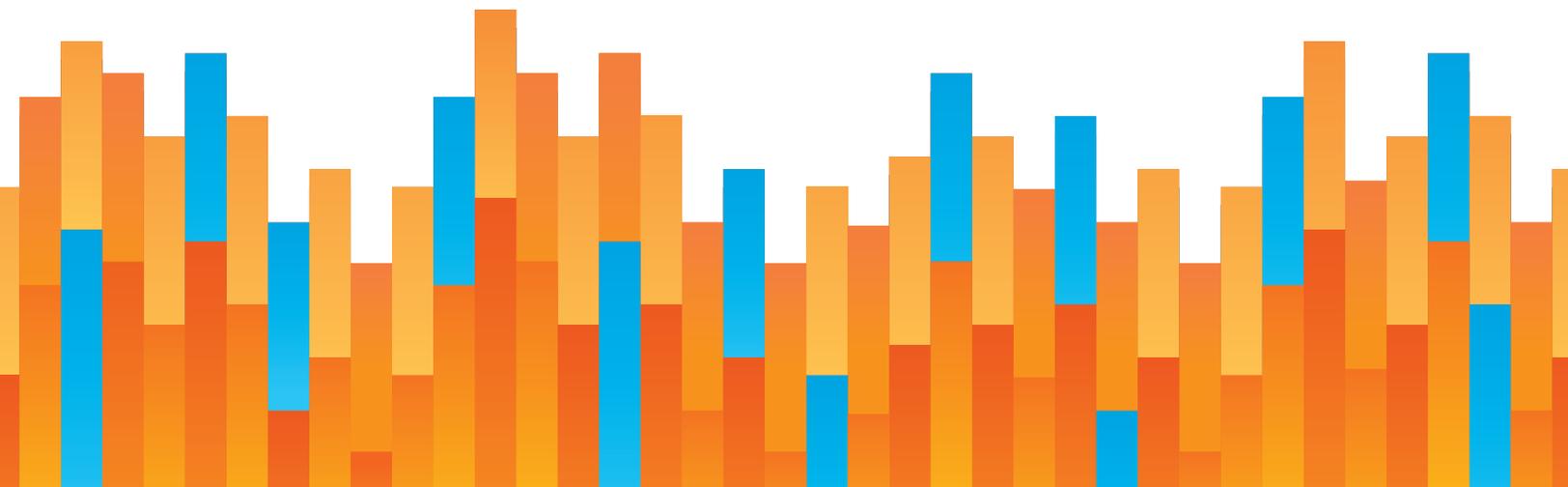




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TRANSPORTATION ADVANTAGES OF DISPERSED CITY STRUCTURES COMPARED TO CENTRAL BUSINESS DISTRICT-FOCUSED CITY STRUCTURES

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TABLE OF CONTENTS

PART 1:	INTRODUCTION.....	1
PART 2:	GREATER MOBILITY	3
PART 3:	THE EFFECTS OF CONGESTION	9
PART 4:	GREATER PRODUCTIVITY.....	10
PART 5:	CONSUMER COSTS IN CENTRALIZED VS. DISPERSED CITIES	12
PART 6:	FLEXIBILITY, RELIABILITY AND CONVENIENCE: RAIL VS. AUTOMOBILE.....	16
PART 7:	CONCLUSION.....	19
	ABOUT THE AUTHOR	20

PART 1

INTRODUCTION

Early economies revolved around available transportation. Predictably, the more difficult it was to move goods and people, the more economies tended to centralize. With the advent of railroads, a greater quantity of goods and people could be moved wherever rails could reach, expanding outward from city centers, similar to the spokes of a wheel. Indeed, historic centralized cities focused on rail transportation, which depends on one strong and growing central business district.

Since railroads are fixed, high-investment systems, the hub-and-spoke cities that evolved around them developed economies that focused on dense central business districts (CBDs) as economic hubs.¹ Cities that developed after the proliferation of automobile-oriented transport could also have developed as hub-and-spoke economies, but, interestingly, they did not. While roadways were initially intended merely to supplement transport in older hub-and-spoke cities, new cities without legacy hub-and-spoke infrastructure have taken advantage of the greater flexibility of roadways to promote dispersed economies, easily incorporating new, raw land for development. This approach allows areas of development to form around employment centers. Roadway-led development, such as we see in newer cities, tends toward grid patterns, and accordingly, the economies of roadway-based cities tend toward dispersed and lower density economic hubs, which some call “sprawl.”

¹ “Railroads and Hegemons.” *economist.com*. 12 October 2013. Web. <https://www.economist.com/news/special-report/21587382-globalisation-depends-technology-and-politics-railroads-and-hegemons>. 15 February 2018.

Notably, the newer, farther-flung surrounding areas of older, rail-based European cities, where automobiles are prevalent and legacy rail does not dominate the infrastructure, also tend toward dispersed clumps of development.² If CBD-focused economies were inherently more efficient, we would expect to see the “wheels” of these cities get larger and larger as the older cities grew, but that’s not the case.

There are several reasons for this evolution from CBD-focused hub-and-spoke city structures to dispersed grid pattern structures.



If CBD-focused economies were inherently more efficient, we would expect to see the “wheels” of these cities get larger and larger as the older cities grew, but that’s not the case.



² Cox, Wendell. “Examining Sprawl in Europe and America.” *Out of Control*. Reason Foundation. January 16, 2009. Web. 1 July 2016.

PART 2

GREATER MOBILITY

When a city is focused on the central business district, most commutes bring workers into the city in the morning and back out to their homes in the evening. Yet, such one-way commutes make poor use of the roadway, as inner-city-bound lanes are flooded in the mornings and outbound lanes are flooded in the evenings.

As automobile use proliferated after World War II, most regions developed since then adopted a dispersed city structure that fostered grid-patterned roadways as opposed to the less-efficient hub with spokes. Grid-pattern cities disperse employment and residences across the “sprawl” of lower density development, making for suburb-to-suburb commutes that use more of the available roadway. Research supports this assertion.

Alain Bertaud of New York University states that mobility allows a worker to choose from many jobs and an employer to choose from many workers. Mobility increases when the number of jobs and amenities that can be reached within a given amount of time increases.³ In a separate paper Bertaud argues that since the time spent commuting is an economic dead loss, the size of the labor market depends on a short, cheap and comfortable commute.⁴

Both New York City and Washington, D.C. lean toward a monocentric, CBD-focused model. Both Atlanta and Dallas have multiple job centers. Adie Tomer of the Brookings Institute, in

³ Bertaud, Alain. *Mobility: Transport is a Real Estate Issue*. New York: New York University, 2016. Chapter 5. Print.

⁴ Ibid.

a piece on employer access to labor by transit, found that in Atlanta more than 95% of jobs could be reached within 50 minutes despite an extremely low population density, while in New York only about 60% of jobs could be reached within 50 minutes despite a significantly higher population density.⁵



...since the time spent commuting is an economic dead loss, the size of the labor market depends on a short, cheap and comfortable commute.



Commute times do not continue to increase as population disperses.⁶ The decentralization of employment naturally accompanies the decentralization of workforces. In dispersed and sprawling cities, such as Atlanta and Houston, businesses have taken advantage of lower-cost sites outside of city centers and higher proximity to employee and customer bases there. Thus, the congested, one-directional commutes from suburbs to the central business districts of cities evolve into multi-directional commutes between suburban communities.⁷

Such dispersed commutes make the most efficient use of roadways, as commuters use both directions of roads, rather than clogging just one way in the morning and the other at close of business. As well, suburb-to-suburb commutes are lower-income-friendly, as families unable to afford high urban housing prices can take advantage of lower housing prices and more housing choice in the suburbs, and avoid the congested one-way commutes to city centers.

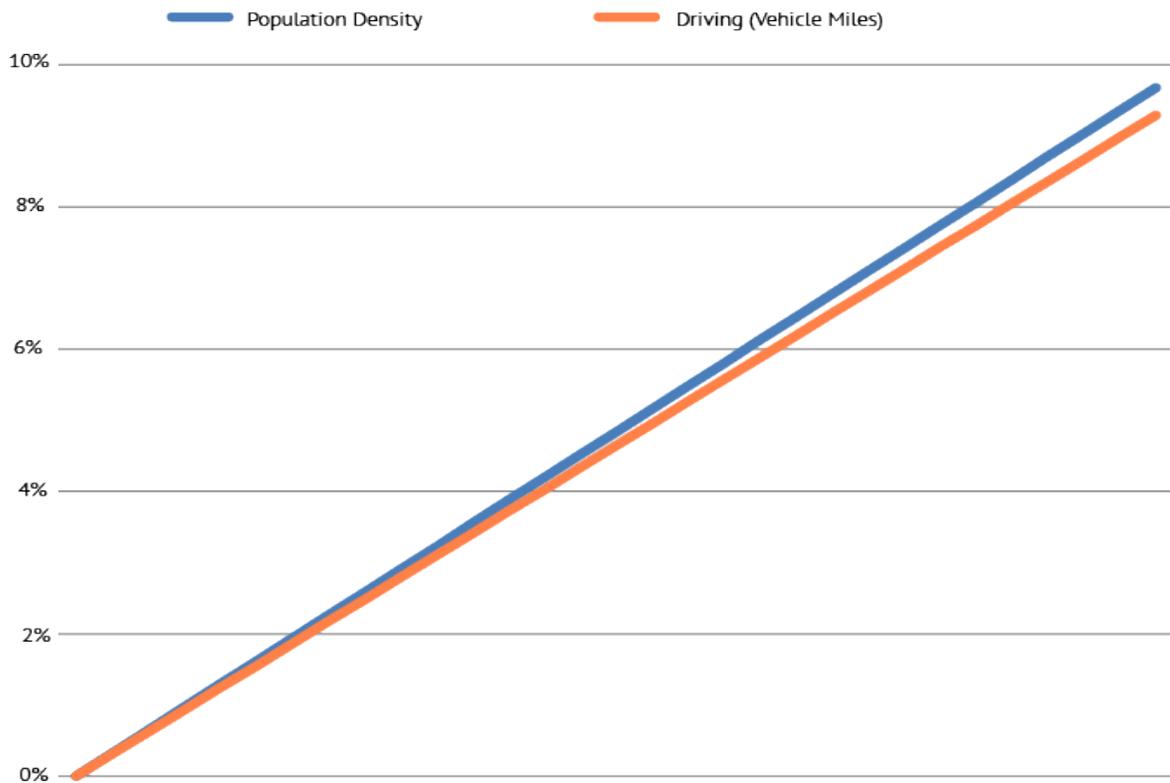
⁵ Tomer, Adie. "Where the Jobs Are: Employer Access to Labor by Transit." Washington, D.C.: Brookings Institute, July 2012. Web. <https://www.brookings.edu/wp-content/uploads/2016/06/11-transit-labor-tomer-full-paper.pdf>, 13 February 2018.

⁶ Crane, Randal and Chatman, Daniel. "As Jobs Sprawl, Whither the Commute?" *accessmagazine.org*. Fall 2003. Web. <https://www.accessmagazine.org/fall-2003/jobs-sprawl-whither-commute/> 22 February 2018.

⁷ White, Michelle. "Urban Areas with Decentralized Employment: Theory and Empirical Work." *Handbook of Urban and Regional Economic.*, Eds. Mills, E.S. and Cheshire. P. London, England: Elsevier Science, 1999. 1404-1410. Print. Crane, Randal and Chatman, Daniel. "As Jobs Sprawl, Whither the Commute?" *accessmagazine.org*.

Workers want cars because most people will not or cannot spend more than a particular amount of time each day on the journey to work. As travel time increases due to slow commute speeds, the number of miles a commuter can travel within this amount of time decreases. Imagine a circle of available access, with a person’s home in the center and a range of employers, some five miles away, some 10 miles away and some 20 miles away. In a certain time frame, auto commuters can reach every point within a 20-mile circle, but transit users can only reach the points within the 10-mile circle or maybe even just points within the five-mile circle. According to basic geometry, the area of a 20-mile radius circle is four times that of a 10-mile radius circle. If work possibilities are randomly distributed across the landscape, the 20-mile circle will include four times as many job opportunities as the 10-mile circle.

FIGURE 1: IMPACT OF INCREASE IN POPULATION DENSITY ON VEHICLE TRAVEL



Source: Ewing and Cervero, “Travel and the Built Environment,” *Journal of the American Planning Association*.

Logically, the more decentralized a city’s employment and amenities are, the lower the premium cost of location nearer to employment and amenities. As a result of the dispersion of employment, commuting times remain significantly shorter, particularly for the central

business district, as shown in Table 1.⁸ Studies on urban dispersion and trip-to-work times over nearly 30 years show that the dispersion of employment in U.S. cities has kept trip-to-work times much shorter than such commutes in areas with CBD-focused growth.⁹

TABLE 1: U.S. CITIES MEAN COMMUTE TIME (IN MINUTES): DISPERSED CITIES VS. CENTRALIZED CITIES

MSA Name	All Modes				Drive Alone			
	Metro-Wide	CBD	Subcenter	Dispersed	Metro-Wide	CBD	Subcenter	Dispersed
New York	34.3	51.1	38.6	31.6	28.5	55.6	30.2	27.8
Los Angeles	29.0	39.0	30.0	28.1	27.8	36.6	28.9	27.0
Chicago	31.3	46.4	33.3	29.7	28.9	41.8	32.1	28.0
Washington, D.C.	32.1	42.0	32.2	31.2	30.3	40.2	30.2	29.8
San Francisco	30.4	40.9	30.7	29.4	28.4	39.3	29.3	27.8
Philadelphia	27.7	38.8	26.4	26.6	26.1	36.6	26.1	25.7
Boston	28.3	42.3	26.5	27.2	27.1	41.6	25.9	26.7
Detroit	26.6	32.0	27.7	25.9	26.2	31.0	27.7	25.4
Dallas	28.1	33.3	28.5	27.6	27.4	31.5	28.0	27.1
Houston	29.2	35.8	30.0	28.2	28.1	32.9	28.9	27.3
Atlanta	31.9	37.8	32.4	31.3	30.9	36.0	31.4	30.3
Miami	28.9	35.8	29.6	28.0	27.9	33.8	28.9	27.1
Seattle	27.9	35.1	27.5	27.1	26.2	30.7	26.3	25.8
Phoenix	26.2	32.2	25.6	25.7	25.4	31.1	24.7	25.0

⁸ Gordon, Peter and Bumpsoo Lee. "Spatial Structure and Travel Trends in Commuting and Non-Commuting Travel in US Metropolitan Areas." *International Handbook on Transport and Development*, Eds. Hickman, Robin et. al. Cheltenham, England: Edward Elgar, Sept. 2013. Web. http://www-bcf.usc.edu/~pgordon/pdf/GORDON_LEE_SEP_25_2013.pdf. 22 February 2018.

⁹ Gordon, Peter, Ajay Kumar, and Harry W. Richardson. "The Influence of Metropolitan Spatial Structure On Commuting Time." *Journal of Urban Economics*, Vol. No. 26 (1989) 138-151. Print.

THE LA ANOMALY

Los Angeles is a favorite negative example of the consequences of sprawl. But Los Angeles is almost unique among U.S. metro areas, in having had significant periods of urban development of homes with comparatively small lots. The norm in U.S. cities is larger lot sizes. The very much denser cores of New York City and a few other legacy cities exist because they evolved prior to the advent of the automobile. But they nevertheless have far less dense suburbs than L.A., which actually results in Los Angeles being the U.S.'s densest urban area.¹⁰ The cause of L.A.'s famous congestion is actually not "low" density, but its *lack* of roadways compared to its population density.¹¹ According to Eric Morris of Clemson University:

...by the standards of U.S. cities, Los Angeles is not sprawling, has a fairly extensive transit system, and is decidedly light on freeways...Los Angeles's traffic woes stem from the fact that it doesn't sprawl enough and has overinvested in costly rail transit at the expense of developing its undersized freeway network...¹²

Measured in miles, Los Angeles residents have some of the shortest commutes of any major U.S. region and Atlanta residents have some of the longest. However, the reason for that difference is severity and length of congestion. Atlanta's rush hour lasts for slightly over four hours per day, while Los Angeles' is 8.5 hours long.¹³ The Atlanta travel time index of 2.52 is relatively high. The 2.52 means that during rush hour it can take 2.5 times as long to get somewhere as during off peak hours. However, the Los Angeles' index of 3.74 is the worst in the country. Put simply, L.A. residents travel fewer miles, because travel speeds are so slow for much of the day.

¹⁰ Fulton, William, et. al. *Who Sprawls Most: How Growth Patterns Differ Across the U.S.* Policy Survey Series. Washington D.C.: Brookings Institute, July 2001. Print.

¹¹ Morris, Eric, "Los Angeles Transportation Facts and Fiction: Driving and Delay." Web blog post. *Freakonomics.com*. 10 March 2009. Web. <http://freakonomics.com/2009/03/10/los-angeles-transportation-facts-and-fiction-driving-and-delay/> 22 February 2018.

¹² Ibid.

¹³ Taylor, Rich. "Urban Congestion Report." Federal Highway Administration. *fhwa.gov*. 2015. Web. http://www.ops.fhwa.dot.gov/perf_measurement/ucr/reports/fy2015_q3.pdf. 22 February 2018.

These shorter commutes in grid-pattern cities make sense. Moving to a dispersed economy characterized by greater automobile use theoretically lessens congestion by making more-efficient use of the roadway, resulting in greater mobility overall.



Moving to a dispersed economy characterized by greater automobile use theoretically lessens congestion by making more-efficient use of the roadway, resulting in greater mobility overall.



PART 3

THE EFFECTS OF CONGESTION

National Cooperative Highway Research Program Report 786 notes that congestion has many negative impacts on freight.¹⁴ Worse, this effect is exponential because traffic that once flowed freely becomes stop-and-go, increasing congestion in other areas of the road network. The stop-start conditions reduce throughput of vehicles compared to free-flow, significantly lengthening rush hour.

While this means a longer time commuting for office workers, for trades it actually translates to less pay, as plumbers, electricians, repairmen, delivery people, real estate agents, salespeople and others make it to fewer jobs during the course of the day. Indeed, the economy of the entire city—businesses and consumers—is affected, as congestion delays the delivery of goods and services. In this way, congestion—and indeed any policies that make a city less productive—disproportionately affects low-income families that spend a greater percentage of their income on daily goods and services.

Fast, reliable delivery of goods and services can reduce the need for vehicles, warehouse space and investment in equipment and facilities.¹⁵ This effect also increases the productivity level of workers, whereas the traffic congestion of CBD-focused cities decreases economic productivity.

¹⁴ “Assessing Productivity Impacts of Transportation Investments.” The National Academies of Science. 2014. Web. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_786.pdf, 13 February 2018.

¹⁵ Ibid.

PART 4

GREATER PRODUCTIVITY

Notably, studies have recently found an observable correlation in the data between dispersion and productivity.¹⁶ This suggests that suburbanization—which has made the U.S. a world leader in low-density, spacious, lower cost of living housing—may actually foster a more productive economy than high-density, cramped, higher cost-of-living conditions.¹⁷ Such a correlation is not surprising, given that in sprawling cities, such as Atlanta and Houston, businesses have decentralized along with the population.¹⁸ As the U.S. shifts from a more goods-oriented economy to a more services-oriented one,¹⁹ this dispersal not only brings employers closer to employees, but to customers as well. Since only 40% of road trips are for work commutes,²⁰ employees who work in a suburban setting are likely to be

¹⁶ Gordon, Peter and Harry Richardson. “Urban Structure and Economic Growth.” *Oxford Handbook of Urban Economics and Planning*, Eds. Nancy Brooks, Kieren Donaghy and Gerrit-Jan Knaap. Oxford, England: Oxford University Press, 2016. Print.

¹⁷ “Space and the City.” *economist.com*. April 14, 2015. Web. <https://www.economist.com/news/leaders/21647614-poor-land-use-worlds-greatest-cities-carries-huge-cost-space-and-city>. 13 February 2018.

¹⁸ White, Michelle. “Urban Areas with Decentralized Employment: Theory and Empirical Work.” *Handbook of Regional and Urban Economics*, Eds. E.S. Mills and P. Cheshire. Chapter 26. Ann Arbor, MI: Elsevier, 1999. Print. 1375–1412.

¹⁹ Berlingieri, Giuseppe. “Outsourcing and the Rise in Services: Discussion Paper No 1199.” <http://cep.lse.ac.uk> (*London School for Economics and Political Science*). Sept. 2014. Web. <http://cep.lse.ac.uk/pubs/download/dp1199.pdf>, 13 February 2018.

²⁰ Pisarski, Alan and Steve Polzin. “Commuting in America—Brief 2 The Role of Commuting in Overall Traffic.” *traveltrends.transportation.org*. May 2013. Web. <http://traveltrends.transportation.org/Pages/default.aspx>, May 9, 2016.

closer to the services they need, decreasing miles traveled. The more mobility an urban area has, the faster people, goods and services move, and the more productive the city is.

Schlomo Angel and Alejandro Blei of the Marron Institute of Urban Management at New York University have examined the relationship between commuting, land use and economic productivity. Their findings echo that of other researchers:

The agglomeration economies associated with clustering—a large and diverse labor pool, knowledge exchange within industries and across different sectors, shared infrastructure, shared inputs, shared services and amenities, a diverse industry mix that reduces economic shocks, and the presence of large internal markets—are all metropolitan in scope rather than pertaining to concentrations of people and jobs within metropolitan areas.²¹

As this dispersal of the economy enables businesses to be more efficient due to lower overhead costs (such as building costs, due to lower land prices), and competition between businesses drives prices downward, customers get more for less. Such productivity gains benefit all, but most specifically lower income residents, who now have more discretionary income for goods and services—in other words, a lower cost of living and a higher quality of life.

As the U.S. shifts from a more goods-oriented economy to a more services-oriented one, this dispersal not only brings employers closer to employees, but to customers as well.

²¹ Angel, Shlomo and Alejandro Blei. “The Productivity of American Cities: How Densification, Relocation, and Greater Mobility Sustain the Productive Advantage of Larger U.S. Metropolitan Labor Markets.” *Cities*. Volume 1, January 2016. 36–51. Print.

PART 5

CONSUMER COSTS IN CENTRALIZED VS. DISPERSED CITIES

Some central city advocates suggest that consumers benefit from not owning an automobile by saving on car expenses (purchase, maintenance, insurance). However, they do not consider the advantages of an automobile (ability to travel anywhere, expanded circle of opportunity). These back-to-the-city advocates often point to Europe as a shining example of lower use of automobiles. But while the average European car is only driven about two-thirds as many miles per year as the average American car, the data on commute times show that this is not the result of inherent efficiency of urban form, but of less discretionary non-commuting travel. This can largely be explained by differences in real discretionary income and the effect of Europe's very high motor fuel taxes.

Higher housing and transport costs (along with other costs, such as much higher taxes) leaves European households with reduced discretionary incomes, constraining household options not just for travel mileage, but for health, clothing, entertainment, hobbies, education, and childcare. Table 2 shows the costs of living for the U.S. and selected European countries. The United States has a lower cost of living than every country except Germany. Germany's costs are lower due to Germany's central location and stewardship of Europe's economy.²²

²² Bell, Todd. "How Does Euro Membership Help Germany?" *wsj.com*. 22 July 2015. Web. <http://www.wsj.com/europe>, 14 February 2018.

TABLE 2: COST OF LIVING INDEX IN SELECTED COUNTRIES*

Country	Cost of Living Index	Rent Index	Groceries Index	Restaurant Price Index	Local Purchasing Power Index
United States	74.08	38.39	75.69	69.13	139.17
Germany	65.54	24.01	53.12	60.68	147.61
United Kingdom	81.03	36.29	68.48	86.68	120.00
Sweden	75.70	25.21	67.89	79.18	128.22
France	75.30	26.22	69.62	73.48	118.51
Japan	81.25	56.50	86.90	47.45	117.55

Source: Numbeo, http://www.numbeo.com/cost-of-living/rankings_by_country.jsp

*Note that for all columns except Local Purchasing Power, a lower score equals cheaper costs. For Local Purchasing Power, the higher score is better. Note that these scores are countrywide averages—not for one city; so while overall living in France, for example, may be reasonably affordable, living in a major city such as Paris is likely very expensive.

Table 3 compares energy prices for the U.S. and selected European countries.

TABLE 3: ENERGY PRICES AND TAXES MARCH 2016 (IN U.S. DOLLARS)

Country	Price of Liter of Gas Before Tax	Tax	Total Price in Dollars	Taxes as a Percent Of Total Prices	Percentage Increase in Base Prices as a Result of Taxes
United States	0.401	0.12	0.520	23%	30%
France	0.449	0.96	1.403	68%	212%
Japan	0.424	0.57	0.996	57%	135%
Spain	0.481	0.60	1.077	55%	124%
United Kingdom	0.399	1.07	1.470	73%	268%
Germany	0.446	0.71	1.153	61%	159%

Source: International Energy Agency: Energy Prices and Taxes, <http://www.iea.org/statistics/topics/pricesandtaxes/>

Another reason for Europeans' higher cost of living is the need for government to subsidize mass transit. Studies confirm that European transit is heavily subsidized, and getting costlier over time.²³ An E.U. parliament discussion paper concluded that "the burden of public transport subsidies negatively affects Europe's economy," costing 1%–5% (depending on country) of GDP per year.²⁴ As a result, transportation budget money is often diverted from roads to mass transit, the capital and operating costs of which are several times higher per capita than for automobiles. Since individuals pay most of the cost of personal automobile transportation (gas, insurance, repairs, etc.), the costs for transit are less visible. Ticket price covers less than half of the operating costs of most transit systems (a European Union average of 44%), the rest of which is subsidized by taxpayers.²⁵

Similarly, in the United States, many parts of the transit system are subsidized—the rolling stock and other capital costs, the energy and other running costs—in contrast to car drivers who pay for most of these things themselves. Drivers do benefit from a small subsidy for the roads that they drive on, less than five cents per mile, due largely to general funding of roadway construction and maintenance.²⁶ The mass transit subsidy is at least 20 cents per person-mile in all but the largest, densest cities such as New York, and can be as high as several dollars.²⁷ With the exception of the six rail legacy regions (Boston, Chicago, New York City, Philadelphia, San Francisco and Washington DC), spending money on rail transit

²³ Vermelun et. al. "The Price of Transport." <https://research.vu.nl>. Dec. 2004. Web. 20 May 2016; Lave, Charles. *Things Won't Get a Lot Worse: The Future of U.S. Traffic Congestion*. Berkeley: University of California Press, 1991. Print.

²⁴ Vatanen, Ari and Malcolm Harbour. *European Transportation Policy: Liberating or Strangling Europe's Potential*. Brussels, Belgium: European Parliament, 2005. Print.

²⁵ Lindquist, Kathy, Michel Wendt and James Holbrooks. "Transit Farebox Recovery and U.S. and International Transit Subsidization: Synthesis." *natco.org*. 8 Oct. 2009. Web. https://nacto.org/docs/usdg/transit_farebox_recovery_and_subsidies_synthesis_taylor.pdf. 15 February 2018.

²⁶ Cox, Wendell and Ronald Utt. *Federal Transportation Program Shortchange Motorists: Update of a USDOT Study*. Backgrounder No. 2283. Washington D.C.: Heritage Foundation, June 2009. Web. <https://www.heritage.org/transportation/report/federal-transportation-programs-shortchange-motorists-update-usdot-study>. 15 February 2018.

²⁷ Mallinckrodt, Albert John. "The Public Costs of Transportation Alternatives." *debunking portland.com*. October 2007. Web. <http://www.debunkingportland.com/docs/costcomp.pdf>, 14 June 2016; Rubin, Thomas A. "Are The Full Costs of Roads Paid For By Roads Users?." *debunking portland.org*. October 2007. Web. <http://www.debunkingportland.com/ADCHardCosts.pdf> 15 February 2018.

systems instead of roadways will reduce mobility. It will also lead to much higher costs that consumers and cities will have to pay.

“
... spending money on rail transit systems lead to much higher costs.
”

PART 6

FLEXIBILITY, RELIABILITY AND CONVENIENCE: RAIL VS. AUTOMOBILE

While automobile use dominates in grid-pattern cities, CBD-focused city advocates often hope that mode shift to public rail transport, as in historic cities, would negate the effects of road congestion, but increasingly residents side with the automobile. Researchers have found that automobiles provide access to far more jobs and other destinations than transit. This access is particularly important to low-income individuals who may not be able to afford to live close to work and amenities.²⁸

Researchers find rail transit lacking in several areas, notably:

- Heavy- and light-rail lines are expensive to build (\$200M–\$339M per mile).²⁹ compared to roadways averaging \$6 million per lane-mile in the U.S.³⁰

²⁸ Blumberg, Evelyn and Gregory Pierce. “A Driving Force in Moving to Opportunity.” *Access Magazine*. Spring 2016. Web. <https://www.accessmagazine.org/spring-2016/a-driving-factor-in-moving-to-opportunity/>. 16 February 2018.

²⁹ O’Toole, Randal. *The Worst of Both: The Rise of High-Cost-Low-Capacity Rail Transit*. Policy Study No. 750. Washington, D.C.: Cato Institute. June 3, 2014. 30–44 Online.

³⁰ “Frequently Asked Questions: How much does it cost to build a mile of road??” *artba.org*. 1 January 2016. Web. <https://www.artba.org/about/faq/14>, April 2016.

- Unless they cover a city in a grid-like pattern—to which rail is not suited—some sort of rubber-tire transport, such as a taxi, is still required to get from origins to rail stations and from rail stations to many destinations, making for longer and more expensive commutes.
- Rubber-tire vehicles can easily change direction and intensity to respond to where cities grow, but railroads cannot be picked up and relocated, or change direction.
- People can trip-chain several destinations with a car, but not easily by rail.
- Tradespeople and others who carry equipment for work or play, or who use their cars in their work, cannot use rail.
- People can buy vehicles customized to their needs and pocketbooks, but rail travel costs the same for all.

Reducing vehicle size and weight will decrease gasoline costs, allowing low-income commuters to travel by car if they wish. The superior efficiency of a system of roads and automobiles allows for trips for the lowest possible number of riders (i.e. 1) to the maximum possible number of destinations. Reimposing a dense enough urban form to make rail transit competitive with automobiles is economically prohibitive. Indeed, a study calculates that a hypothetical rail-based transit system that operated on a grid system similar to a road network, rather than a radial system, would cost more to finance and operate than the entire city's GDP.³¹ And most rail lines require perpetual subsidies to remain in good condition.

TABLE 4: COSTS PER MILE FOR VARIOUS TYPES OF TRANSPORTATION INFRASTRUCTURE (U.S. AVERAGE)

Infrastructure Type	Per Mile Cost (Capital)	Per Mile Cost (Operating)	Capital and Operating Subsidy (per Mile)
Local Street (2 lanes)	\$4 million	--	\$4 million
Minor Arterial (4 lanes)	\$24 million	--	\$24 million
Expressway (6 lanes)	\$58 million	--	\$58 million
Streetcar (2 tracks)	\$59 million	\$245 million	\$304 million
Light Rail, Separated (2 tracks)	\$200 million	\$245 million	\$445 million
Heavy Rail (2 tracks)	\$339 million	\$199 million	\$538 million

Sources: "Outrageously Expensive Transit." Randal O'Toole. APTA's Analysis of National Transit Database <http://www.apta.com/members/memberprogramsandservices/international/Documents/U.S.%20National%20Transit%20Database.pdf>, Reason's Annual Highway Report Calculations, Florida DOT's Cost-estimation Tool

³¹ Cox, Wendell. "The Illusion of Transit Choice." *Veritas*. March 2002, 34-40. 12. May 2016. Print.

The U.S. is not the only country where transit is much more heavily subsidized than automobiles. A comprehensive study in The Netherlands established that the private motor vehicle, in Europe, is by a wide margin the least subsidized mode.³² This is a good thing, because, between 1965 and 1987, the growth in the number of automobiles per capita was three times faster in Western Europe than in the United States.³³ Even policies that penalize car use, make travel very expensive, and restrict parking space do not seem to be preventing Europe's auto use from converging on the U.S.'s, taking into account demographic and economic evolutionary factors at a couple of decades' time lag.

Such growth in auto use in Europe shows that, as with low-density living, travel by private automobile is what many people want, in both Europe and the U.S., and they vote for it with their wallets. It is likely that, similar to Americans, Europeans don't want to haul their groceries/children/purchases home on foot in inclement weather from a transit stop, or spend 40 minutes getting to work on transit when a car could get them there in 20 minutes.³⁴ While urban planners promote high density living to make origins closer to destinations, that does not mean the trip takes less time.



...travel by private automobile is what many people want, in both Europe and the U.S., and they vote for it with their wallets.



³² Vermelun et. al. "The Price of Transport."

³³ Lave, C. "Measuring the Decline in Transit Productivity in the U.S." *Transportation Planning and Technology*. Vol. 15. 115–124. Print.

³⁴ Cox, Wendell. "Urban Containment: the Social and Economic Consequences of Limiting Housing and Travel Options." Policy Study #449. Los Angeles: Reason Foundation, March 2016. Web. https://reason.org/policy_study/urban-containment-the-social-travel/, 15 February 2018, Online calculations made using Census data from American Fact Finder.

PART 7

CONCLUSION

Before the automobile, city structures radiated outward from a central business district due to lack of transport. The farther from the city center, the harder it was to procure goods and services. But since the widespread use of the automobile, city structures have evolved to form “splatter” patterns, whereby smaller economic centers coagulate organically in dispersed areas across a city, providing consumers with nearby goods and services, employers with nearby workers, and workers with nearby jobs. Free from the constraints of permanent rail lines, and the necessity to get from a point of origin to the rail, as well as from the rail line to a destination, roadway patterns have evolved to connect locations most efficiently—in a grid pattern. Even the historic cities of Europe, which all began as hub-and-spoke, centralized cities, have largely evolved to grid patterns where the new growth occurs on the peripheries. While many city planners disparage the automobile in favor of transit, such as rail, residents prefer the flexibility and greater mobility of the automobile, as demonstrated by its widespread use compared to transit.

Grid-pattern cities are not only more efficient, but also more democratic. Centralized cities have a single economic hub, leading to higher home prices at the center, and long, onerous commutes from the periphery where the affordable homes are. With automobiles, all land is accessible, beginning and ending at one’s driveway, so there is less stratification of housing prices and fewer residents are priced out of the housing market. These dispersed cities form many lesser and dispersed hubs, keeping home prices more consistent, and these suburb-to-suburb commutes less arduous. Clearly, the proliferation of the automobile and the sprawling city structures it engendered brought better access to goods, services and employment than rail did—in other words, a higher quality of life that trickles down to the lower income tiers in the form of the personal automobile.

ABOUT THE AUTHOR

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A native of New Zealand, Hayward has been published by the New Zealand Productivity Commission, the *New Zealand National Business Review*, *Quadrant Magazine* and *Investigate Magazine*.

