

The Long Haul: A Comparative Performance Analysis of Bus and Rail Transit in Los Angeles



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ABSTRACT: This policy paper analyzes the recent performance of three modes of transit in Los Angeles County: Metro Rail, the Metro Rapid bus network, and freeway High-Occupancy Toll lanes. Since 1990, Metro has invested a great deal of money in a new regional rail network, promising congestion relief and the transformation of Los Angeles into a world-class city. Despite these investments, which have yielded 2 heavy rail, 4 light rail, and 2 BRT lines, 75% of all Metro passengers get around by bus, and in the last couple of years Metro ridership has actually declined sharply from its peak in 2010 and 2011. In light of these facts, I propose several criteria necessary for a “performance analysis” of L.A.’s transit network, including Ridership, Operating Cost per Boarding, Capital Cost per Boarding, Long-Haul Capacity, and Service Reliability. I analyze Metro’s rail network and Bus Rapid program according to these criteria, finding that while rail, bus, and HOT lanes all have certain strengths and weaknesses, light rail is a poor investment from a cost/benefit perspective. I conclude by arguing that Metro should commit to placing heavy rail transit along a handful of high-need corridors, and invest in a regional network of Bus Rapid Transit with dedicated rights of way.

NOTE TO READER: To maintain as much consistency as possible, I have used data from Fiscal Year 2015, the most recent full year for which such data is available.

In particular, this applies to: 1) Cost information, levels of service, and aggregate ridership, which is included in Metro’s Adopted FY2015 budget, and 2) Individual line data on daily and annual ridership and passenger-miles, which is available in the “Ridership Statistics” section of Metro’s website. Any data not from FY2015 is noted in the text.

This paper does not include information from either of the two Metro extensions that opened in 2016, the Gold Line Extension to Asuza and the Expo Line Extension to Santa Monica. It also does not account for Measure M, a transit-funding package that was approved in November 2016.

Most transit agencies with limited resources and great ambitions eventually face the dilemma of whether to invest in bus or rail service. In theory, the two modes can provide very different, and complementary, kinds of service. According to Brown and Thompson, casting bus and rail as an either/or decision “overlooks the several other functions [besides commuting] that express bus and rail transit modes might serve.”¹ Unfortunately, due to finite funding and political pressures, agencies often operate in a zero-sum reality. Nowhere has this been clearer than in Los Angeles, where as Taylor and Morris note, a massive and controversial rail-building campaign “would ultimately experience dramatic cost overruns, while bus fares were eventually raised sharply and bus service was cut.”²

The rail-centric priorities of the L.A. County Metropolitan Transportation Authority (Metro) might be defensible if these investments paid off in high ridership, but so far they have not. The built form of Los Angeles is entirely unlike that of New York, Chicago, and Washington, D.C., the United States’ transit capitals. Jonathan Richmond, a critic of rail in Los Angeles, claims:

Rail transit plays an important role in many East Coast American cities because there are well-defined intense demands for travel between concentrated foci of employment and their surrounding suburbs...In contrast, the low density and widespread distribution of both population and economic activity in Southern California generates a dispersed and complex pattern of transportation demands among a myriad of origins and destinations.³

¹ Jeffrey R. Brown and Gregory L. Thompson, “Express Bus Versus Rail Transit: How a Marriage of Mode and Mission Affects Transit Performance,” *Transportation Research Record* 2110 (2009): 45.

² Brian D. Taylor and Eric A. Morris, “Public Transportation Objectives and Rider Demographics: Are Transit’s Priorities Poor Public Policy?” Springer Media (2014): 18, doi: 10.1007/s11116-014-9547-0.

³ Jonathan E.D. Richmond, “The Mythical Conception of Rail Transit in Los Angeles,” *Journal of Architecture and Planning Research* (1996): 3-4.

Richmond is incorrect about population density – in fact, Los Angeles has the highest population density of any U.S. urbanized area – but he is correct about job distribution.⁴ The city has no Central Business District in the traditional sense; Kotkin estimates that 2-3 percent of the regional labor force works Downtown versus 20 percent in New York and 10 percent in San Francisco.⁵ The chronic congestion in Southern California largely results from the fact that: 1) Multiple major job centers are scattered throughout the area, and 2) These job centers were frequently designed to accommodate private auto access at the expense of transit.

This does not mean that rail transit *cannot* be useful in Los Angeles – but it does mean Metro must strike a better balance between building rail and serving the vast majority of the city’s transit riders, who rely on the bus and are disproportionately low-income minorities.⁶ With the overall stated goal of reducing congestion, Metro has complemented its rail buildout with a series of high-capacity, limited-stop buses, known as Metro Rapids, and High-Occupancy Toll lanes on two freeways. The purpose of this analysis is to evaluate how well these modes have been performing compared to one another, and what could be done to make them perform better.

In particular, Los Angeles’ transit will be evaluated according to the following criteria:

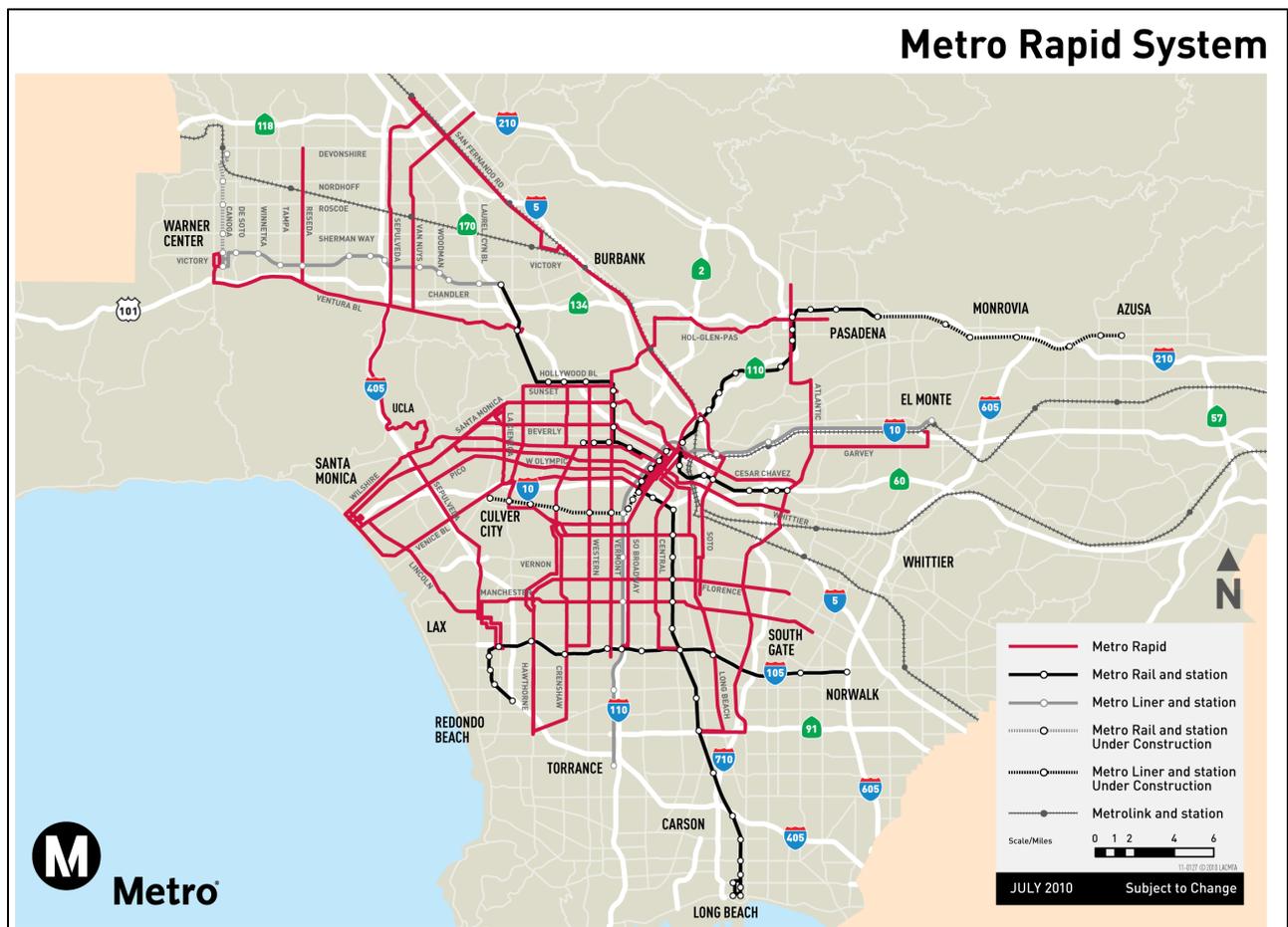
⁴ Brian D. Taylor, “Congested Development? Rethinking the Causes and Consequences of Congestion” (lecture presented at Urban Planning 255, University of California Los Angeles, April 4-6, 2016).

⁵ Joel Kotkin, “Los Angeles: City of Losers?” *New Geography*, December 9, 2015, <http://www.newgeography.com/content/005117-los-angeles-city-of-losers>.

⁶ Taylor and Morris, “Public Transportation Objectives.”

1. RIDERSHIP

A January 2016 article in the *Los Angeles Times* analyzed why Metro's ridership has been declining for several years since a peak in the mid-2000s.⁷ Explanations included an improving economy, cheaper gas, and significant cuts to bus service, but in fact, both rail and bus have lost riders steadily. Which lines or modes are maintaining high levels of ridership? Is Metro having any success in winning over so-called "choice riders," or failing that, has it provided better service for its core constituency of lower-income riders? Have any Metro lines bucked the regional trend and gained riders in recent years?



Metro Rapid Bus Network as of July 2010. Source: *CTA Concerns*, Nov 17, 2011

⁷ Laura J. Nelson and Dan Weikel, "Billions Spent, but Fewer People Are Using Public Transportation in Southern California," *Los Angeles Times*, January 27, 2016, <http://www.latimes.com/local/california/la-me-ridership-slump-20160127-story.html>.

2. COST-EFFECTIVENESS

The recent news about falling ridership has been embarrassing for Metro, which has sold its projects to the public on the premises of congestion relief and increased transit mode share. Therefore, to gauge Operating Cost Effectiveness, I will use the metric of Cost per Unlinked Boarding. Metrics such as Cost per Revenue Vehicle Hour or Mile are good at tracking money but not at accounting for the amount of service consumed.⁸ It is therefore a poor tool of analysis for large metro areas, where major projects can make up for high cost with a large rider base. In light of Metro's major campaign of rail construction since 1990, I will also examine Capital Cost per Boarding, to see how these new investments are performing.

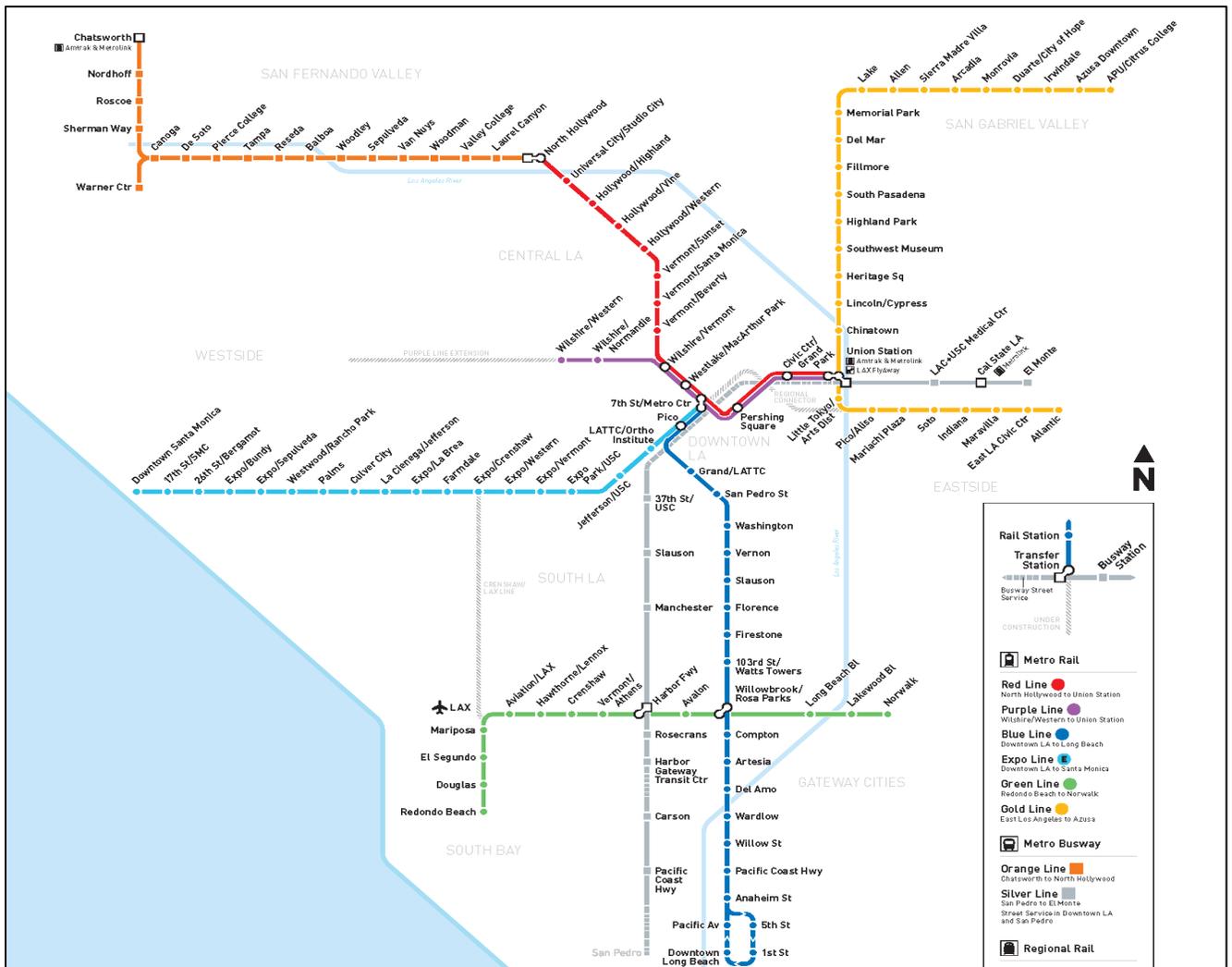
3. LONG-HAUL ABILITY

Los Angeles is always congested, but its polycentric urban form means that rush hours are particularly problematic due to the simple volume of cars on the road, attempting to reach disparate destinations. Angelenos do not have to give up their cars entirely in order for transit to still be useful for commuting. Which modes and lines are carrying a disproportionately high number of passenger-miles, and what does this tell us about commuting patterns?

⁸ Brian D. Taylor, "Understanding and Evaluating Public Transit Performance" (lecture presented at Urban Planning 255, University of California Los Angeles, May 4, 2016).

4. RELIABILITY AND FREQUENCY

As Jarrett Walker says, “Frequency Equals Freedom.”⁹ Short, predictable transit headways can contribute to a virtuous cycle that picks up riders. Late vehicles and infrequent service will justifiably lead riders to ask why they should bother taking transit in the first place. How often do Metro’s rail and bus services come – and do they come on time? And if rail, which carries one-quarter of Metro riders, performs substantially better, what does that say about Metro’s attitude towards the three-quarters of its customers that ride the bus?



Metro Rail Network as of June 2016. Source: Metro

⁹ Jarrett Walker, *Human Transit* (Washington, D.C.: Island Press, 2011), 85-6.

RIDERSHIP: IF YOU BUILD IT, WILL THEY COME?

In many ways, the scale and speed of Los Angeles’ rail-building boom has been impressive, but its performance has yet to reach its ambitions. As Jonathan Richmond and Jarrett Walker note, an extensive rail network was promoted by decision-makers as an investment in prestige transit — the sort of thing that would give Los Angeles a place alongside New York and Paris as a truly global city.^{10,11} However, despite billions spent since the opening of the Blue Line in 1990, Metro’s rail network has recently seen the same declining ridership as the rest of the L.A. transit system.

As of FY2015, Metro rail had more riders than it did during the peak years of the Great Recession (2009-2010), but the L.A. area population has grown in absolute terms since then, and Metro has also significantly extended the scope of its service during this time.¹² Looking at individual rail lines that have existed in some form for at least a decade (i.e., excluding the Expo Line), the downward trend comes into clearer focus:

Figure 1: Average Weekday Ridership, Metro Rail Lines (excluding Expo Line)

FISCAL YEAR	Blue	Subway	Green	Gold
2010	76,906	149,991	38,443	28,173
2011	79,079	145,406	40,047	34,992
2012	82,212	151,727	43,402	41,078
2013	89,646	157,184	44,824	43,041
2014	85,943	159,362	42,294	42,678
2015	82,396	148,218	40,027	43,588

¹⁰ Richmond, “Mythical Conception,” 10-11.

¹¹ Jarrett Walker, “Bus-Rail Debates in a Beautiful Abstract City, and in Los Angeles,” November 20, 2009, <http://humantransit.org/2009/11/busrail-debates-in-a-beautiful-abstract-city-and-in-los-angeles.html>.

¹² “Ridership Statistics,” L.A. County Metropolitan Transportation Authority, Fiscal Year 2015, <http://isotp.metro.net/MetroRidership/IndexAllBus.aspx>.

Building a rail network has not succeeded in pulling a large number of riders from the bus to the train. Rail trips made up approximately 24% of all Los Angeles transit trips in FY2015, unchanged from FY2013 when the train system reached first its current extent.¹³ If the goal of building a train network was to attract so-called “choice” riders and boost overall transit use in Los Angeles, there is little evidence this has been accomplished either. As Richmond writes in “Evaluating the Promise and Performance of Rail,” according to studies done in the 1990s only about a third of L.A. rail passengers were new to riding transit.¹⁴

Metro’s Rapid bus program has been experimenting with improved bus service since 2000, mostly in the form of wider stop spacing and signal priority.¹⁵ However, in 2013 and 2014, the 720 bus along Wilshire Boulevard was turned into a sort of “flagship” Rapid service and given a dedicated lane during rush hour, into which cars may pass only to make right turns. Dedicated lanes are a core feature of Bus Rapid Transit systems that are especially popular in Latin America and have often been called “light rail on wheels”; by running buses at very short headways and allowing them to bypass cars, agencies can ensure a faster and more reliable journey for passengers.

Wilshire is an obvious candidate for such improvements because it is the most heavily traveled bus corridor in Los Angeles. In FY15, the 720 had an average weekday ridership of 39,255.¹⁶ The 20, which provides local service, served an additional 16,000 riders. Even so, Wilshire has not

¹³ For the purposes of this essay, assume that the 2016 Gold Line extension to Azusa and Expo extension to Santa Monica have not occurred.

¹⁴ Jonathan Richmond, “Evaluating the Promise and Performance of Rail,” in *Transport of Delight: The Mythical Conception of Rail Transit in Los Angeles* (Akron: University of Akron Press, 2005), 44.

¹⁵ *Ibid.* 76-77.

¹⁶ “Ridership Statistics,” <http://isotp.metro.net/MetroRidership/IndexAllBus.aspx>.

been immune to declining ridership: At their peaks in FY13, the Rapid and Local respectively carried 41,254 and 17,091 weekday riders. Of the remaining 17 lines that make up Metro Rapid, daily weekday ridership ranges from approximately 20,000 (Vermont Avenue) to 1623 (a commuter bus between Westwood and Van Nuys). Like the 720, these lines have all seen ridership drop recently, but none of them has seen the concerted investment that Metro made on Wilshire.

Metro's ExpressLanes HOT program, which operates on portions of I-110 and I-10, grants access to transit buses, carpools, and toll-paying solo drivers. Because these are roadways and not transit services, it is difficult to define what constitutes "ridership." However, Metro has described its goal for the ExpressLanes project as "Move More People, Not More Vehicles," and a \$210 million federal grant helped launch a pilot project in 2012.¹⁷ Using this framework, the evidence for increased person throughput is mixed at best. A 2015 study estimated that at three different points along I-110, peak-hour person throughput changed by -9.1%, -17.4%, and 4.7%. The same study conducted at four points on I-10 yielded results of -6.1%, 6.1%, 13.6%, and 25.3%.¹⁸ Metro's FY15 budget claims that an estimated 75,000 vehicles daily use the HOT lanes, but does not break these vehicles down by type (carpool, toll-paying solo drivers, and transit).¹⁹

The one unambiguous bright spot in HOT performance is the Silver Line, a bus that travels in the ExpressLanes. With an estimated 14,530 weekday riders in FY2015, this is one of the few Metro services that has been steadily increasing ridership over the last several years (Metro estimated

¹⁷ "Metro ExpressLanes" (presented at the Joint California and Washington State Transportation Commission Meeting, August 19, 2014), http://www.catc.ca.gov/meetings/Joint%20Meetings/S_Wiggins_ExpressLanes.pdf.

¹⁸ "Los Angeles Congestion Reduction Demonstration Program: National Evaluation Report," U.S. Department of Transportation (August 31, 2015), A38-9, <http://ntl.bts.gov/lib/55000/55600/55669/FHWA-JPO-14-126-1.pdf>.

¹⁹ "Adopted Budget FY2015," L.A. County Metropolitan Transportation Authority (2014), pg. 27, http://media.metro.net/about_us/finance/images/Adopted_FY_2015_Budget.pdf.

April 2016 ridership at 16,321). The Orange Line, which runs on a dedicated transitway in the San Fernando Valley, carried 27,602 daily weekday riders in FY15 – another bus-lanes-only service that has been gaining ridership.²⁰ According to the Department of Transportation report on the ExpressLanes program, the switch to tolled lanes on I-110 and I-10 helped to increase Silver Line ridership by up to 52% on certain corridors, and caused marked increases in rider satisfaction.²¹

COMPARING COSTS AND BENEFITS

Many scholars disdain light rail because they believe it is not cost-effective compared to bus and BRT-type alternatives, which provide similar capacity at a fraction of the cost. Given the fact that rail capital costs tend to be exponentially higher than new bus infrastructure, one measure of “bang for buck” is capital cost per boarding. Los Angeles’ rail lines cost anywhere from \$718 million to \$4.5 billion to build.²² Using data on Unlinked Boardings from Metro’s FY15 budget, the metric of Capital Cost per Boarding yields the following:²³

Figure 2: Capital Cost per Boarding

	CAPITAL COST	BOARDINGS, FY2015	CAPITAL COST PER BOARDING
Blue	877,000,000	27,597,000	\$31.78
Subway	4,500,000,000	50,383,000	\$89.32
Green	718,000,000	13,315,000	\$53.92
Gold	2,800,000,000	13,594,000	\$205.97
Expo	930,000,000	9,222,000	\$100.85
All Rail	9,825,000,000	114,111,000	\$86.10
Orange	484,000,000	8,957,000	\$54.04
Silver	587,000,000	3,978,000	\$147.56
Wilshire BRT	31,500,000	25,321,898	\$1.24

²⁰ “Ridership Statistics,” <http://isotp.metro.net/MetroRidership/IndexAllBus.aspx>.

²¹ “Los Angeles Congestion Reduction Demonstration Program,” 38-9.

²² “Facts at a Glance,” L.A. County Metropolitan Transportation Authority, <https://www.metro.net/news/facts-glance/>.

²³ “Adopted Budget FY2015,” 57.

(NOTE: Wilshire Boardings calculated by multiplying estimated yearly ridership by 2, i.e. assuming one round trip per rider per day).

The Green Line's relatively low capital costs (it was built in the median of a freeway) lead to a low cost per passenger, even though it has the second-fewest riders of any train line (the Expo Line is last). The subway, as would be expected because of the huge cost of underground tunneling, has a high capital cost of \$4.5 billion but has high ridership to help mitigate this cost. The Gold Line combines the worst of both worlds: high capital and relatively low ridership give it the highest per-passenger cost in the system.

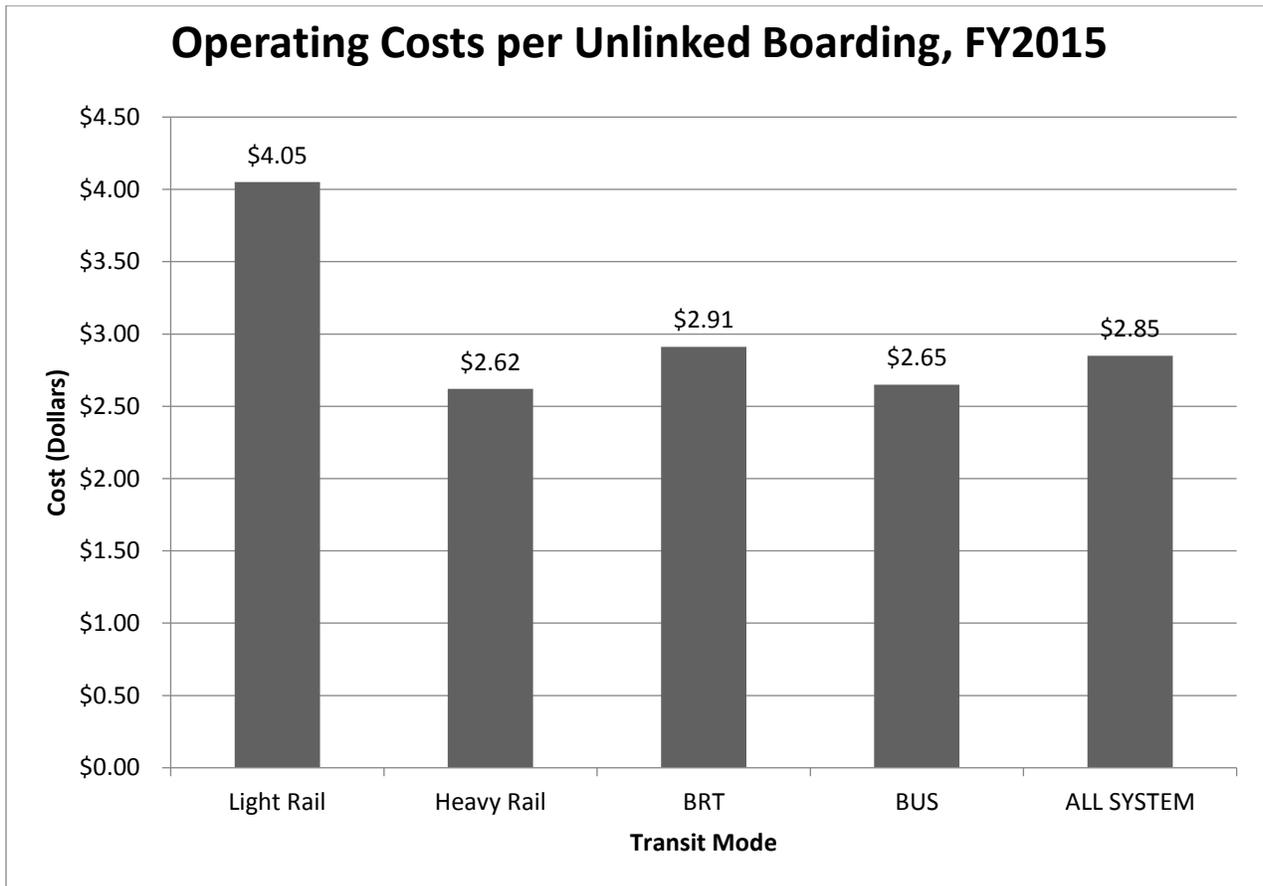
Comparatively, the improvements to bus transit on Wilshire came at an extremely low capital cost. The total cost of the Rapid upgrades in the early 2010s was \$31.5 million for 7.7 miles of bus lanes.²⁴ Using the metric of Capital Cost per Boarding, and assuming that each weekday rider represents two boardings per day (a round-trip commute), the 720 upgrades are clearly a more cost-effective investment. The 720, like other Rapid services, also tends to use articulated buses, allowing Metro to save on operating costs by allowing one driver to carry nearly double a normal load of passengers (labor costs are 76.2% of Metro's operating expenses).²⁵ However, as we will see in the next section, Wilshire's low cost does not guarantee excellent service.

In contrast to the massive discrepancies in capital funding, Operating Expenses differ between modes but are less severe. One frequent criticism of light-rail programs, highlighted by Richmond, is that they provide similar capacity to buses but at a much higher cost. Given Metro's current goal

²⁴ Joseph Lemon, "Longest Segment of Wilshire Peak Hour Bus Lanes to Open on Wednesday," *The Source* April 7, 2015, <http://thesource.metro.net/2015/04/07/longest-segment-of-wilshire-brt-bus-lanes-set-to-open-on-wednesday/>.

²⁵ "Los Angeles County Metropolitan Transportation Authority," National Transit Database, 2014, <https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/90154.pdf>.

of increasing transit ridership across the region, a Cost/Benefit metric that directly links costs to number of riders seems ideal for gauging the effectiveness of different modes. The 2014 National Transit Database report on Metro yielded the following data: ²⁶



This seems to imply that despite the high capital cost of heavy rail, light rail is actually the outlier in terms of long-term operating costs, and could be phased out in favor of Bus Rapid Transit on most new projects. For those corridors which truly require tens of thousands of riders to be transported every day, heavy rail may well be worth the up-front cost for the long-term durability.

²⁶ "LACMTA," National Transit Database.

The costs and benefits of ExpressLanes, like its ridership, are difficult to ascertain clearly because of the multiple modes that use the service. However, according to Metro's FY15 budget, ExpressLanes is noteworthy for being the rare Metro service that actually brings in more revenue than it costs to operate. The \$210 million grant that first funded the project was largely federal money, and this past year the lanes brought in an estimated \$30.7 million in toll revenue while costing \$20.3 million to operate.²⁷

LONG DISTANCE AND RELIABILITY: THE BENEFITS OF RAIL

Rail does have undeniable advantages over bus. First, it carries a disproportionate number of passenger-miles, indicating that the system is used for longer trips and has utility as a commuting option. In FY2015, out of 2.09 billion passenger-miles traveled on Metro's entire system, rail was responsible for 641 million, or 31% (compared to 24% of boardings).²⁸ The Blue Line and subway make up more than half of all passenger-miles traveled by rail, indicating the centrality of these two routes in the regional transit system.²⁹ Richard Stanger puts rail's relatively large share of passenger-miles in context by comparing the rail/bus dynamic to the role of freeways versus arterials in Los Angeles. Noting that freeways carry 20% of all auto traffic but 43% of all vehicle-miles traveled, Stanger concludes that rail is "already half as important to Los Angeles's transit system as the region's freeway system is to its streets and roads system."³⁰

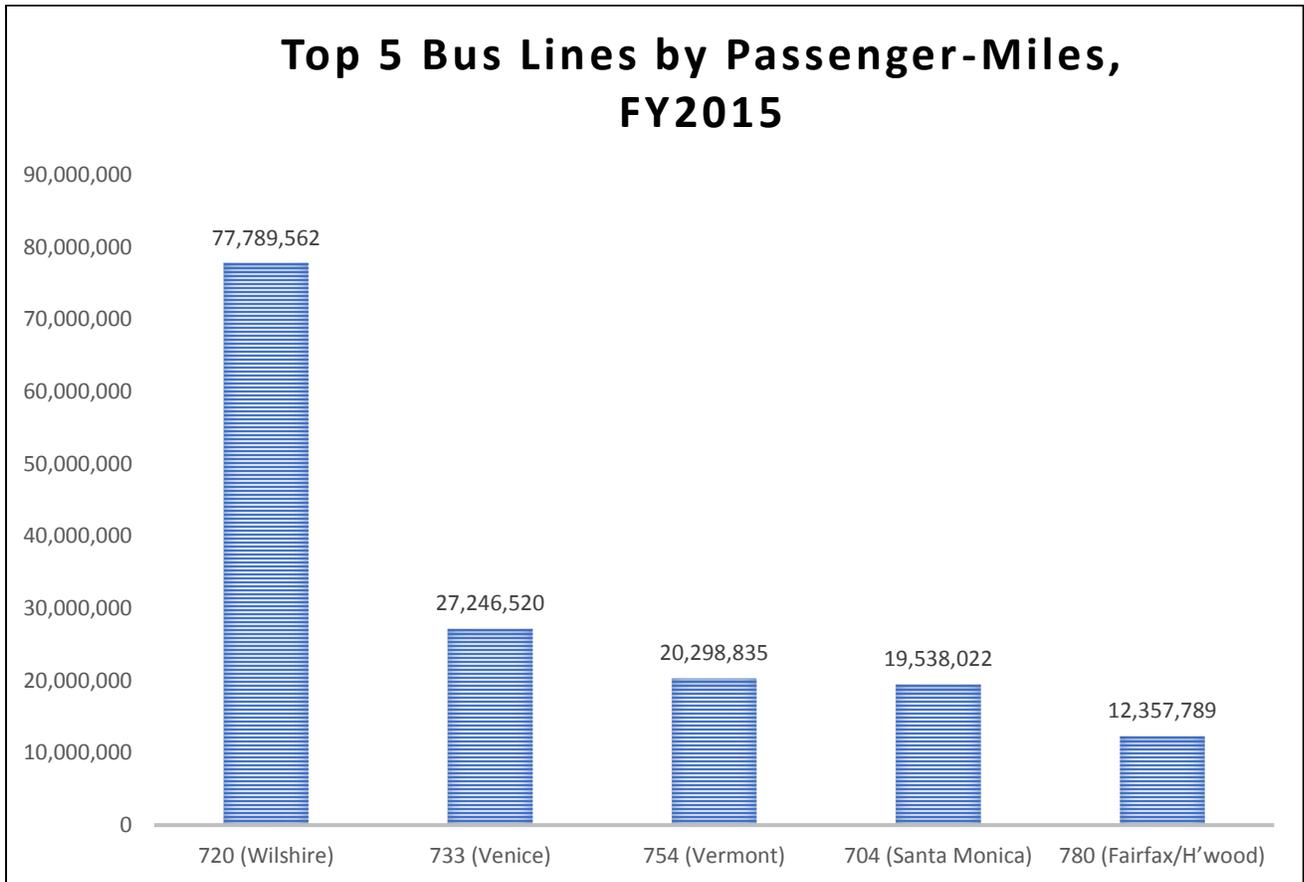
²⁷ "Adopted Budget FY2015," 27-29.

²⁸ Ibid. 56.

²⁹ Ridership Statistics," <http://isotp.metro.net/MetroRidership/IndexAllBus.aspx>.

³⁰ Richard Stanger, "Influence of the Rail Program on Bus Transit in Los Angeles," *Journal of Public Transportation* Vol. 3 No. 2 (2000): 11.

While Metro does not provide cost information on its individual lines, some other statistics illustrate the role that the Rapids play in the Metro network. They carried 14% of all bus riders and 18% of all passenger-miles in FY2015. The top five Rapid lines by Passenger-Miles were:³¹



In addition, to further determine the role that Rapids plays in transporting passengers longer distances, I divided each line's total passenger-miles traveled in FY2015 by its total ridership that year, to create a Distance Index. The results were as follows:³²

³¹ Ridership Statistics," <http://isotp.metro.net/MetroRidership/IndexAllBus.aspx>.

³² Ibid.

**Figure 3: Distance Index for Metro Rapid Lines
(Annual Psgr Miles/ Ridership, FY2015)**

Route Number	Primary Streets	Distance Index
704	Santa Monica	5.2
705	La Cienega	4.0
710	Crenshaw	4.6
720	Wilshire	6.1
728	Olympic	4.5
733	Venice	6.6
734	Sepulveda	6.1
740	Crenshaw/Hawthorne	4.0
744	Van Nuys	N/A
745	Broadway	4.4
750	Ventura	6.7
751	Soto	3.6
754	Vermont	3.1
757	Western	3.3
770	Garvey/Cesar Chavez	5.2
780	Fairfax/Hollywood	5.0
788	I-405/Van Nuys	N/A
794	San Fernando	7.9
All Rapid		5.2
All Bus		4.2

Although the Rapid network as a whole has a higher Distance Index than that of the entire Metro bus network, this masks a great degree of variation between individual Rapid lines. The 794 along San Fernando has about 5000 daily weekday riders but transports them long distances (the route passes from Sylmar to Burbank and Downtown, acting as a feeder from the San Fernando Valley to several major job centers).³³ In contrast, the Rapid lines down Vermont and Western serve some of the city’s most crucial transit corridors, but because this part of Los Angeles has

³³ “794,” L.A. County Metropolitan Transportation Authority, http://media.metro.net/riding_metro/bus_overview/images/794.pdf.

both high population density and a high rate of transit usage overall, these lines log heavy ridership but relatively few passenger-miles.³⁴

Rail's second major advantage over bus is its reliability. Jarrett Walker notes in *Human Transit* that “waiting time...is often the major variable that governs actual travel time.”³⁵ While a standard rail headway in the Metro system is 12 minutes, bus headways vary widely, including some of more than 15 minutes during peak hour and peak direction, and are further subjected to the whims of traffic.³⁶ In short, good transit requires a dedicated right of way — something that all Metro rail lines have to some extent, but that no Metro Rapid buses enjoy in full. (The 720 includes a handful of features designed to speed up the journey, but as discussed previously, the lack of a truly dedicated right-of-way and pre-paid fares mean this line cannot truly be classified as BRT).

According to a KPCC study of Metro data from 2010 through March 2016, train tardiness fluctuates each year, but within a narrow range: In 2010 and 2011, about one-half percent of trains arrived at their stations late, and in 2015, 1.2% were late (“late” in this case defined as more than five minutes).³⁷ In particular, the Red and Purple Lines, which operate underground with fully dedicated rights of way, performed best. The Blue Line, with its many at-grade street crossings, performed worst. Buses were late 21.4% of the time (using the same definition of “late”). Of the five worst-performing buses, three were part of the Rapid network: the 733 Venice, 704 Santa Monica, and 720 Wilshire, which, despite BRT-style improvements, was late to 29% of stops.

³⁴ Jordan Fraade, “A Way Forward for Metro: Winning Back Riders and Improving Service in the Neighborhoods that Need It Most (Final Project for UP206A, University of California, Los Angeles, March 2016).

³⁵ Walker, *Human Transit*, 41.

³⁶ “Maps and Timetables,” L.A. County Metropolitan Transportation Authority, <https://www.metro.net/riding/maps/>.

³⁷ Aaron Mendelson, “Metro’s Buses and Trains Having Trouble Sticking to Schedule, Data Show,” KPCC, May 12, 2016, <http://www.scpr.org/news/2016/05/12/60250/data-metro-s-buses-and-trains-having-trouble-stick/>.

Personal cars in Metro’s ExpressLanes are not subject to frequency and reliability standards, but Silver Line riders have a right to expect a high level of performance given the route’s dedicated right-of-way and fare premium (\$2.50). On-time data for the Silver Line has not been made available, but the experience of the Orange Line, which also runs on a dedicated right-of-way, could be illustrative. In KPCC’s study, the Orange Line had the single best on-time performance of any bus line, coming late to 5.4% of stops. This fact, along with information presented by Genevieve Giuliano on comparative scheduling performance, leads to a clear conclusion: There is no substitute for a truly dedicated right of way, and if policymakers aim to create one, they must fully commit to it.³⁸

RECOMMENDATIONS AND CONCLUSION

In “Evaluating the Promise and Performance of Rail,” Richmond writes, “There is no evidence to suggest...that rail systems have advantages over bus systems with similar quality and quantity of service provision in attracting development.”³⁹ His broader point about the cost drawbacks of light rail construction is well-made, but “bus systems with similar quality and quantity of service provisions” is a threshold that Los Angeles has not met. Notwithstanding Richmond’s quasi-Freudian theories about the irrational appeals of train travel, the data on passenger-miles and on-time percentages make it very clear: If transit riders do not want to sit in traffic, their current options in L.A. are rail service or two dedicated busways.

³⁸ Genevieve Giuliano, “The Bus Vs. Rail Debate” (lecture presented at Urban Planning 255, University of California Los Angeles, May 16, 2016).

³⁹ Richmond, “Evaluating the Promise and Performance,” 70.

The fiscally responsible solution is to stop building rail to outlying regions of L.A. County, and focus on providing bus service with guaranteed rights of way for central neighborhoods that already have high transit ridership, such as Koreatown, Westlake, and Pico-Union. Wilshire Boulevard and Vermont Avenue are two ideal places to begin. These two streets carry the most bus traffic in the Metro network, with about 55,000 and 45,000 daily riders respectively.⁴⁰ Median-running Bus Rapid Transit service on both avenues, with a physically dedicated center lane, signal priority, and fare pre-payment, would be an extremely cost-effective way to serve riders.⁴¹ While this would require more capital outlays than have currently been spent on Wilshire, the Capital Cost per Boarding on Wilshire is so miniscule compared to rail that Metro would still save money.

Politically, this will be easier said than done. Rail development is not without its many controversies, as evidenced by the success of a 1998 ballot initiative that required Metro to spend sales-tax revenue on light rail and buses instead of subways (despite the fact that heavy rail, as we have seen, performs better than light rail in many respects).⁴² However, rail can also be seen as a win-win situation: It provides a new transit service where there previously was none, and no one's mobility is compromised. Bus Rapid Transit on streets like Wilshire and Vermont is zero-sum: In order for something to be given to transit riders, it must be taken *away* from drivers. One need only read the Final Environmental Impact Report for the Wilshire BRT project, with 1000 pages of comments from local homeowners' associations opposing the project, to understand how vehemently drivers oppose any concessions for transit.⁴³

⁴⁰ Ridership Statistics," <http://isotp.metro.net/MetroRidership/IndexAllBus.aspx>.

⁴¹ Fraade, "A Way Forward for Metro."

⁴² Jeffrey L. Rabin and Richard Simon, "Backing for Anti-Subway Measure Equally Strong in All Areas of City," *Los Angeles Times*, November 5, 1998, <http://articles.latimes.com/1998/nov/05/local/me-39573>.

⁴³ "Final Environmental Impact Report/Environmental Assessment for the Wilshire Bus Rapid Transit Project," L.A. County Metropolitan Transportation Authority, November 2010, http://libraryarchives.metro.net/DPGTL/eirs/WilshireBRT/2010_final_eir_ea_2010.pdf.

However, the voice of a well-connected minority should not prevail. Due to their low operating cost, high capacity, and good reliability, subways are an ideal choice to serve a handful of major commuter corridors. The Purple Line Extension along Wilshire Blvd. and the Sepulveda Pass subway, both of which are included in Metro's Measure M funding plan, are examples of subway projects that serve a clear, demonstrated need for regional travel. Aside from these high-profile projects, Metro can best minimize costs and maximize ridership through an extensive network of bus-only lanes, focused on the most densely populated parts of L.A. County and aimed at winning back the trust of riders who have given up transit in recent years. Whether those lanes are on arterial roads or dedicated busways is less important than Metro sending the broader message that it knows and values its most loyal customers, and is dedicated to improving their mobility.

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APPENDIX

See attached Excel spreadsheet compiling data on transit performance, costs, and ridership.