding declined while local funding increased between 1998 and 2008. Other funding sources contributed one percent to capital expenditures in 2008, while fare revenues contributed zero percent in both 1998 and 2008. In essence, transit capital expenditures are almost entirely dependent on public investments. Table 2 shows the farebox recovery ratio (i.e., fare revenues divided by operating expenditures) for 16 U.S. transit agencies in 2012. The transit agencies are ranked according to greatest operating expenditures.

Ratio of Fare Revenues to Operating Expenditures of North American Transit Agencies for 2012

Rank	Operator (State)	Fare Revenues	Operating Expenditures	Ratio
1	NYCT (NY)	$3,622,833,825	$6,685,391,347	0.54
2	NJ Transit (NJ)	$891,835,082	$1,890,514,517	0.47
4	MBTA (MA)	$472,185,325	$1,295,890,428	0.36
3	WMATA (DC)	$714,512,997	$1,513,176,930	0.47
6	LACMTA (CA)	$359,058,439	$1,245,808,764	0.29
5	CTA (IL)	$551,162,509	$1,283,092,210	0.43
7	MTA LIRR (NY)	$581,408,370	$1,163,468,650	0.50
8	SEPTA (PA)	$451,094,843	$1,163,326,950	0.39
9	MTA-MNCR (NY)	$588,121,687	$945,225,586	0.62
10	MUNI (CA)	$202,266,632	$646,619,295	0.31
11	King County Metro (WA)	$181,315,403	$630,539,306	0.29
12	Metra (IL)	$298,394,322	$627,591,444	0.48
13	MTA (MD)	$137,905,520	$597,623,138	0.23
14	BART (CA)	$366,474,018	$488,882,256	0.75
15	DART (TX)	$61,614,860	$450,030,313	0.14
16	DTPW (PR)	$44,904,968	$45,951,173	0.98

Table 2. Ratio of fare revenues to operating expenditures of North American Transit Agencies in 2012. (National Transit Database [NTD], 2013).

As Table 2 shows, none of the transit agencies' fare revenues covered their operating expenditures. The transit agency with the highest farebox recovery ratio of 0.75 was the San Francisco Bay Area Rapid Transit Authority (BART), while the Dallas Area Rapid Transit Authority (DART) had the lowest recovery ratio of 0.14. The Department of Transportation and Public Works of Puerto Rico is included as an outlier with a recovery ratio of 0.98. In order to understand the fiscal situations of the transit agencies in more detail, Table 3 and Table 4 display the operating revenues and operating margins by mode in 2012. Note that in Table 3 and Table 4, the modes under "railway" include street car rail, light rail, commuter rail, heavy rail, hybrid rail, and cable cars. The modes under "bus" are motor bus, trolleybus, commuter bus, and bus rapid transit. The "other" modes include demand response, vanpool, taxi, and ferryboat.

North American Transit Agencies Operating Revenues and Statistics in 2012

Operator	Passenger-miles (million)	Railway Revenues		Bus Revenues		Other Revenues		Total Operating Revenues	
		Million 2012 dollars	Percentage	Million 2012 dollars	Percentage	Million 2012 dollars	Percentage	Million 2012 dollars	Percentage
NYCT (NY)	12,189.81	2,742.05	76%	870.48	24%	10.30	0%	3,622.83	100%
NJ Transit (NJ)	3,082.68	528.74	59%	358.22	40%	4.87	1%	891.84	100%
MBTA (MA)	1,845.57	376.15	80%	85.43	18%	10.61	2%	472.19	100%
WMATA (DC)	2,017.10	569.24	80%	137.45	19%	7.82	1%	714.51	100%
LACMTA (CA)	2,117.18	71.44	21%	272.57	79%	-	-	344.01	100%
CTA (IL)	2,266.25	262.54	48%	288.62	52%	-	-	551.16	100%
MTA LIRR (NY)	2,083.40	581.41	100%	-	-	-	-	581.41	100%
SEPTA (PA)	1,632.22	261.38	58%	183.67	41%	6.05	1%	451.09	100%
MTA-MNCR (NY)	2,438.20	587.49	100%	0.41	0%	0.22	0%	588.12	100%
MUNI (CA)	468.71	70.64	35%	130.33	64%	1.29	1%	202.27	100%
Metra (IL)	1,681.88	298.39	100%	-	-	-	-	298.39	100%
King County Metro (WA)	576.54	14.49	8%	155.17	86%	11.65	6%	181.32	100%
DART (TX)	472.43	25.81	42%	32.53	53%	3.28	5%	61.61	100%
MTA (MD)	818.31	60.27	44%	75.08	54%	2.55	2%	137.91	100%
BART (CA)	1,545.72	366.47	100%	-	-	-	-	366.47	100%

Table 3. Operating revenues of transit agencies in North America. (NTD, 2013).

Operating Profits and Loss of North American Transit Agencies in 2012

Operator	Railway		Bus		Other		Operating Income in 2012 dollars
	Operating Income in millions of 2012 dollars	Operating Margin	Operating Income in millions of 2012 dollars	Operating Margin	Operating Income in millions of 2012 dollars	Operating Margin	
NYCT (NY)	(1,002.03)	-37%	(1,631.49)	-187%	(429.04)	-4163%	(3,062.56)
NJ Transit (NJ)	(472.89)	-89%	(454.02)	-127%	(71.77)	-1472%	(998.68)
MBTA (MA)	(407.51)	-108%	(302.43)	-354%	(113.77)	-1072%	(823.71)
WMATA (DC)	(274.42)	-48%	(428.35)	-312%	(95.89)	-1225%	(798.66)
LACMTA (CA)	(235.59)	-330%	(651.94)	-239%	-	-	(887.53)
CTA (IL)	(252.47)	-96%	(479.46)	-166%	-	-	(731.93)
MTA LIRR (NY)	(582.06)	-100%	-	-	-	-	(582.06)
SEPTA (PA)	(242.88)	-93%	(426.10)	-232%	(43.25)	-716%	(712.23)
MTA-MNCR (NY)	(353.18)	-60%	(0.83)	-205%	(3.09)	-1387%	(357.10)
MUNI (CA)	(170.78)	-242%	(256.37)	-197%	(17.20)	-1329%	(444.35)
Metra (IL)	(329.20)	-110%	-	-	-	-	(329.20)
King County Metro (WA)	11.70	81%	(332.29)	-214%	(59.86)	-514%	(380.44)
DART (TX)	(135.99)	-527%	(210.07)	-646%	(42.36)	-1292%	(388.42)
MTA (MD)	(133.69)	-222%	(256.19)	-341%	(69.83)	-2740%	(459.72)
BART (CA)	(122.41)	-33%	-	-	-	-	(122.41)

Table 4. Operating margins of transit agencies in North America. (NTD, 2013).

From Table 3, the distribution of fare revenues from railways and bus revenues seems to display no pattern. For some transit agencies, the fare revenues from each mode is almost evenly divided, while for other agencies, the figures are skewed with either railways or buses generating most of the revenues. Revenues from other modes are meager for all of the transit agencies. In addition, from Table 4, almost every mode under every transit agency operates at a loss (i.e., based on revenue from fares). The highest operating margin of railways is negative 33 percent for BART, while the lowest is negative 527 percent for DART. For buses, the highest operating margin is negative 127 percent for NJ Transit, while the lowest is negative 646 percent for DART. With other modes, the highest operating margin is negative 514 percent at King County Metro, while the lowest is negative 4,163 percent at New York City Metropolitan Transportation Authority (NYCT). Railways under King County Metro have the only positive operating margin. This figure is a bit misleading as King County Metro does not carry out rail operations itself, but is contracted out by the Central Puget Sound Regional Transit Authority (Sound Transit) to run Link light rail service. Overall, NYCT had the highest operating deficit at over $3.06 billion, while BART had the lowest operating deficit at over $122 million.

While the arguments that for a given level of service, transit can handle extra passengers more cheaply than automobiles (Small, 1997, p. 674) and that rail subsidies are actually lower than automobile subsidies on a passenger-mile basis when considering both direct costs and indirect costs (Cranor, 2011) are valid, the reality is that governments can only spare a certain amount of available cash towards public transit expansions and operating subsidies in light of other public expenditures. This limitation of funds can slow down and delay the expansion and improvements to public transit systems until more funds become available.

3. Premise

3.1. Problem

While the U.S. has invested substantial public funds in transit and passenger railway systems, such systems continually perform with negative operating margins, or deficits. This makes it difficult for such systems to make modifications and improvements to services and amenities that might increase their ridership. Additionally, the need to search for external sources of operating funds forces transit agencies to compete for limited funds with other public expenditures and puts them in a negative political light to taxpayers.

3.2. Study Purpose

The purpose of this study is to explore and examine alternative institutional arrangements that allow transit agencies and passenger railway companies to provide services on a profitable basis, and therefore on a more competitive basis.

3.3. Study Methodology

This study consisted of a literature review of the state of transit in the U.S. in terms of usage and funding levels relative to other modes of transportation. Then, the institutional arrangements that allow transit and railway operators in Japan and Hong Kong to operate on a profitable basis was studied. Finally, key principles of the institutional arrangements and their implications for the

U.S. are identified. Recommendations of policy are provided for transit agencies to take advantage of the benefits of the alternative institutional arrangements.

4. Alternative Institutional Models

4.1. Japan's Private Railway Companies

A different situation from the U.S. in terms of passenger ridership and availability of funds for transit agencies exists in East Asian cities, however. In Japan and in Hong Kong, transit operators take a more commercial approach to their operations. In the case of Japan,

> there are 149 private railway companies, 135 of which are engaged in passenger transport. Of these 135, 15 are major companies. The total length of line operated by the 15 majors is 2,860 [kilometers (km)], or a mere 14 [percent] of the total length of line—20,580 km—operated by the six [Japan Railways (JRs), which are the large privatized railway companies in charge of operating the national rail network leftover from the now defunct Japan National Railways (JNR)]. Nevertheless, the number of passengers carried by the 15 majors is equivalent to 89 percent of the total number of passengers transported by the six JRs, and their passenger-km reaches 45 percent of those of the six JRs. In Tokyo, Osaka, and Nagoya, in particular, the 15 majors carry far more passengers than the JRs (60 [percent] vs. 40 [percent]), showing that the principal field of activity of the major private railway companies is big cities (Saito, 1997, p. 2).

How is this possible? Saito (1997, p. 3) attributes the success of the private railway companies to four factors, which include 1) efficient management, 2) a large, high-density market, 3) overcrowding during rush hours, and 4) business diversification. Saito (1997, p. 3) focuses on business diversification as a major factor to the railways' success. Indeed, the railway companies should not be thought of as just transportation businesses, but as major land developers that provide a wide variety of services to people who live along their lines (Saito, 1997, p. 3). The history of private railway companies in Japan began in the late 19th and early 20th centuries, during which several railway booms (or rapid line extensions) occurred (Saito, 1997, p. 3). In the interest of nation building activities, such as transporting military goods, the Japanese government nationalized 17 private railway companies in 1906-1907 to create the state owned JNR (Saito, 1997, p. 3). The remaining private railway companies were allowed to continue business as long as their operations did not interfere with that of JNR's. Given this situation, the private railway companies built lines that branched off from JNR's main lines into rural areas. They then "had to increase the population near their lines and attract as many passengers as possible by creating entertainment near their lines" (Saito, 1997, p. 4). The first company to do so was Hanshin, which constructed a tram line between Osaka and Kobe in 1905 and "developed residential areas, recreational facilities (spas, mountain-climbing sites, and playgrounds)[, and department stores] along the line" to build ridership (Saito, 1997, p. 4). Another extreme example is the Tokyu Group, which is "Japan's largest private railway company group with about 400 affiliated companies and more than 100,000 employees" (Saito, p. 4, 1997). Tokyu originated as a real-estate development company and entered the railway industry when it founded a railway company to build and operate a line that connected its developments to downtown Tokyo (Saito, p. 4, 1997). Saito (p. 4, 1997) notes that Tokyu is a special case because most private railway companies started off as railway companies and branched into real-estate development and investment.

The company constructed the Den-en-toshi Line with a length of 20.1 km (15 stations) in the southwestern suburbs of Tokyo between 1963 and 1984. At the same time, it developed Tama Den-en-toshi (Tama Garden City) with an area of about 5,000 [hectares (ha)] by levelling a huge hill along the line. The population of the new town is now [as of 1997] almost 500,000 (Saito, p. 4, 1997).

In 1977, the Den-en-toshi Line was connected with the Teito Rapid Transit Authority (TRTA) subway line, allowing Tokyu trains to run right into central Tokyo (Saito, p. 4, 1997). Figure 6 displays a map of the Greater Tokyo Area and its railway network.

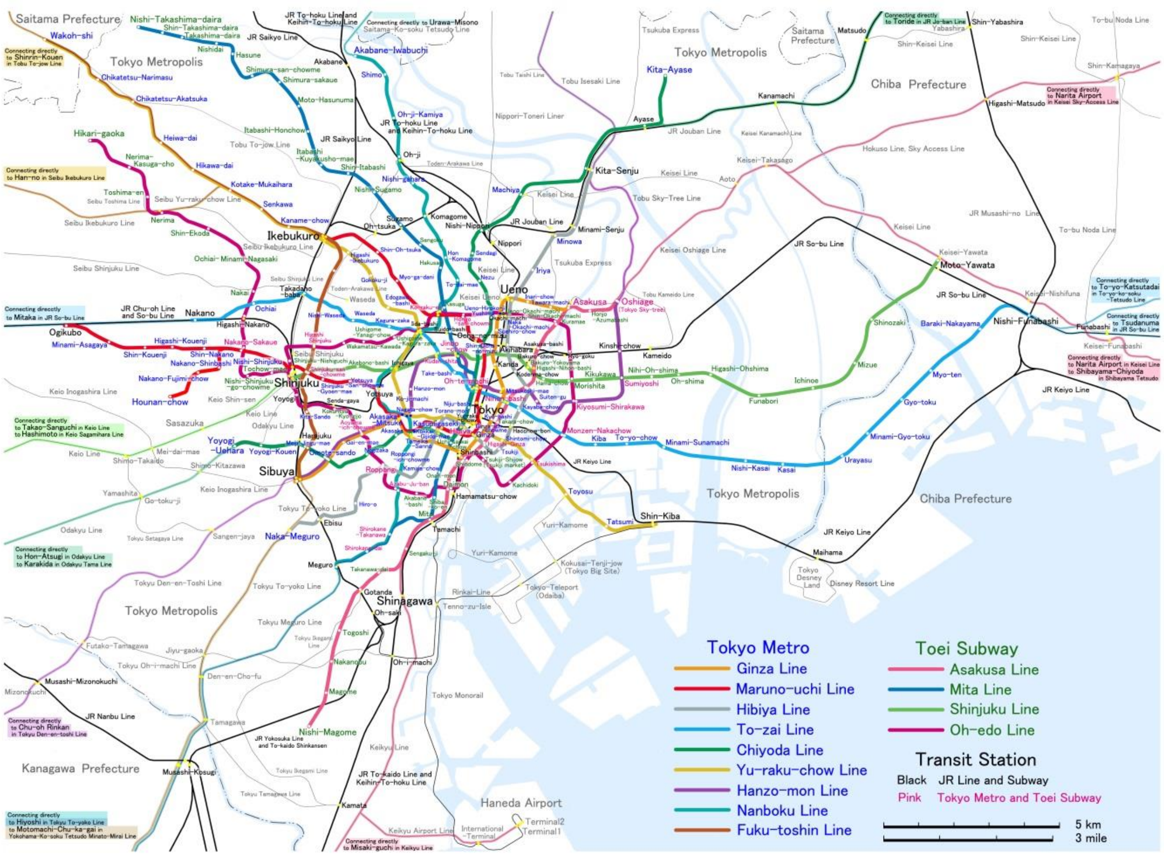

Figure 6. A map of the railway network in the Greater Tokyo Metropolitan Area. ("Tokyo Metro map kai," 2013).

Private railway companies in Japan have also engaged in industries besides railways and real-estate development. This includes the operation of bus systems, taxis, and station area retail, and is shown by the operating figures of the 15 major private railway companies in Japan presented in Table 5 and Table 6.

Private Railway Company Operating Revenues and Company Statistics in 1994

Company	Line Length (mile)	Passenger-mile (million)	Railway Revenues		Bus Revenues		Other Revenues		Total Operating Revenues	
			Million 2012 dollars	Percentage	Million 2012 dollars	Percentage	Million 2012 dollars	Percentage	Million 2012 dollars	Percentage
[Tokyo Area]										
Tobu	288.38	8,926.64	2,146.68	59%	536.67	15%	959.64	26%	3,642.99	100%
Seibu	111.72	5,896.21	1,323.48	39%	-	-	2,096.65	61%	3,420.13	100%
Keisei	56.86	2,398.50	777.72	59%	407.81	31%	122.80	9%	1,308.32	100%
Keio	52.69	4,309.84	1,052.12	59%	322.91	18%	403.26	23%	1,778.29	100%
Odakyu	75.56	6,824.54	1,449.31	63%	10.61	0%	855.03	37%	2,314.96	100%
Tokyu	62.57	5,442.60	1,599.40	40%	-	-	2,416.53	60%	4,015.93	100%
Keikyu	52.07	3,899.11	932.35	46%	362.33	18%	712.53	35%	2,007.21	100%
Sotetsu	21.75	1,754.14	427.52	21%	134.93	7%	1,432.64	72%	1,995.08	100%
[Osaka area]										
Kintetsu	369.22	9,477.18	2,869.82	74%	154.63	4%	827.75	21%	3,852.20	100%
Nankai	107.06	3,129.23	996.02	56%	186.47	11%	585.18	33%	1,767.68	100%
Keihan	57.10	3,305.08	911.13	57%	-	-	686.76	43%	1,597.88	100%
Hankyu	90.84	6,424.37	1,570.59	58%	-	-	1,117.30	42%	2,687.90	100%
Hanshin	28.02	1,358.94	438.13	41%	81.86	8%	553.35	52%	1,073.34	100%
[Nagoya/Fukuoka areas]										
Meitetsu	335.11	4,544.10	1,241.62	55%	338.07	15%	683.72	30%	2,263.41	100%
Nishitetsu	75.25	1,298.05	385.07	17%	1,141.56	51%	724.66	32%	2,251.28	100%
[Reference]										
JR East	4,661.54	79,625.19	28,384.38	96%	-	-	1,244.65	4%	29,629.03	100%
JR Central	1,232.49	30,762.92	16,964.22	92%	-	-	1,459.92	8%	18,424.15	100%
JR West	3,150.42	34,476.24	12,968.01	98%	-	-	281.98	2%	13,249.98	100%
TRTA	100.79	9,868.02	3,958.32	98%	-	-	63.67	2%	4,021.99	100%

Table 5. Operating revenues of railway companies. Modified from (Saito, 1997, p. 5).

Operating Profits and Loss of Major Private Railway Companies in 1994

Company	Railway		Bus		Other		Operating Profit in millions of 2012 dollars
	Operating Income in millions of 2012 dollars	Operating Margin	Operating Income in millions of 2012 dollars	Operating Margin	Operating Income in millions of 2012 dollars	Operating Margin	
Tobu	227.40	44%	(32.14)	-6%	325.79	63%	521.05
Seibu	216.94	52%	-	-	197.39	48%	414.33
Keisei	128.10	87%	(5.31)	-4%	24.56	17%	147.36
Keio	167.22	60%	(3.79)	-1%	114.91	41%	278.34
Odakyu	212.55	51%	2.43	1%	203.75	49%	418.72
Tokyu	309.12	49%	-	-	326.25	51%	635.36
Keikyu	148.27	55%	(10.01)	-4%	129.77	48%	268.03
Sotetsu	68.83	28%	(16.07)	-7%	189.50	78%	242.26
Kintetsu	243.17	51%	(21.68)	-5%	252.11	53%	473.60
Nankai	122.49	44%	(18.95)	-7%	174.34	63%	277.89
Keihan	100.66	49%	-	-	106.42	51%	207.09
Hankyu	132.35	42%	-	-	181.47	58%	313.82
Hanshin	41.84	22%	1.97	1%	142.20	76%	186.02
Meitetsu	109.76	43%	(18.80)	-7%	166.46	65%	257.42
Nishitetsu	36.84	25%	11.67	8%	96.42	67%	144.93

Table 6. Operating profits for major private railway companies in Japan. Modified from (Saito, 1997).

The original numbers from Saito (1997, pp. 5-6) were converted from 1994 Japanese yen to 1994 US dollars, and then to 2012 US dollars using the Consumer Price Index (Forecast-Chart.com, 2012; Bureau of Labor Statistics, 2014). From Table 5, it can be seen that some companies focus their efforts on functions other than railways. Seibu, Tokyu, and Hanshin, for instance, have chosen to focus their businesses on real-estate development and other services. Seibu and Tokyu do not even operate buses. On the contrary, Keisei and Nishitetsu earn a respectable portion of their revenues from bus operations. One key feature is that the railway branches of all the companies more than make up for their operating expenditures, as shown in Table 6. The highest operating profit on railway operating expenditures is 87 percent for Keisei, while the lowest is 22 percent for Hanshin. Another feature to note is that branches of private railway companies that specialize in bus operations seem to either be marginally profitable or unprofitable. It can be guessed that bus operations act as feeders and allow the companies to attract patronage to their other services, thereby increasing operating profits for the branches that provide those other services. Since it appears that bus operations generally pay for themselves, there is little to no net loss to the companies' overall operating margins. In general, the private railway companies are able provide the important social service of transportation in a way that does not strain local governments of their cash assets, but actually provides them with massive tax revenues (Shoji, n.d. p. 3).

4.2. Hong Kong's Mass Transit Railway Corporation

In Hong Kong, a similar approach to transit operations is done by MTRC. MTRC is the main transit operator for the Hong Kong Special Administrative Region (SAR). Founded in 1975, MTRC was solely state-owned until 2000, when 23 percent of its shares were sold to private shareholders (Cervero & Murakami, 2008, p. 8). The entrance of private shareholders incentivized MTRC to adopt a more commercial and entrepreneurial approach to its operations (Cervero & Murakami, 2008, p. 8). In particular, the company's R + P program was accelerated and broadened (Cervero & Murakami, 2008, p. 8). In the R + P process, the Hong Kong government gives exclusive development rights to MTRC around and above its station areas in the form of land grants (Cervero & Murakami, 2008, p. 10). MTRC then develops the land and capitalizes on the premium, or the difference between the "before rail" price and "after rail" price, that the land gains (Cervero & Murakami, 2008, p. 10). In the U.S., this process is known as "value capture." Cervero & Murakami note that R + P has been lucrative enough for MTRC that it is able to cover the costs of railway investments and future line extensions without direct financial help from the Hong Kong government (2008, pp. 11-14). For example, in the 1980s, although MTRC was operating at a loss, income from its R + P projects curtailed some of the losses (Cervero & Murakami, 2008, p. 13). In the 1990s, MTRC expanded its R + P program and debt financed the construction of the Airport Line with income from R + P investments (Cervero & Murakami, 2008, p. 13). Additionally, revenue from R + P developments along the Airport Line helped finance the construction of the Tseung Kwan O Line (Cervero & Murakami, 2008, p. 13). Figure 7 shows the MTRC Hong Kong railway network in 2009. As of 2014, MTRC is planning the opening of seven new lines and extensions (MTR Corporation, 2014).

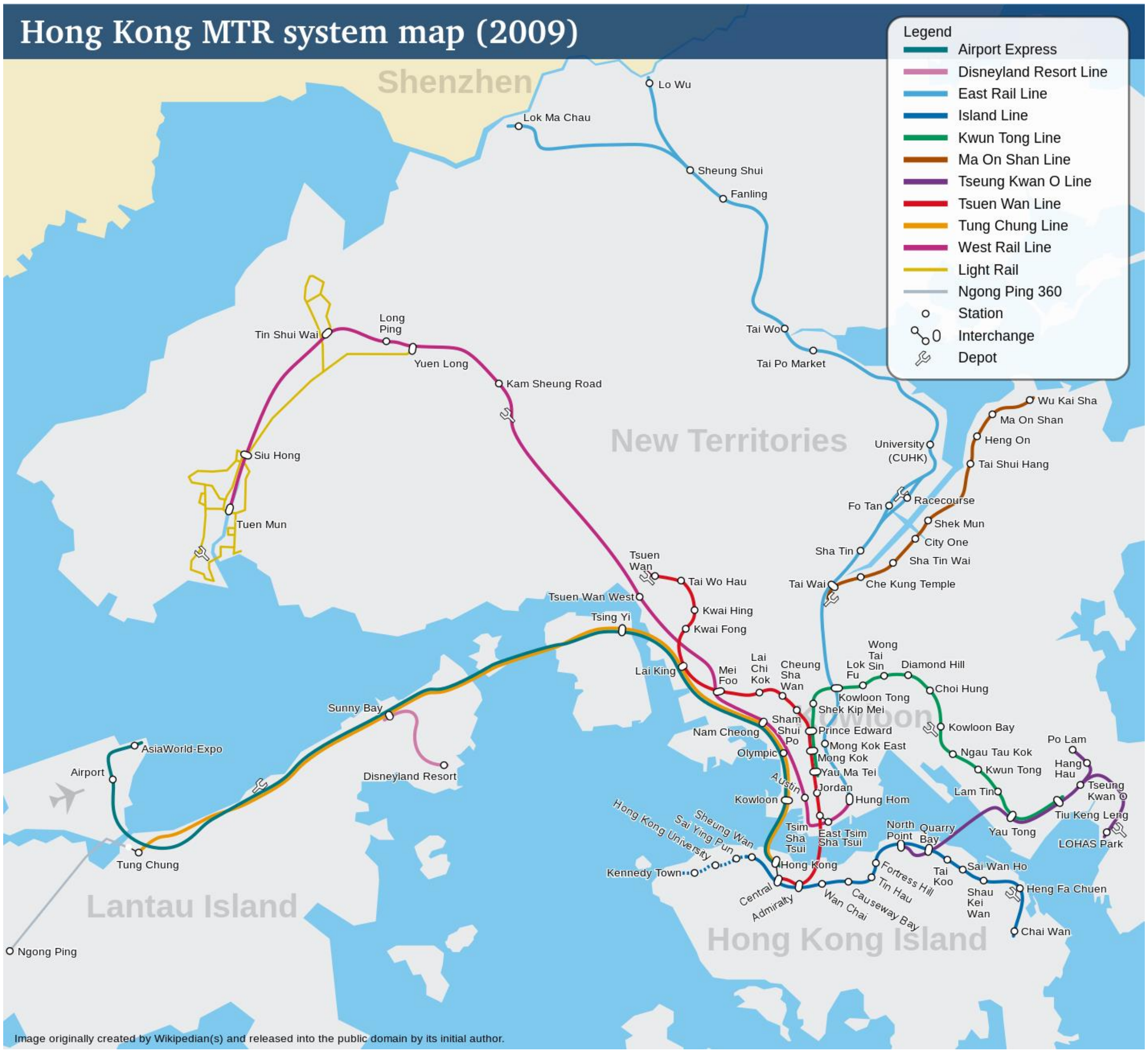

Figure 7. MTRC network in Hong Kong SAR. ("Hong Kong MTR system map," 2009).

Table 7 presents the type and size (in gross floor area [GFA]) of land development and investment projects that MTRC has been involved with.

Property Development Overview of MTRC in 2006

Type of Land Use	Residential		Commercial		Office	
Units	GFA (ft2)	Percentage	GFA (ft2)	Percentage	GFA (ft2)	Percentage
Urban Lines	341,022.23	35%	3,389,803.18	43%	2,248,215.06	25%
Airport Line	308,386.05	32%	3,300,645.70	42%	6,587,115.33	74%
Tweung Kwan O Line	313,951.00	33%	1,138,972.49	15%	53,819.56	1%
Total	963,359.28	100%	7,829,421.37	100%	8,889,149.94	100%
Type of Land Use	Hotel/Service Apartments		Government & Institutions		Total	Number of Carparks
Units	GFA (ft2)	Percentage	GFA (ft2)	Percentage	GFA (ft2)	Spaces
Urban Lines	-	-	1,539,605.26	85%	7,518,645.73	6,012
Airport Line	3,140,069.68	83%	266,622.08	15%	13,602,838.84	14,360
Tweung Kwan O Line	625,706.15	17%	N/A	-	2,132,449.19	6,547
Total	3,765,775.83	100%	1,806,227.34	100%	23,253,933.76	26,919

Table 7. Overview of MTRC property development. Modified from (Cervero & Murakami, 2008, p. 12).

Similar to the private railway companies in Japan, MTRC has also diversified its projects to include "equity ownership, cash holdings, property management, consulting, advertising, and ownership of other assets (e.g., telecommunications leases, [and] convenience retail shops)" in order to be more robust against cyclical swings in the economy and earn revenues from a variety of ventures (Cervero & Murakami, 2008, p. 13). For example, between 2001 and 2005, MTRC received revenues from property development (52 percent), railway fares (28 percent), property investment and management (ten percent), and non-fare sources (ten percent) (Cervero & Murakami, 2008, p. 13). In light of this, Cervero & Murakami also note that

> MTRC has hardly been the sole financial beneficiary of R + P. Society at large reflected by Hong Kong SAR's majority ownership of MTRC, has also reaped substantial rewards. For the 1980 to 2005 period, it is estimated that Hong Kong SAR has received nearly $140 billion (in [2008] Hong Kong dollars[,or $19.17 billion in 2012 U.S. dollars]) in net

> financial returns. This is based on the difference between earned income ($171.8 billion [or $23.53 billion in 2012 U.S.] from land premiums, market capitalization, shareholder cash dividends, and initial public offer[ing] proceeds) and the value of injected equity capital ($32.2 billion[or $4.41 billion in 2012 U.S.]). Thus the government of Hong Kong has enjoyed tremendous finance[ial] returns and seeded the construction of a world-class railway network without having to advance any cash to MTRC. The $140 billion figure, of course, is only the direct financial benefit. The indirect benefits—e.g., higher ridership through increased densities, reduced sprawl, air pollution, and energy consumption, etc.—have increased net societal returns well beyond $140 billion (2008, p. 14).

Again, as in Japan, Hong Kong has enjoyed the expansion and operation of a high quality transit system that hardly burdens the local government of any resources.

4.3. The Connection between Transportation and Land Use

While the financial successes that MTRC in Hong Kong and Japanese private railway companies have enjoyed are great, it should be noted that their achievements were possible because they took advantage of a relationship between transportation and land use. This relationship is known as the transportation-land use dynamic, and is presented in Figure 8.

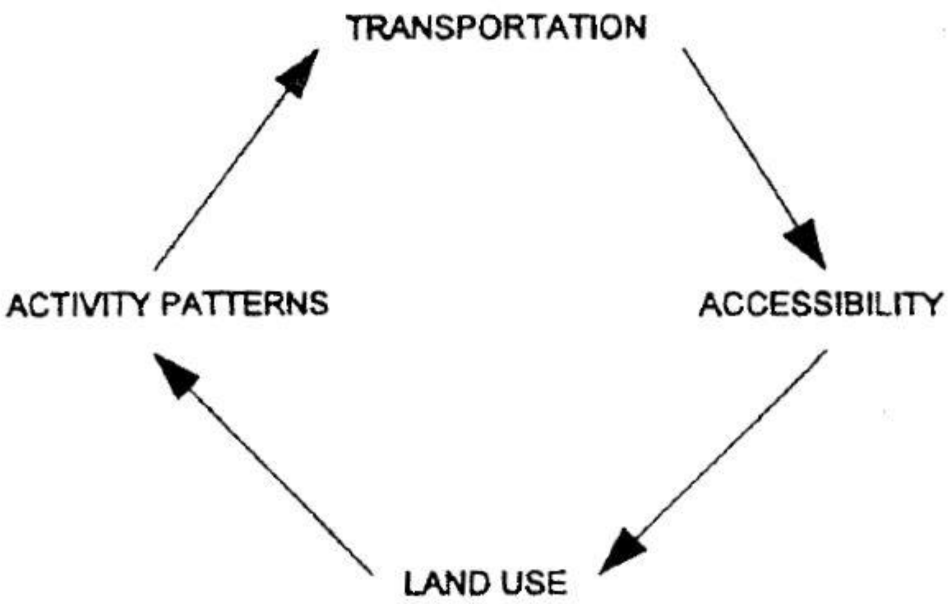

Figure 8. The transportation-land use dynamic. (Giuliano, 1995, p. 307).

Giuliano provides the following analysis of the dynamic:

> The characteristics of the transportation system determine accessibility, or the ease of moving from one place to another. Accessibility in turn affects the location of activities, or the land use pattern. The location of activities in space affects daily activity patterns, which in turn result in travel patterns (daily trips within the region). These travel patterns, expressed as flows on the transportation network, affect the transportation system (1995, p. 307).

What should be taken from the dynamic is that transportation and land use are interdependent. For example, one should typically not wait until after an area has been developed to create a transportation system because doing so may physically disturb the developments and cost more than if the system had been planned and built before the developments. Similarly, one should not build a transportation system in an area where there are no developments or any developments planned for in the future because its utility would be low. In general, transportation and land use are interdependent and feed off of each other, and should be planned together.

Tang, Chiang, Baldwin, & Yeung (2005) show a similar finding of the connection between transportation (railway) and land use (property) in Figure 9. In this case, the connection is related to the railway and property development model that MTRC and Japanese private railways use.

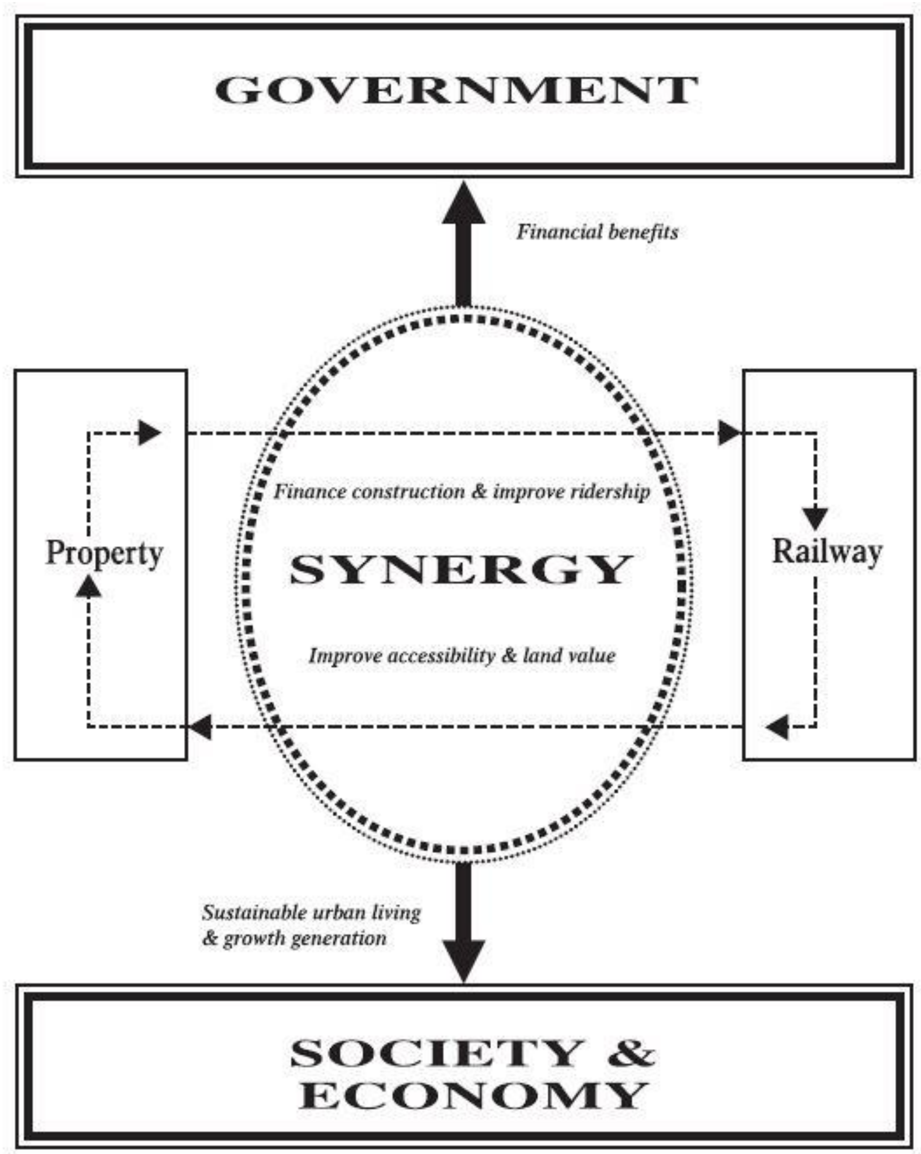

Figure 9. A model of the synergy between railways and property development. (Tang, Chiang, Baldwin, & Yeung, 2005, p. 3).

The integration of railway and property development, or R + P, is used to take advantage of the fact that a single entity absorbs the externalities that are associated with transportation investments and land developments. This integration results in two benefits: 1) Optimization of the scale of both transportation investments and property developments and 2) the minimization of transaction costs. Transportation investments typically involve huge upfront costs and need to be justified by a high expectancy of utilization after construction. Transit in particular operates most efficiently only when patronage is very high. On the other hand, land developments are often limited in scale because of the potential traffic congestion they might generate on a transportation system. Roads and highways only have so much capacity, especially when the majority of traffic is single-occupancy vehicles. In order to prevent congestion, they either need to be widened to add more lanes, or have their surrounding land uses. With either option, the effects on the environment are great as much land area is needed. When R + P is used, a single entity plans for transit and land use in tandem and can balance the intensity of land use with high capacity transit to maximize the utility and value capture from the entire investment.

It is also important to note the institutional relations that take place under R + P to optimize the scale of transportation investments and property development. Tang, Chiang, Baldwin, & Yeung (2005, p. 7) depict two models of institutions regarding railway and property development in Figure 10.

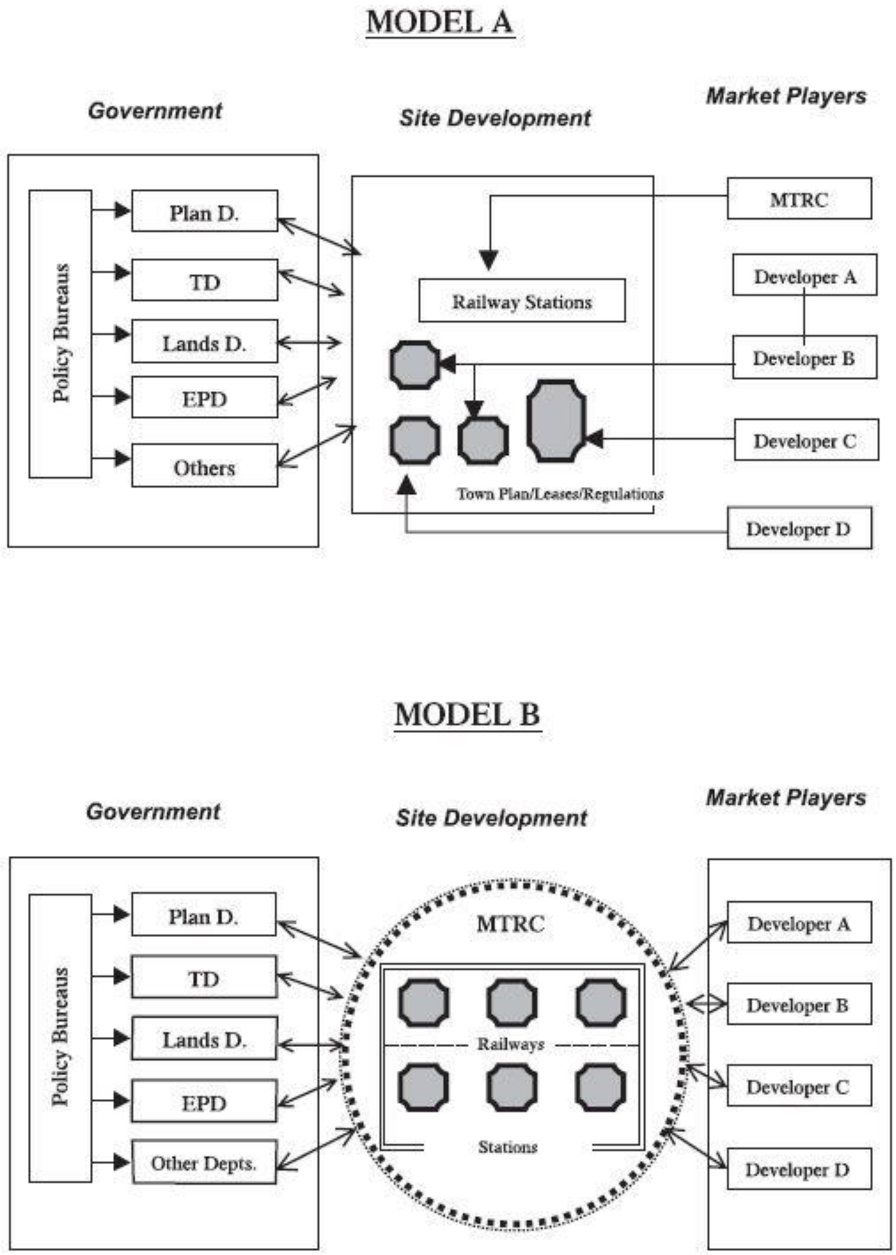

Figure 10. Two models of railway and property development. (Tang, Chiang, Baldwin, & Yeung, 2005, p. 7).

Model A in Figure 10 represents a traditional model of railway and property development where there is no lead institution undertaking the project. Under this model, “the statutory town plans, land lease documents, . . . government land sale [programs], and . . . government policies and regulations provide the principal coordinating mechanisms in bringing together all the key players in developing the sites" (Tang, Chiang, Baldwin, & Yeung, 2005, p. 8). Notice that the arrows, representing a relation between two parties, do not all point to one place. In Model B, MTRC is the lead coordinator between all of the relevant parties in a development. Tang, Chiang, Baldwin, & Yeung (2005, p. 8) state that Model B

> does not obviate the need for statutory town plans, land lease documents, government policies and regulations, but unlike [Model A], they only frame rather than dictate all the development particulars. The site development details are expected to be worked out by the MTRC in negotiation and consultation with the government departments and the developers. Exclusive development rights for the station sites are granted to the MTRC and this provides an incentive for the corporation to plan and develop the sites in such a way as to maximize the values of its entire development projects and "internalize" all possible external benefits generated from railway and property development. The MTRC provides the platform for the resolution of conflicting interests of all the relevant parties in connection with the site development.

Although Tang, Chiang, Baldwin, & Yeung's models are specific to Hong Kong, the same concept can be applied to Japan's private urban railway companies with a slight modification in that the companies are also developers. Nevertheless, in both cases, the scale of both transportation and property developments are planned carefully to bring out the full potential of the investments.

R + P also minimizes the transaction costs between transportation and land use planning. It is important to keep transaction costs low in order to increase the chance of success of a project. Tang, Chiang, Baldwin, & Yeung (2005, p. 15) note that "conflicting objectives can be more effectively resolved when the decisions are put under a company hierarchy," turning a "zero-sum game" between two conflicting parties into a "trade-offs" decision within a single firm. For example, in a complex that includes a transit station and shopping mall, property planners would want to design pathways so that as many pedestrians pass by and are retained by as many retail shops as possible (Tang, Chiang, Baldwin, & Yeung, 2005, p. 14). On the other hand, transportation planners would want to design pathways that provide for the smooth and quick flow of pedestrians as much as possible (Tang, Chiang, Baldwin, & Yeung, 2005, p. 14). If the two types of planning are done by different organizations, the costs of planning property and transportation would be greater than if the two types of planning were done by the same organization (Tang, Chiang, Baldwin, & Yeung, 2005, p. 14). In another example, Mizutani & Nakamura (2004, p. 308) discuss the reasons that Japan did not opt to vertically separate its railways during the privatization of JNR. Vertical separation of railways, a policy that the European Union promotes through EU Directive 91/440, generally refers to the separation of responsibilities of train operations and right-of-way maintenance to different entities and allows for the open access of train operations in order to entice competition (EU Directive 91/440, 2014). Instead, Japan opted to vertically integrate its railways (i.e., trains are operated and the right-of-way is maintained by the same entity).

> [A]s the case of British Rail indicates, the division of track from trains becomes problematic because an adversarial relationship has developed between the central track

authorities and the train-operating companies. Problems associated with vertical separation include high transaction costs, a need for monitoring of the other's performance, the difficulty in creating complex performance schedules, and the stimulation of incentives for the track authority to invest in new facilities to increase efficiency and improve safety (Mizutani & Nakamura, 2004, p. 308).

While vertical separation is intended to encourage railway operators to reduce their costs from competition with other operators, the high transaction costs of vertical separation may actually diminish some of the savings from competition. In general, "[t]he transaction costs in reaching a settlement within a firm are much lower than between separate companies," and R + P manages to reduce the transaction costs between different entities involved in a transit and property development project.

4.4. Station Area Partnerships

It would be of interest to look at the arrangements of station area management in R + P. Among the stakeholders, who pays for what, and who manages what in a transit station after opening likely affects the success of an R + P project. In the case of North America, it was stated by Hall & Weeks (2014, metropolitan planning meeting) that transit agencies usually do not engage in property development or investment directly because of their lack of expertise in the practices. Property development and investment are most commonly procured through sub-contracting with private sector stakeholders. In Japan, the entire process of R + P, from purchasing the land to developing station areas is handled by private railway companies and their subsidiaries with some financial help from the national government. A look into MTRC's approach, however, may give a better understanding to how transit operators in North America can benefit more directly from their investments.

As mentioned above, MTRC is jointly-owned by the public and private shareholders. This gives it the incentive to maximize the return from its investments and adjust to changing market conditions from commercial principles, while also preserving the public interest in its investments (Tang, Chiang, Baldwin, & Yeung, 2005, pp. 8-11). Within the station area, MTRC takes the role of planning and coordinator of development, transit operator, and property manager. According to Tang, Chiang, Baldwin, & Yeung (2005, p. 11),

> [d]evelopers agree to offer a sharing of their profits from the above-station development projects [(i.e., air-rights development)], when the MTRC invites them for tender. The MTRC is required to shoulder both development as well as financial risks in this process as the profit sharing is highly sensitive to the market conditions . . . . [T]he corporation is required to pay full ["after rail"] market premiums to the government for the property development rights. The market premiums are [then] levied on the property developers who are susceptible to the market environment.

Put another way, the Hong Kong government assists MTRC in acquiring right-of-way and station areas at a price that does not reflect accessibility to transit service (i.e., "before rail" price). Upon construction of the transit infrastructure and station area development, the Hong Kong government demands the added value of the land from accessibility to transit service (i.e., "after rail" price) from MTRC, which MTRC demands from the developers. Under this system, MTRC is the entity that assumes the risk from the project, rather than the central government or developers. There are two benefits that result from this. Firstly, since MTRC is the master planner and designer of the station area, MTRC will want to make sure that the station area is designed in such a way to encourage as much transit ridership and high occupancy rates of developments as possible. To do this,

> [b]y means of "Development Agreements," the MTRC will control, monitor and supervise [the] implementation of the adopted master plan proposals of the station development by the developers which have won the subject tender. The Development Agreements stipulate, in great details, the conditions, responsibilities and duties to be fulfilled by the developers as the implementation agent of the MTRC. Most developers describe the conditions of Development Agreements as very "harsh." Nonetheless, the Development Agreements perform an important function in ensuring that good quality development product will come out in the end.

Secondly, as MTRC is both the transit operator and property manager of the station area after construction, it will be encouraged to maintain transit service and the station area property in as good of a state as possible to retain patronage. Figure 11 and Table 8 show the responsibilities that separate stakeholders in a MTRC station area project assume.

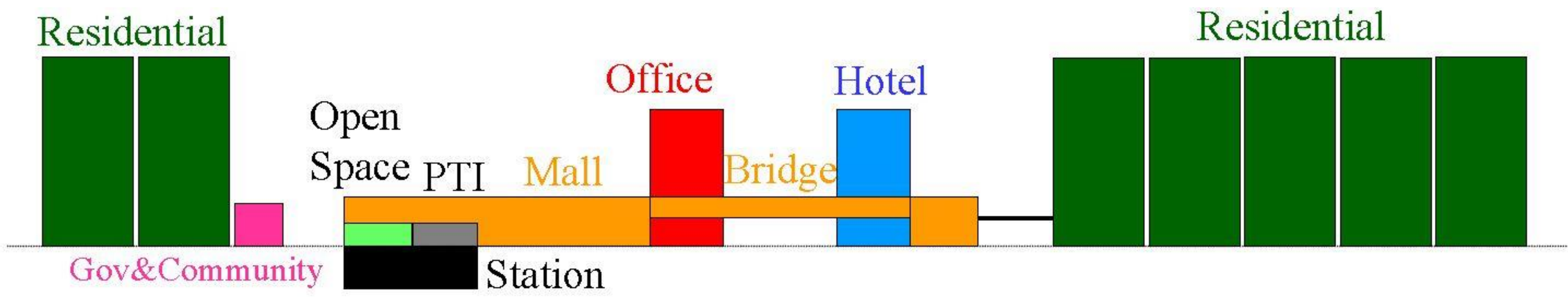

Figure 11. The components of a station area development with MTRC. (Cervero & Murakami, 2008, p. 72).

<table>
<tr><th>Project Components</th><th>Residential Towers</th><th>Mall and Retail Bridge</th><th>Office</th><th>Hotel</th><th>Town Square</th><th>Government and Community</th><th>Public Transport Interchange</th></tr>
<tr><td>1) Construction</td><td colspan="7">Developer based on railway/ development coordinated design; enabling works provided by MTRC (multiple packages)</td></tr>
<tr><td rowspan="2">2) Mechanism for sharing costs & profit</td><td colspan="4">Developer paid land premium and development cost</td><td rowspan="2">Part of the property design</td><td colspan="2" rowspan="2">Conditions in land grant</td></tr>
<tr><td colspan="4">Investment return split by up-front profit and end-profit sharing</td></tr>
<tr><td>3) Ownership of asset</td><td>Individual flat owners</td><td colspan="3">Developer</td><td>Common area of the mall and Public Transport Interchange</td><td colspan="2">Government</td></tr>
<tr><td>4) Management</td><td>MTRC</td><td colspan="2">Developer</td><td>Hotel operator</td><td>Developer</td><td colspan="2">Government delegated to operator (MTRC)</td></tr>
</table>

Table 8. The partnership responsibilities in a station area development project. Modified from (Cervero & Murakami, 2008, p. 72).

Note that Figure 10 and Table 8 present only one example of an arrangement between station area project stakeholders. Each station may have a different arrangement. Also, the public transport interchange is the area immediately outside of the transit station area that facilitates transfer between different modes of transportation. In the case of Japanese private railway companies, it is likely that the arrangement is very similar to that of MTRC, except that more responsibilities fall to subsidiaries of the main company.

To demonstrate the quality of transit service, depending on the line and time of day, MTRC can have train headways range from about 20 minutes to as low as two minutes (MTRC, 2014). The Tokyo Metro, formerly known as TRTA, operates one of two subway systems in central Tokyo (the other being Toei Subway), serving 179 stations on nine lines that make up a network of 121.2 miles (Tokyo Metro, 2014). Along with its own trains, many Japanese private railway companies operate through-service trains coming from Tokyo's suburbs on Tokyo Metro's lines, resulting in train headways that range from a high of six minutes at off-peak hours to a low of one minute and 50 seconds at peak hours (Kimura, 2013, p. 10).

A discourse on station area design also reveals a difference in thinking and extent of the function of stations between North America and other parts of the world. Arcady, quoted by Tillier (2009), states:

> There's a big difference in philosophy between European and American station design. In Europe, the trains are within the overall architectural space defined by the station, in the grandest examples a big steel and glass arch covering the tracks and platforms. In

America, the station is separate and distinct from the tracks, which are off to the side in what is basically a train yard. In Europe, passengers wait on the platform, and it's not unusual to see, say, a coffee shop right on the platform. In America, probably because of the tradition of low platforms and train-yard style stations, trains and passengers are kept separate until it's actually time for boarding, at which point the passengers go out of the station and to the train, oftentimes walking directly across other tracks. Hence, in even the grandest of US stations (Grand Central for example), the track area is generally ugly and utilitarian.

A picture of the main railway station in Berlin, Germany, taken by Ephemeron 1 (2008) and presented by Tillier (2009), furthers the point of the above discussion in Figure 12.

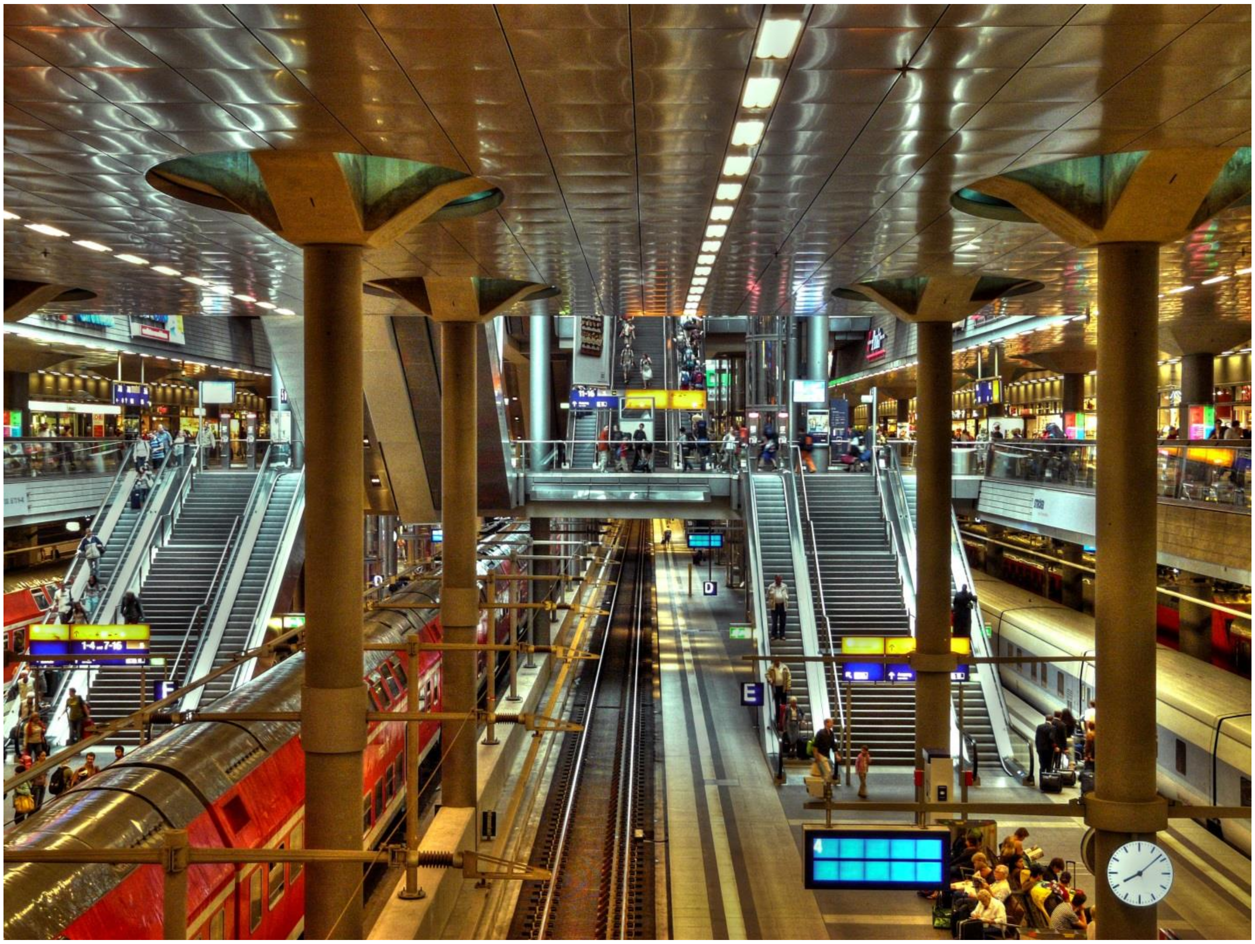

Figure 12. Berlin's main railway station. (Ephemeron 1, 2008).

The point presented by Tillier (2009) is that train stations outside of North America function not only as transportation nodes, but also as commercial and social centers in their spheres of influence. This dual function is reflected in the urban design and orientation of the station, which often is built within the same building of a large commercial-hotel-residential complex. This is in contrast to North American examples where the station is off to the side and distinctly separate from other developments, as shown in Figure 13 and Figure 14.

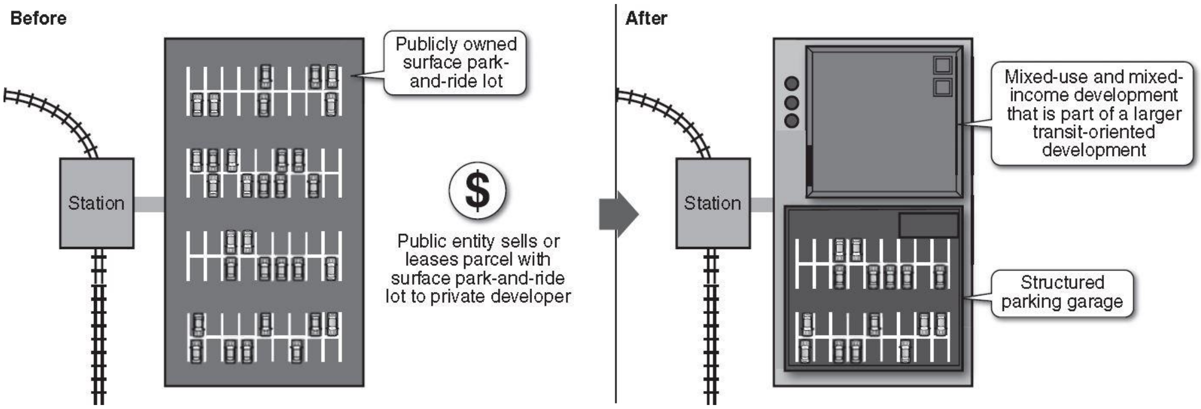

Figure 13. An example of joint development. In both cases, the station is off to the side. (GAO, 2010, p. 6).

Figure 14. "Transit-Adjacent Developments" around Valley Transit Authority light rail in San Jose, California. (Cervero & Murakami, 2008, p. 27).

While reasons for the compartmentalization of North American station are not explicitly known, three reasons for this phenomenon can be guessed at. Firstly, the United States is a country of huge expanse, relative to many Western European and East Asian countries. Stations could therefore be built on larger plots that afforded the luxury of compartmentalizing functions and separating waiting areas from platform areas. Secondly, train service in the United States has generally not been known to operate at high frequencies (number of trains per hour), meaning that headways (time between trains) can be much greater than that of other countries. Thus, as demonstrated by Amtrak, trains in the United States may spend several minutes boarding passengers. This allows enough time for passengers in the waiting area to walk over to the platform area and board their train, whereas on train systems where trains can afford to only spend less than a minute boarding passengers, passengers are allowed to wait on the platform so that they are closer to the train, and hence take less time boarding the train. Finally, in the case of intercity rail, noise generated by the propulsion unit of trains can be a nuisance to waiting passengers. As Figure 15 shows, at lower speeds, diesel-electric propulsion tends to emit considerably more noise at lower speeds relative to electric traction propulsion. This is explained by the fact that at lower speeds, locomotive exhaust noise and air conditioning unit noise dominates as ambient noise. As speeds increase, noise from the interaction of the rails and wheels and air turbulence noise begins to overwhelm other noise sources (FTA, 2006, pp. 2-6–2-7).

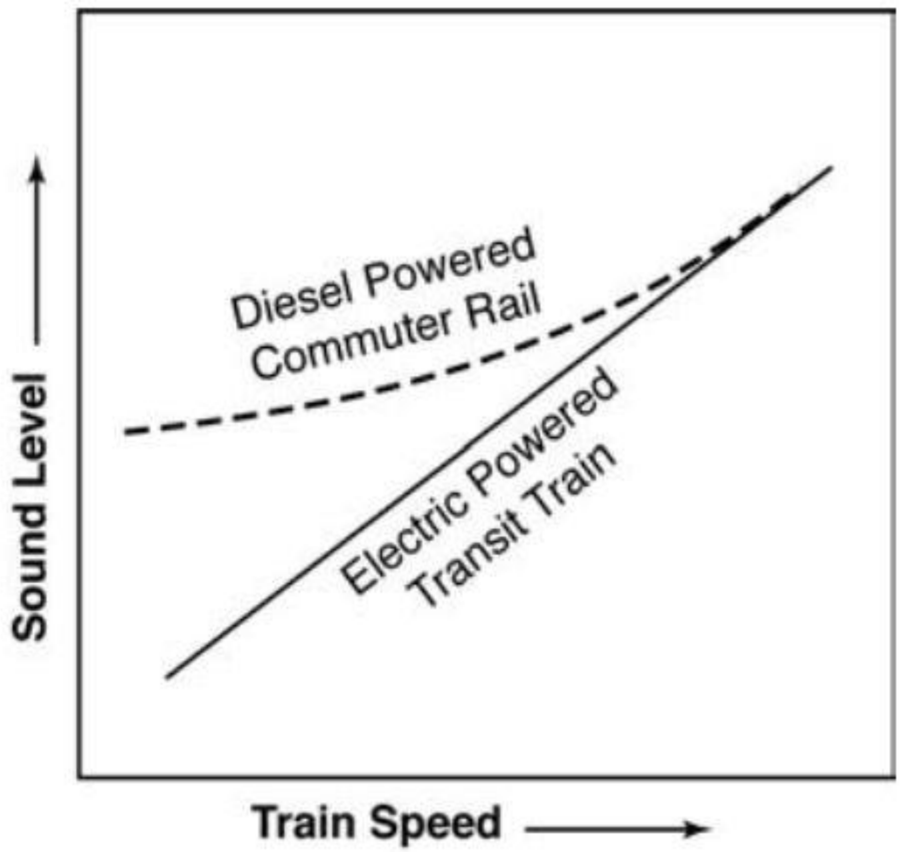

Figure 15. Relative sound levels emitted according to relative speed. (FTA, 2006, p. 2-6).

It can also be noted that the intensity of the land uses around a station can affect the potential demand of ridership, encouraging MTRC and Japanese private railways to develop their station areas to extremely high densities. Figure 16 shows Tung Chung Station along the MTRC line. A central plaza with urban design elements exists outside of Tung Chung station. In addition, high-density residential developments are visible near the station.

Figure 16. Tung Chung Station and surrounding developments. (Hokachung, n.d.).

Tung Chung Station opened in conjunction with a line of the same name in 1998. Judging by the land use data presented in Table 9, the station serves a predominantly residential neighborhood. This, as well as the fact that the station is only 35 minutes away from the central business district, suggests that ridership patterns at the station exhibit those of bedroom communities (i.e. high peaking at rush hours) (Cervero & Murakami, 2008, p. A2-16). 51,303 passengers per day use the station (Cervero & Murakami, 2008, p. A2-16).

Tung Chung R + P Station Area		
Land Use Make-up	GFA (ft^2)	Percentage
Residential	935,910	91.0%
Office	14,999	1.5%
Hotel	55,862	5.4%
Others	22,000	2.1%
Total	1,028,771	100%
Parking Spaces	3,869	

Table 9. Statistics on the Tung Chung Station Area. Modified from (Cervero & Murakami, 2008, p. A2-16).

Most of the housing is located within 80 meters (262.47 feet) of the station (Cervero & Murakami, 2008, p. A2-16). 26.7 percent of the housing is private (Cervero & Murakami, 2008, p. A2-16). With a gross floor area of 103.08 hectares and site area of 21.70 hectares, the floor-to-area ratio for the station area is 4.75 (Cervero & Murakami, 2008, p. A2-16). Note that this is on the low side of floor-to-area ratios for R + P projects, with the highest reaching 14.84 (Cervero & Murakami, 2008, p. 39).

Figure 17 displays station area property developments by the Tokyu Group around Shibuya Station in Tokyo. Shibuya Station first opened in 1885 to serve the western portion of Tokyo (Shibuya Station, 2014). Today, the station serves as one of the main transfer points between the western and southwestern suburbs of Tokyo and central Tokyo (Shibuya Station, 2014). The station is served by five railway operators on five separate lines and has an average count of over 3.06 million passengers per day, making it Japan's fourth-busiest railway station (Shibuya Station, 2014). Figure 18 shows a bus facility outside Shibuya Station. The left side of the photo shows one of the train lines entering the station complex.

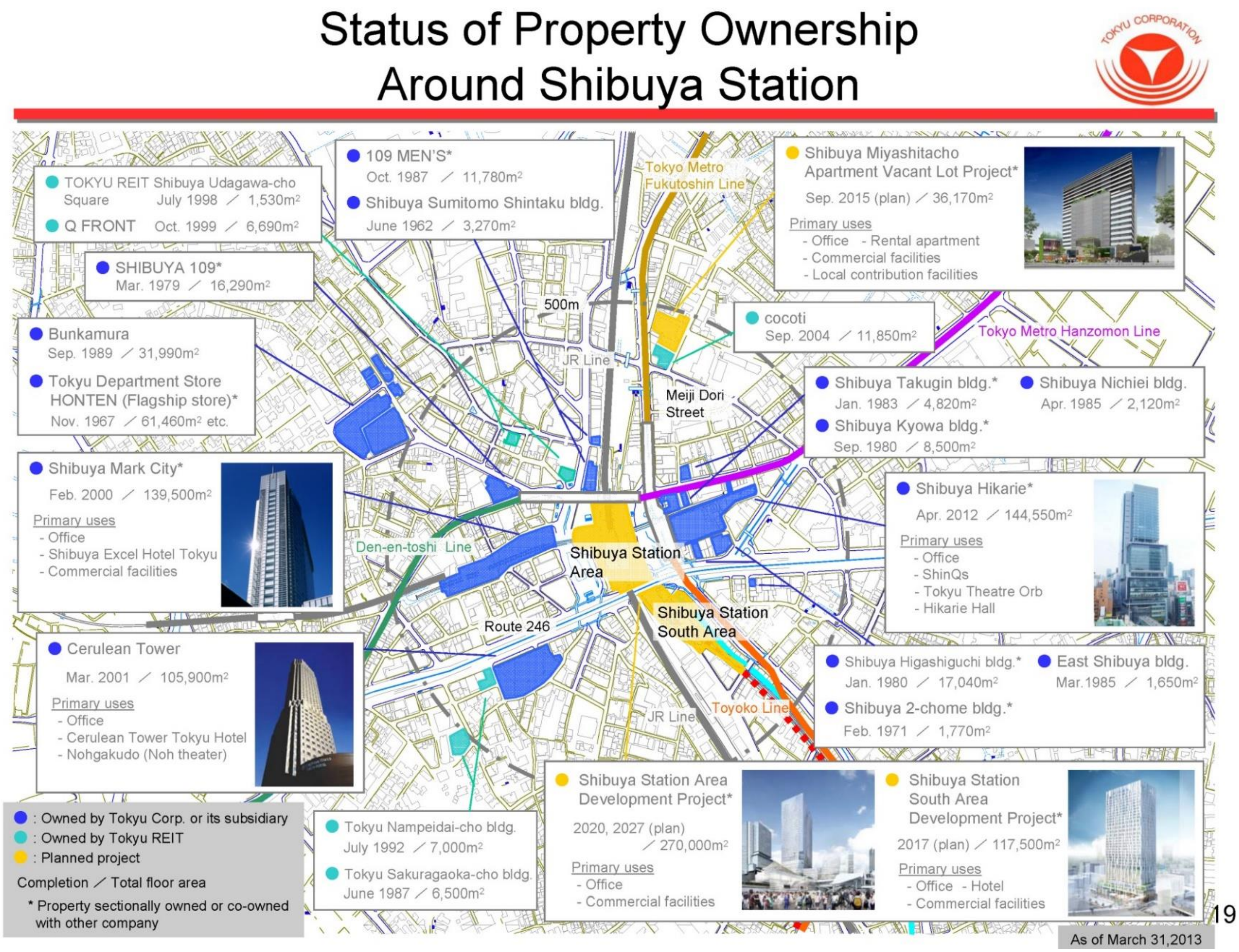

Figure 17. Station area developments by the Tokyu Group. (Tokyu Group, 2013).

Figure 18. Outside of Shibuya Station in Tokyo, Japan. (“Shibuya Station West Exit Bus Terminal,” n.d.).

The potential for station area design is very high for North America.

4.5. Lessons for the U.S.

After a review of the literature on value capture, joint development and transit-oriented developments in North America, it became evident that most of the literature does not discuss the integration of transit operations and property development to the extent of the R + P process, but rather focused on coordination (Wolf & Symington, 2009; GAO, 2010; Federal Transit

Administration [FTA], 2013; Becker, Bernstein, & Young, 2013; Central Puget Sound Regional Transit Authority [Sound Transit], 2014). The GAO stated that "[s]pecifically, transit agencies are responsible for building, maintaining, and operating transit, but need to coordinate with local and state governments that generally have authority over taxation, land use, and development" (2010, p. 23). Wolfe & Symington (2009) noted that one of the challenges to implementation of transit projects is the lack of common interests from various stakeholders. It was suggested that in large regions a consolidation of multiple agencies that have the authority to issue permits into one regional government might improve coordination between the sub-regions (Wolfe & Symington, 2009, p. 33). Wolfe & Symington (2009, p. 33) also proposed that a "greater level of regional coordination or consolidation" of seven transit agencies in the four-county Seattle metropolitan region "could improve service, planning and reduce overhead costs." However, Wolfe & Symington (2009) did not mention combining the different types of roles into one entity. Most of the literature assumed that the transit agency is relegated to just the responsibilities of ownership and operation of transit facilities. Also, design of station areas was master planned not by the transit agency, but by local governments. Finally, property development and investment was left to private developers and property owners. As a note, coordination between agencies with different roles may not be as effective as integrating select roles into a single agency because of transaction costs, as discussed above. On a tour of Sound Transit's light rail extension projects (i.e. East Link and University Link), a representative of Sound Transit was asked if Sound Transit would engage in management and investment of property developed around the new transit stations. The representative responded that "We like to stick with doing the 'T' in TOD" and that it would not be in the interest of Sound Transit as a public agency to engage in property development or investment (2014). Furthermore, the representative stated that property development and investment should be left to the private sector (2014). From this answer, there seems to be a general reluctance of transit agencies in North America to admittedly engage in commercial activities and privatization. The source of this reluctance is not known. A review of a draft FTA circular on guiding joint development for transit agencies contained no restrictions of transit agencies engaging in commercial activities, minus using FTA awarded funds for specifically supporting commercial activities (2013). In fact, the circular appeared to encourage private stakeholder involvement in joint development projects. The FTA circular states:

> While the statute prohibits FTA from outfitting a commercial space, FTA funds may be used to construct the "shell" of a facility that will be occupied by a commercial entity, as long as the statutory eligibility criteria are met. To illustrate, FTA funds could be used to construct a facility that would be occupied by a coffee shop or news stand in exchange for rent payments. FTA could assist in the construction of the overall facility that includes the commercial space, but could not pay for seating in the commercial areas, shelving, countertops, or other commercial equipment. (Note: as discussed above, occupants of a facility must pay a fair share of the costs of the facility through rental payments or other means) (2013, p. III-9).

Clearly, FTA does not discourage commercialization. Shoji (n.d., pp. 2-3), however, provides the following analysis:

> A public transport system has two basic objectives that it is expected to achieve simultaneously—to serve the public interest and to be profitable [(or, at least to be cost effective given the public investment)]. However, the two objectives can sometimes be in conflict. In such cases, the policy must focus either on the public interest or on profitability. The choice significantly determines how the system evolves because any improvements will be based on the chosen principle. For example, the operator may choose to promote mobility and accessibility by striving to develop and maintain a system that is fair to society as a whole while respecting budgetary limitations. Or the operator may promote commercial objectives according to the self-supporting principle while making exceptions in special cases.
>
> As described above, the general worldwide trend has been for urban public transit systems to take the first approach. This has helped maintain public transit systems that offer relatively low fares and generate large networks. However, the public-interest approach has led to several problems such as inefficiencies in management and operations, and inefficiencies in services. Today, far-reaching reforms are being introduced worldwide to correct these problems. Such reforms have been made necessary by budgetary restrictions to control excess subsidies, worsening government finances, and a change in public opinion especially among taxpayers.

The act of deciding which is the better option—the public interest approach or the self-supporting principle—is not up to the author, transit agencies, or private property developers, but the general public under representation by their local and regional governments. According to

Freemark (2012), privatization of railways has led to mixed results globally. Some countries have experienced success while others have not, and some forms of privatization appeared to work better than others. Saito (1997, p. 9) states that Japanese private railway companies'

> aggressive management based on railway transport and community development was sometimes criticized as giving priority to profits rather than public good. However, after 1970, as the financial difficulties of JNR and publicly-managed railways worsened, the efficient and economically rational management of private railway companies gradually received high recognition.

In retrospect, MTRC and Japanese private railways do seem capable of offering a high-quality lifestyle within their developments and railway lines. The majority of MTRC is owned by the Hong Kong government, preserving an incentive to provide services that benefits the public at large. Even Japanese private railway companies have had to work closely with local and regional governments when engaging in major property developments and transportation projects due to high investment risk (Saito, 1997, p. 9). Also, the fares of Japanese railway companies are strictly regulated by the Ministry of Land, Infrastructure, and Transport (MLIT) by way of the full cost principle with a ceiling price and yardstick regulation (Mizutani & Nakamura, 2004, pp. 33-34; Mizutani, 2010, pp. 12-17). This limits rail fares from increasing too quickly over time. Shoji (n.d., p. 5) mentions that another regulation of private railway companies is the "Railway Accounting Ordinance (*Tetsudo kaikei kisoku*) which controls the allocation of rail and non-rail costs by making cross-subsidization unlawful." This means that the railway section of a company cannot be financially helped by the property development division of the company and vice versa. How this affects the behavior of companies is not deeply discussed or explained clearly and is a topic that should be investigated more thoroughly.

In regard to joint development and value capture in North America, experience has shown that the revenue generated by actual projects has not lived up to potential. The GAO (2010, p. 15) found that “[a]lthough several transit agencies have generated millions of dollars in annual revenue from joint development, this annual revenue is generally small when compared with an agency’s annual operating expenses.” In fact, revenue from joint developments for the three North American transit agencies with the most experience in joint developments—Los Angeles Metro, Washington Metro, and Metropolitan Atlanta Rapid Transit—amounted to at most one percent of their operating expenses in 2008 (GAO, 2010, pp. 15-16). What could be the cause of this? One possible reason is that transit agencies are not allowed by law to own commercial pieces of property. Washington Metro officials noted that they do not have the authority to own land where condominiums are sold, and would rather opt to selling the land in that scenario (GAO, 2010, p. 17). Another reason is that because of local resistance to increasing density, joint developments cannot be built to their full potential and, thus, generate less revenue. Finally, value capture was often discussed in the form of joint development, special assessment districts, tax increment financing, and development impact fees (GAO, 2010, pp. 5-8); with these methods, the added value of the land from accessibility to transit often goes to the local government, rather than the transit agency (GAO, 2010, p. 17). Any amount that the transit agency does receive is only a portion of that originally generated, while the rest is used for other public infrastructure improvements (GAO, 2010, p. 17). These conditions limit transit’s ability to benefit from value capture and reach its full potential in North America.

4.6. Land Use Implications in the U.S.

It is often argued that the low population density of the U.S. relative to other developed countries is justification for not investing in transit. The argument is indeed a valid one, and suggests the need for an institutional reform to change the status quo. It should be understood that transit systems are by nature transmodal—a passenger using transit had to access the system using a different mode, such as walking, bicycling, or driving (Walker, 2012, p. 15). Thus, the utility of transit systems depends on the size and quality of its catchment area, or “the area within which land use and urban design features and the ease and directness of access to the stop or station both have a substantial impact [on] transit ridership” (APTA, 2009, p. 3). The general rule for the size of a catchment area of transit stops is the area within one-quarter of a mile in every direction from the transit stop, or a circle with a radius of one-fourth of a mile (APTA, 2009, p. 3). As the mobility of transit services offered by the transit stop or station increases, the radius of the catchment area tends to increase as well because a faster service provides larger travel time savings to passengers even if they had to walk a longer distance to reach the stop compared to just walking all the way to their destinations. Hence, a regional transit stop or station will have a catchment area of up to three miles) (APTA, 2009, p. 3). The catchment area can be a limitation to transit’s competitiveness compared to automobiles, which have instant mobility and near ubiquitous access. However, the catchment area is also an advantage for transit systems because it provides an easy way to identify where transit operators can concentrate property developments and population density. Suzuki, Cervero, and Iuchi (2013, p. 155) explain that

> [w]hat matters most for transit and land-use integration is not average population densities but "articulated densities"—densities that are strategically distributed across parts of a metropolitan area. The layout depicted in panel c of [Figure 19] is better suited for mass transit than the one in panel a, even though the two forms have the same average population density.

Figure 19. Articulated densities of urban developments. (Suzuki, Cervero, and Iuchi, 2013, p. 155).

Thus, extending the concept of articulated density along the entire length of a transit line that runs across a city, metropolitan area, or even between regions, it would be in the transit operator's interests to plan and establish high density property developments on a "corridor" basis. Figure 20 shows what the relative population density along a corridor might look like. As Cervero (1998, pp. 189-190) and Chorus (2012, p. 350) write, planning for corridors would involve establishing a variety of intense land uses evenly at transit stops. For example, on the ends of its Toyoko line (i.e., Shibuya Station in Tokyo and Sakuragicho in Yokohama),

> Tokyu anchored these two terminal stations with high-rise commercial centers (featuring Tokyu's own department stores) and attracted several prominent university campuses to intermediate stations. These commercial centers, along with the universities, have

produced a steady bidirectional flow of passengers, ensuring efficient train operations (Cervero, 1998, pp. 189-190).

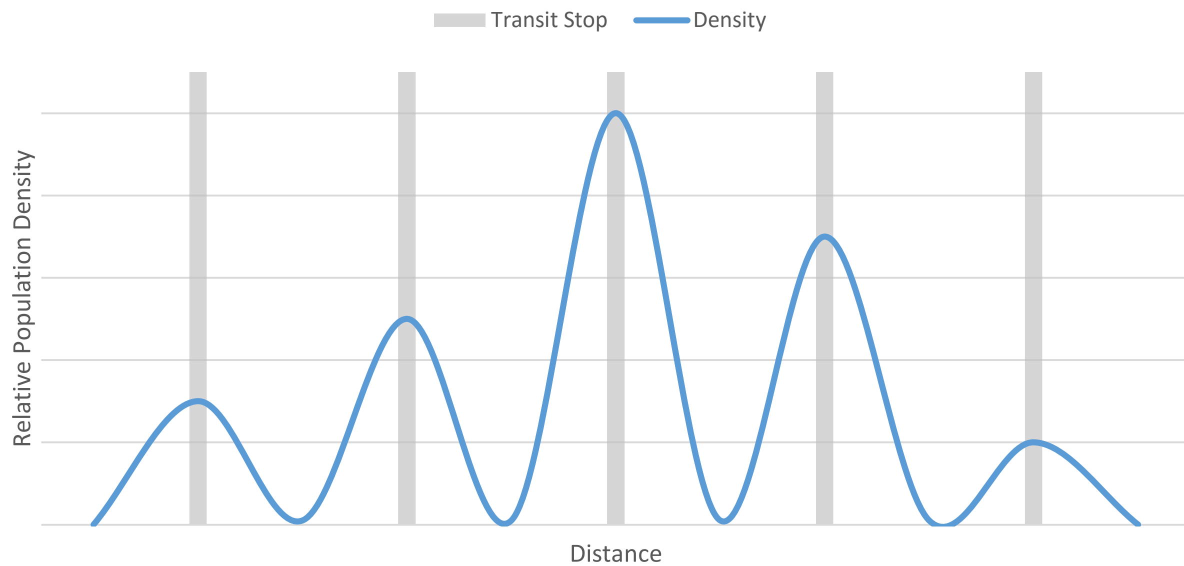

Figure 20. Population density along a transit corridor. Produced by the author.

With the concept of station area corridor planning in mind, the transit operator would want to identify potential corridors that have room for the bus or railway right-of-way and station areas that have room for high-density mixed-use developments. At the same time, however, in the U.S. it would be particularly important to choose places that people would expect to find density and intense land uses in order to avoid what may be perceived as an attack on the suburban lifestyle. As Dimitriou explains, suburbia is directly influenced by a

> drive to preserve natural open space . . . . Natural open space is the sacred cow of the suburbs, and the design of suburban developments is intended to integrate buildings with a natural setting. This stems from people's desire to live in a big house with a bucolic

> countryside and yet still have easy access to the leisure amenities and work opportunities in the city (2001, p. 18).

As follows, the effort to fit denser station area developments within the existing urban and suburban fabric of metropolitan areas in the U.S. to support transit would have to be done without destroying the bucolic sense of suburbia or ruthlessly rebuilding the existing infrastructure and housing developments in the same way that highways did in the mid-20th Century (Norton, 2008, p. 241). The effort would have to be done by

> pattern[ing] urban growth into a series of dense centers surrounding the traditional city center . . . . With this approach, we can reduce the dependence on the private automobile rather than force it's (*sic*) elimination, and we can greatly improve the quality of place through mixing uses and defining public places (Dimitriou, 2001, p. 21).

This idea comes straight from the Garden Cities concept proposed by Ebenezer Howard in 1902 (Dimitriou, 2001, p. 21). In the context of industrial London, the "Garden City" was designed to be a series of new towns located outside and away from the congestion and pollution of the city center. The goal was to provide a "perfect union between the countryside and the town" (Dimitriou, 2001, p. 22).

As such, Dimitriou identifies existing strip commercial centers in American metropolitan areas as ideal places to begin densifying suburbia (2001, p. 22). This seems appropriate, since firstly, strip commercial centers are places where suburbanites would expect to experience the qualities of high-density places, such as noise, pedestrian presence, commerce, and congestion (Dimitriou, 2001, p. 23). By increasing the density of strip commercial centers, one is not initiating a major shift in land use patterns that disturbs people's identification with their current neighborhoods, but simply increasing the intensity of what already exists. Secondly, strip commercial centers are generally auto-oriented, have large parking areas, and accommodate "shopping centers, office blocks, big box retail, and sometimes, medium-density housing" (Dimitriou, 2001, p. 13). In terms of urban design, these land uses have great potential to be reoriented as pedestrian public spaces as they provide the necessary space to do so. Finally, strip commercial centers tend to be "located at the intersection of major arterials, and [are] most often composed of a string of commercially zoned lots that are each independently developed by private developers" (Dimitriou, 2001, p. 22). As Walker notes, these thoroughfares, also called boulevards, are abundant in car-oriented cities and are perfect for providing the space and mobility that would allow transit to be accommodated quickly and offer competitive service within suburban areas (2012, p. 206).

In response to the common claim that metropolitan areas in the U.S. are too low in population density or land-use intensity to justify providing transit services, a viable plan to densify suburban areas was provided. The plan would encompass creating clusters of dense commercial and residential land uses within existing suburban areas on a "corridor" basis for transit lines. This involves 1) identifying arterials that provide the space and mobility necessary to support competitive transit service, 2) and identifying key locations, such as strip commercial centers, that can be redeveloped into denser TODs that provide the necessary ridership to justify transit service. The plan provides a basis for developing new institutional arrangements to proliferate the use of transit in U.S. metropolitan areas.

5. Conclusions and Findings

While public transportation remains a small portion of total travel in the U.S., it is gaining ridership in real terms and provides an important relief of congestion and other positive externalities for urban areas. The increase in ridership is a result of population growth, economic growth, higher gasoline prices, advertising of public transportation by transit agencies, and land use policies to encourage high-density TOD near transit stations. Transit agencies have met this increase in ridership by providing more services and expanding their existing systems, but have also been financially strained by increased operations and capital expenditures. Despite strong financial commitment in the form of operating subsidies and capital grants from all levels of government to support transit since 1998, the operating deficits have limited progress in increases of transit service and network expansions. Thus, there was a need to find an institutional model that allows transit agencies to compete with other modes of transportation, including operating with positive operating margins and changing land use patterns to entice greater patronage.

R + P, a system that has been in use by Japanese private railway companies and Hong Kong's MTRC for decades, provides an institutionally different model from that of the U.S. R + P, which involves transit operators to also assume the role of station area master planner, property developer, and property investor, allows transit operators to receive income other than farebox and increasingly constrained tax revenues. Transit operators using R + P are able to realize positive operating margins while providing valuable transit service without straining governments of limited funds. Because of the inherent features of R + P, transit operators are able to efficiently manage the dynamic between transportation and land use on their systems, and are encouraged to maintain a "state of good repair" of their systems to retain ridership. For patrons, this has resulted in a convenient and high-quality lifestyle that is both financially and environmentally sustainable.

R + P differs from the U.S. model of transit operations and capital funding in several respects. The U.S. model emphasizes coordination between separate entities that carry out the roles of transit operations, master planning of station areas, property development, and property investment. R + P integrates these roles into one entity and realizes lower transaction costs during the planning of these roles, resulting in a more holistically designed transportation system and TOD. R + P is based on commercial principles, which transit agencies in the U.S. either are not authorized to conduct or do not have extensive experience with.

R + P holds important lessons for transit agencies and policymakers in the U.S. Efforts to expand services and transit networks can be benefitted greatly if R + P is adopted by U.S. transit agencies, and allow the American public to enjoy the many benefits of public transportation.

6. Recommendations

Upon the findings of this paper, it is recommended in regard to policy that:

Transit agencies in the U.S.:

- *Actively adopt a commercial and entrepreneurial approach to search for new ways to raise revenue to support transit operations and capital expenditures.*
- *Establish an internal real-estate staff or office.*
- *Establish an internal urban design staff or office to master plan station areas.*
- *Coordinate with local and regional governments to develop corridor plans at the metropolitan scale.*

Policymakers at the local and regional level:

- *Allow transit agencies to engage in commercial activities and own commercial pieces of property.*
- *Allow transit agencies to take the lead in master planning station areas.*
- *Allow transit agencies to buy, develop, manage, and invest in property.*
- *Allow transit agencies to engage in land readjustment, or parcel assembly, in coordination with landowners, local authorities, and property developers.*
- *Establish a method to regulate ticket fares.*
- *Coordinate with transit agencies to develop corridor plans at the metropolitan scale.*

Policymakers at the federal level:

- *Provide guidance on how R + P, or elements thereof, can feasibly be adopted in the U.S.*
- *Provide funding or other financial incentives for R + P pilot projects.*

For further research, it is recommended that property rights in the U.S., Hong Kong, and Japan be studied and compared to identify any potential impediments to R + P in the U.S. In particular, the issue of condemnation of private property for an R + P project should be discussed to explore the constitutionality of such an action. What should also be studied is the Railway Accounting Ordinance (*Tetsudo kaikei kisoku*) which limits cross-subsidization between railway, property development, and other operations of Japanese private railway companies. It seems that such a regulation prevents the basic advantage of R + P, which allows transit operators to have their transit operations financially supported by services that benefit from transit. A discussion in the Japanese context of this issue was brief and inconclusive, and there was no mention by the literature of a similar law in Hong Kong, suggesting that MTRC can engage in cross-subsidization of operations. Fare regulation is another topic that should be investigated. Privatization brings up the concern of whether a private entity can adequately provide the public service of transportation affordably and equitably to all segments of the population in a manner comparable to that of a public provider. In Japan, fare prices are stringently regulated by MLIT, and any increase in fares must be justified. The resulting fare price must fall within an acceptable range of fare prices of other comparable transit providers. In Hong Kong, although there was no discussion of regulation of fare prices, since the central government owns over three-fourths of MTRC, it is assumed that fare prices are set to be affordable to most of the population. A discussion of what concessionary relationships may be possible with R + P would also be helpful. While this paper took the approach that existing transit agencies could engage in new operations to increase revenue and patronage (i.e., master planning, property development and property management), another approach would be for transit agencies to act as an asset holder of the transit infrastructure and invite companies to operate trains and engage in station area development in exchange for a portion of future revenues. For land use in the U.S., the viability of introducing R + P on a metropolitan scale should be looked into. If multiple transit operators become engaged in R + P within the same metropolitan area, rules for fair play and cooperation should be adopted as early as possible to institute them into the behavior of the operators with as little conflict as possible.

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