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Evaluating Transportation Economic Development Impacts

Understanding How Transport Policy and Planning Decisions Affect Employment, Incomes, Productivity, Competitiveness, Property Values and Tax Revenues

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Transportation planning decision affect economic development in many ways: by influencing the connections between resources, workers, businesses and customers; by influencing consumer expenditures; and by affecting land use development location and intensity.

Abstract

Economic development refers to progress toward a community's economic goals such as increased employment, income, productivity, property values, and tax revenues. This report examines how transportation policy and planning decisions affect economic development, methods for evaluating these impacts, and ways to maximize economic development benefits in transport decisions. Some of these impacts tend to be overlooked or undervalued in transportation planning.

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Introduction

Economic development refers to progress toward a community's economic goals such as increased employment, income, productivity, property values, and tax revenues. Transport policy and planning decisions can affect economic development in various ways, including some that are often overlooked or undervalued.

Transportation planning decisions can affect economic development in several ways: by affecting accessibility (people's ability to reach services and activities including goods, education, employment); household, government and business costs; plus local environmental quality and therefore an area's attractiveness to residents, customers and workers.



Some guidebooks and software tools exist for evaluating transportation economic development impacts, but most can only evaluate a limited range of modes, impacts or project types. Few tools can evaluate the full economic impacts of mobility management and smart growth policies and programs.

This has important implications for transport policy and planning decisions. Theoretical and empirical evidence indicates that once a region has a basic paved roadway system, further roadway expansion provides declining marginal benefits, while investments in alternative modes and mobility management generally provide greater economic returns. Similarly, research indicates that efforts to minimize vehicle, road, parking and fuel prices (through low taxes, and direct and indirect subsidies) reduces economic competitiveness and wealth generation. In addition, research also indicates that excessive land use sprawl creates economic costs.

Mobility-Productivity Relationship Analysis

This section examines various associations between mobility (how and how much people travel) and economic productivity.

Productivity refers to the value of goods and services produced. When possible, it should be measured directly as gross domestic product, or GDP. This is somewhat different than income. For example, affluent suburbs can have high household incomes but low productivity, while central cities often have lower household incomes but high productivity, wages, property values and tax revenues due to agglomeration efficiencies.

Most economic activities require some mobility to transport goods, for workers to access jobs, students to access schools, and customers to access businesses. However, there are many possible ways for this access to occur. More efficient transportation systems can reduce the amount of mobility required to achieve accessibility, for example, by creating more compact communities which increase proximity between activities, more multimodal transportation that provides non-auto travel options, and mobility substitutes such as telecommunications and delivery services that substitutes for physical travel (Litman 2013; Levinson and King 2020).

There is currently no comprehensive global mobility data so this analysis uses vehicle ownership as an indicator. Economic productivity tends to increase with vehicle ownership, as illustrated below. The high R² value indicates a statistically strong relationship but the direction is unclear: vehicle ownership may increase productivity or increased prosperity may allow more vehicle purchases. Researchers who investigate this conclude that in developed countries the primary effect is that more productivity increases vehicle ownership (McMullen and Eckstein 2011).





The figure below presents the same data in a different format. Vehicle ownership increases with GDP up to about \$50,000 per capita and subsequently declines. Mode share data have similar results (Fountas, et al. 2020). This suggests that beyond optimal levels, additional vehicle ownership and use does not increase productivity.



The following graph shows a similar pattern for urban automobile mode shares: as GDP grows the portion of trips made by automobile tends to increase, but eventually peaks and declines indicating that the most productive cities tend to have less driving, despite higher incomes that allow households to purchase more vehicles and drive more miles.



Figure 4 Productivity Versus Automobile Mode Share (UITP 2006)

Productivity and vehicle travel have *decoupled* in developed countries. During the twentieth century, vehicle travel and economic productivity were closely aligned. but in the twenty-first century vehicle travel peaked while productivity continued to grow as new efficiencies and technologies reduced the amount of vehicle travel required for economic activities (Ecola and Wachs 2012). The following figure illustrates these trends in the U.S.



Figure 5 U.S. Productivity and Vehicle Travel Tends (FHWA and BEA Data)

The following figure shows the negative relationship between mobility and productivity for U.S. states: productivity declines as vehicle-miles increase, the opposite of common assumptions.



Productivity Versus Vehicle Travel for U.S. States (FHWA 2020, PS-1) Figure 6

The figure below shows that productivity declines as urban lane-miles increase, indicating that expanding urban roadways is economically harmful.



Productivity Versus Urban Lane Miles (USDOT 2024) Figure 7

The figure below shows that regional productivity tends to increase with transit ridership. This reflects the ability of high-quality transit to increase urban transportation efficiency and encourage more compact development.



Productivity Versus Transit Ridership (APTA 2020 and BEA 2024)

The figure below shows that urban region productivity increases with active (walking and bicycling) commute mode shares.



Figure 9 Productivity Versus Active Mode Shares (USDOT 2024 and ABW 2024)

The figure below shows that productivity tends to increase with regional population density, an effect called *agglomeration efficiencies* (Ahrend, Lembcke and Schumann 2017; Angel and Blei 2015; Melo, Graham and Noland 2009). The statistical relationship is strong. This reflects the benefits of increased proximity (reduced travel distances) and travel diversity (better non-auto travel). It implies that policies that allow and encourage compact urban development tend to increase productivity.



Figure 10 Productivity Versus Urban Density (USDOT 2024)



Many people assume that low fuel prices increase economic productivity by reducing producer and consumer costs, but the relationship is actually positive; higher fuel prices are associated with more productivity as illustrated in these two graphs. This probably reflects the increased energy and transportation system efficiency motivated by more costly fuel.



This relationship is particularly strong for petroleum importing countries, which makes sense since in addition to increasing efficiency higher fuel prices the amount those countries must spend importing petroleum, leaving more money circulating in their economy. Petroleum producing countries can also benefit from high fuel prices to discourage domestic consumption, leaving more to export. A good example is Norway, a major petroleum producer that has one of the world's highest fuel taxes and invests heavily in non-auto modes, resulting in a diverse and successful economy. In contrast, oil producing countries with low fuel prices, such as Venezuela, Nigeria and Iran, fail to develop non-petroleum industries, reflecting what economists call the *resource curse*. Conventional planning assumes that traffic congestion is economically harmful and urban roadway expansions increase productivity (TTI 2023), but the figure below indicates the opposite: productivity tends to *increase* with congestion intensity. As previously indicated, productivity tends to decline with more urban lane-miles, indicating that efforts to reduce congestion by expanding roadways tend to be economically harmful overall; their costs exceed their benefits (Litman 2023; Metz 2021).



Similarly, businesses often argue that commercial districts need abundant and free parking, but productivity tends to increase with less city center parking and higher parking prices, as indicated below. Reducing parking supply and increasing fees can improve urban efficiency by freeing up urban land for more productive uses and encouraging more resource-efficient travel.

Figure 14Productivity Versus Parking Supply and Price (PRN 2023; USDOT 2024; CO 2016)



Similar patterns occur at finer geographic scales. Neighborhood productivity, employment, incomes, property values, tax revenues and innovation tend to increase with density, mix and non-auto travel (Boarnet, et al. 2017; Ahlfeldt and Pietrostefani 2019; Minicozzi 2012). The heatmap below shows how urban property values and tax revenues increase with density.



Compact and multimodal development tends to generate higher property values and tax revenue per acre than autodependent sprawl, as illustrated in this heatmap. Column height and color indicate taxable value per acre. Improving non-auto modes, reducing auto trips, and reducing the land area devoted to parking supports such development.

In the past, businesses often assumed that motorists are better customers and workers so improving automobile travel supports economic development, but this research indicates otherwise. Many cities are attracting economically successful residents who prefer non-auto travel and want less vehicle traffic. More compact and multimodal urban neighborhoods tend to attract more residents, customers, and workers by increasing development density and mix, improving multimodal accessibility, reducing vehicle traffic and reducing parking costs. For example, in auto-dependent areas where most customers and workers drive, parking subsidies represent about 20% of rents; in multimodal areas where only half drive, rents can decline about 10%, and the pool of potential workers increases 10-30%, representing non-drivers.

These savings and benefits tend to increase property values. A-10 point Walk Score increase typically raises residential and commercial property values 5-10% (Alfonzo 2015; Bokhari 2020); proximity to transit stations typically raises property values 10-40% (Smith and Gihring 2023); complete streets and bikelanes tend to increase business sales and profits (Arancibia, et al. 2019; Liu and Shi 2020). Of 11 complete streets projects studied, most increased local employment, business activity, property values and private investments (SGA 2015).

These are not just economic transfers in which some areas benefit and others lose, compact, multimodal communities provide true resource savings and efficiencies that can benefit everybody. The results of this analysis are very consistent: productivity declines with virtually every indictor of urban vehicle travel (more vehicle-miles, urban lane-miles, parking supply and sprawl), and increases with every indicator of multimodalism and urbanization (reduced VMT, higher non-auto mode shares, density and higher parking and fuel prices). This validates related research on agglomeration efficiencies and the economic productivity benefits of urbanization.

Explaining The Paradox

This section examines possible reasons that productivity declines with increased motor vehicle travel.

User Costs

Driving is much more expensive than other modes, as illustrated below. Owning, operating and parking an average automobile typically costs \$8,000 annually, more than 10% of average household budgets. These cost burdens reduce economic opportunity and productivity. For example, high vehicle expenses prevent some people from affording education that would increase their future productivity and incomes.



Average motorists spend about \$6,500 annually on vehicles and \$1,500 for parking, far more than other modes.

In auto-dependent communities, cars can significantly increase workers' access to jobs and therefore productivity (Klein 2020), but this is often more than offset by higher transportation costs. One study found that cars increase low-income households' annual incomes about \$2,300 but costs about \$4,100 in additional expenses, leaving them financially worse off overall (Smart and Klein 2015). Car ownership also imposes economic risks on lower-income households, who can face severe financial stress from mechanical failures, crashes or traffic citations. As a result, auto-dependent areas have high home foreclosure rates due to occasional financial shocks caused by vehicle failures, crashes and citations (Gilderbloom, Riggs and Meares 2015)

The cost-efficiency of automobile travel can be evaluated using *effective speed*, which measures distance travelled divided by time spent traveling *and* earning money to pay travel expenses (Meira, et al. 2020), illustrated in the following graph. Blue shows time spent travelling and orange shows time spent earning travel expenses. Since lower-wage workers must spend more time earning their travel expenses and drive fewer average annual miles, effective speeds increase with income, as illustrated below. Measured this way, automobile travel is regressive, and improvements to slower modes increase affordability and equity.



Public Infrastructure Costs

Automobile travel requires governments to provide roads and businesses to provide parking facilities for their use. These costs total about \$4,000 annually per vehicle, much more than the infrastructure costs of other modes, as illustrated below. They are mostly borne indirectly through general taxes and building rents. For example, a restaurant that provides "free" parking must charge \$2-4 extra per meal, reducing its profits, competitiveness and productivity.



External Traffic Costs

Vehicle traffic imposes various external costs on other people including infrastructure costs not borne by user fees, congestion, crashes, and environmental degradation. These costs filter through the economy as higher taxes and building rents, travel delays, injuries and disabilities, and less valuable properties. Driving imposes higher costs than other modes per passenger-mile, as illustrated below, and since motorists tend to travel far more miles per year than non-drivers, their annual external costs per capita are much higher.



This figure compares external costs (infrastructure subsidies, congestion, barrier effect, crash risk, noise and air pollution, and fuel production external costs) of six modes. Automobile travel has higher costs per passenger-mile and since motorists travel more annual miles than non-drivers, their annual external costs are much higher.

Total Costs

The table below compares total annual costs by mode, reflecting differences in per-mile costs and annual miles travelled (indicated in parentheses). This suggests that owning and operating an automobile adds nearly \$10,000 in total costs.



Many of these costs are indirect (road and parking subsidies) and external (congestion, risk and pollution), and are often overlooked in transportation planning. They filter through the economy as higher taxes, housing costs and prices of other goods, plus increased time spent travelling, injuries and disabilities, and reduced property values which reduce productivity.

Of course, most people rely on a combination of modes depending on their location and lifestyle. The figure below compares per capita total transportation costs for car-free (household owns no automobile but rents them when needed), car-lite (one vehicle is shared by multiple adults), average (household owns one 10,000 annual mile vehicle per adult) and high mileage (household owns one 15,000 annual mile vehicle per adult).



Figure 21 Total Costs by Transportation Lifestyle

Reduced Mobility Options

This research reflects the ways that increased mobility can reduce overall accessibility (SSTI 2021). Increased automobile travel displaces other modes, as summarized in the box to the right, which reduces non-auto travel options and therefore non-drivers' ability to access economic opportunities, reducing worker and business productivity. For example, inadequate non-auto commute options reduces pool of workers available to businesses by 10-30%, more for low-wage service jobs, representing those that cannot drive or temporarily lack a vehicle due to mechanical failure. Extensive research indicates that employment and productivity increases with worker's access to jobs, particularly for disadvantaged groups (Bastiaanssen, Johnson and Lucas 2020).

Inadequate non-auto travel options increases chauffeuring burdens. Chauffeuring trips often generate empty backhauls, which increases traffic problems. For example, a parent chauffeuring a child one mile to school generates four vehiclemiles (two round trips) per day. This increases household vehicle costs, driver's time costs, plus infrastructure and travel external costs.

How Driving Displaces Non-Auto Travel

- Motor vehicle traffic risk, noise and pollution degrade walking and bicycling conditions.
- Investments in roads and parking displace investments in other modes.
- Non-auto travel becomes less integrated. For example, most public transit trips include walking links, so degraded walking conditions make transit travel less efficient.
- Sprawl encourages regional shopping, reducing neighborhood services and jobs.
- Driving requires more space for travel and parking, discouraging compact development.
- Reduced transit ridership reduces fare revenues, resulting in less frequent service.
- Reduced non-auto travel makes these modes less safe.
- Non-auto travel becomes stigmatized.

More Sprawl and Less Accessibility

Because driving is space-intensive and imposes danger, noise, dust and pollution, it discourages compact development and increases spawl. Sprawl tends to reduce economic productivity by reducing accessibility, particularly for non-drivers; increasing transportation, public infrastructure (roads, utilities, emergency services, stormwater management, schooling, etc.) and health costs; and by reducing, agglomeration efficiencies and innovation (Ahlfeldt and Pietrostefani 2019; CNT 2024; Litman 2024; Hamidi, Zandiatashbar and Bonakdar 2019).



Various studies have calculated the additional costs of providing public infrastructure and services (Litman 2024; Mattson 2021). For example, Aderneck (2023) found that infrastructure servicing costs per dwelling unit usually decline as densities increase, due primarily to reduced linear infrastructure (i.e., roads, water pipes, sewer lines) and onsite infrastructure and servicing are typically five to nine times higher per unit (\$40,000 vs. \$5,000) for single-family compared with multifamily housing because infrastructure costs can be apportioned to more units. The figure below illustrates results of one study.



Figure 23 Road and Pipe Costs by Density (Sense Partners 2024)

Applying the New Planning Paradigm to Economic Analysis

Conventional transportation planning is *mobility-based*; it assumes the goal is to maximize vehicle travel speed and convenience so motorists can reach destinations quickly and easily. It evaluates transportation system performance using mobility-based indicators such as average traffic speeds, hours of congestion delay, roadway level-of-service, and parking ratios, which prioritize roadway expansions and parking supply over other investments such as sidewalk, bikeway and public transit improvements.

The new planning paradigm is more multimodal and comprehensive (Litman 2013). It is *accessibility-based*, which recognizes that the ultimate planning goal is to provide access to desired services and activities – education, employment, retail, recreation – and that many factors can affect this accessibility including vehicle traffic speeds, the quality of non-auto modes, proximity (and therefore development density and mix), transport network connectivity, plus affordability and user information (Levinson and King 2020).

The new paradigm considers all impacts, including vehicle expenses, road and parking facility costs, plus external costs such as congestion, crash risk and pollution damages. It recognizes that non-auto modes play important roles in an efficient and equitable transportation system; they provide access for travellers who cannot, should not or prefer not to drive, plus efficient mobility in cities where roadways are congested and costly to expand, and vehicle traffic imposes significant external costs.

The new paradigm also recognizes ways that automobile traffic and sprawl reduce accessibility. For example, wider roads, increased vehicle traffic degrade walking conditions (called the *barrier effect*), and since most public transit trips include walking links, this reduces transit access. Similarly, parking mandates discourage compact infill development, increasing sprawl. The new paradigm recognizes these trade-offs between different forms of access.

Accessibility mapping models show that non-drivers in central urban areas can reach more jobs and services by non-auto modes, with far lower total costs, than suburban motorists can reach by car, which helps explain why productivity and economic opportunity increase with density and multimodal travel.

This new paradigm helps explain the negative relationships between mobility and productivity: mobilitybased planning decisions increase automobile access but reduce other forms of access, and increase many costs which burden the economy. These decisions increase the amount of travel and therefore the total costs required for economic activities such as delivering goods, commuting to work and shopping.

The new paradigm provides better guidance for achieving economic development goals. It strives to maximize accessibility while minimizing transportation costs. For example, in a traditional, multimodal community, major activity attractors – stores, office buildings, schools and recreational centers – are located downtown or in neighborhoods so they are easily accessible without driving, maximizing accessibility for everyone including non-drivers, and minimizing transportation costs. That facilitates economic productivity and economic opportunity. In contrast, in auto-dependent, sprawled areas, major attractors are located along urban fringe highways where traffic flows quickly and parking is abundant. This facilitates driving but tends to reduce overall accessibility, increasing the vehicle travel required to engage in economic activities, and increase costs to travellers (for vehicle expenses and chauffeuring burdens), governments (for roads and traffic services), businesses (to subsidize parking), and communities (for crash injuries and environmental degradation). Accessibility-based planning recognizes that helping children walk or bike to school, and commuters to use transit, tends increase productivity and opportunity more than helping them to travel by automobile.

Accessibility-based planning does not eliminate driving or suburban housing but does recognize the importance of non-auto travel for efficiency and equity, and ways that common planning decisions – road and parking facility expansions, and underinvestments in sidewalks, bikeways and public transit services – can reduce accessibility, exclude non-drivers and increase total costs.

Conclusion: prosperity increases with transportation system efficiency, which minimizes the travel distance and total transportation costs required to engage in economic activities.

By increasing travel distances and reducing mobility options, sprawl reduces accessibility, particularly for non-drivers. The figure below shows that urban fringe workers spend about twice as much time commuting as in central neighborhoods, and sprawl increases errand and chauffeuring travel times. Central urban neighborhood residents can typically access more jobs and services by non-auto modes than urban fringe residents can be car, which reduces disparities between drivers and non-drivers.



Because they are compact and multimodal, central neighborhoods tend to have shorter commute durations, more nearby services, and less need to chauffeur non-drivers than in urban fringe areas. This increases economic opportunity and productivity. This figure illustrates this effect in Nashville, Tennessee. Similar patterns are seen in most urban regions.

Fiscal impact analysis measures the productivity, property value, tax revenue and government cost burden changes provided by various land uses and therefore development policies. The figure below illustrates typical results. This research generally shows that compact and mixed development tends to increase productivity and tax revenue per acre, and tends to provide better fiscal returns than sprawl due to more tax revenue and lower infrastructure costs.



Figure 25 Development Costs Versus Revenues (Urban Three)

Development fiscal impact mapping indicates revenues (above ground) and costs (below ground).

This analysis indicates that compact development tends to provide the greatest revenues, and compact, mixed development provides the greatest efficiency by minimizing the costs of providing public infrastructure and services. Transportation planning that supports compact development tends to increase this efficiency.

Less Productive Expenditures

Because motor vehicle and fuel production are highly automated and many inputs imported from other regions, vehicle and fuel expenditures generate fewer local jobs and business activity than most other consumer spending, so increased spending on vehicles reduces productivity.

People sometimes argue that more expensive transportation is economically beneficial by stimulating a particular industry, for example, that automobile dependency and sprawl are good for the economy by increasing automobile and petroleum industry employment and profits. However, since households have limited budgets, the money they spend on vehicles and fuel reduces expenditures on other goods. There is no evidence that money spent on vehicles and fuel generate more jobs or business profits than other goods, in fact, because they are highly automated and their components largely imported from other regions, they tend to generate less local employment, profits and productivity than other expenditures.

Similarly, many regions have poor quality public transit access to their airports, forcing visitors to rent cars or take taxis. The taxi industry sometimes opposes public transit improvements arguing that the regional economy benefits if visitors are forced to spend more resulting in more employment and money circulating the in the local economy. That might be true if all visitors had unlimited budgets, but many do not. If budget-constrained visitors are forced to pay more for airport transportation they will have less to spend at local hotels, restaurants and entertainment, and a transit-lacking city may gain a reputation for being an expensive destination that offers poor value. As a result, higher costs will be bad for the regional economy.

Industry advocates often exaggerate the economic importance of vehicle manufacturing. At its peak the industry employ up to 10% of workers and paid better than average wages, but this has significantly declined; vehicle production (<u>NAICS codes 3361-3363</u>) now represents just 0.6% of U.S. employment and pays below average wages (<u>FRED 2024</u>). Vehicle dealer profit margins average less than 4%, so buying a \$50,000 vehicle adds less than \$2,500 to the local economy, and fuel sales generate even less since most pumps are now automated (Hawley 2023). In a typical community, only about 11% of vehicle-related spending stays in the local economy, indicated in the following table. In contrast, about 75% of transit spending consists of local labor and goods. As a result, reducing vehicle travel and associated spending increases local business activity, employment and productivity.

Local components of venicie Expenditures (<u>DE0 2025</u>)				
Expenditures	Per	Estimated	Local	Non-Local
(Consumer Spending Survey)	Vehicle	Local Portion	Amount	Amount
Purchase	\$2,915	5%	\$146	\$2,770
Fuel	\$1,418	5%	\$71	\$1,347
Insurance	\$934	10%	\$19	\$171
Maintenance and repairs	\$513	60%	\$308	\$205
Vehicle rental, license, fees	\$386	10%	\$39	\$348
Vehicle finance	\$190	10%	\$93	\$841
Totals	\$6,356		\$676 (11%)	\$5,681 (89%)

Table 1 Local Components of Vehicle Expenditures (BLS 2023)

Vehicle and fuel purchases generate little local employment and business activity because production is highly automated and largely located in other regions, and low dealer profit margins.

The following figure compares estimated regional jobs generated per million dollars spent on various goods. Because their production is highly automated and much of their inputs imported (at least at the regional level, and often at the national level), they generate fewer jobs and regional productivity than most consumer goods and far less than public transit expenditures.



Figure 26 Employment Impacts per \$1 Million (Based on Chmelynski 2008)

Public transit investments tend to create relatively large numbers of jobs. A billion dollars spent on transit operation typically creates about 41,000 jobs, and spent on transit capital projects about 24,000 jobs, or 36,108 averaged overall; about 9% higher than road maintenance, nearly 19% higher than new roadway projects, and 17% more than average for federal spending overall (EDRG 2014). Similar patterns occur with other transportation expenditures. One study found that the number of jobs generated per million dollars of highway spending declined 27% between 1997 and 2007 due to increased labor productivity, as summarized in this table.

Table 2Million Dollar Highway Expenditure Impacts (FHWA 2008)

	1997	2005	2007
Construction Oriented Employment Income	\$589 <i>,</i> 363	\$428,842	\$394,814
Construction Oriented Employment Person-Years	15.6	10.0	9.5
Supporting Industries Employment Income	\$222,577	\$192,752	\$175,068
Supporting Industries Employment Person-years	5.5	4.5	4.3
Induced Employment Income	\$545,182,399	\$548,154,399	\$492,090,698
Induced Employment Person-years	17.0	14.7	14
Total Employment Income	\$1,357,125	\$1,169,751	\$1,061,973
Total Person-years	37.9	29.2	27.8

This table indicates total estimated economic impacts from a million dollar highway expenditure.

Transportation maintenance and repair projects are generally faster to implement (due to minimal planning and land assembly requirements), create more jobs per dollar (land acquisition and equipment costs are low), employ more local workers (fewer tasks require specialized labor), and are more geographically distributed than large highway expansion projects.

Table to Employment Per Billion L		(neiniz, Foliin and	Garrell-Peiller 2009
Category	Direct and Indirect	Plus Induced	Domestic Content
Energy	11,705	16,763	89.4%
Transportation	13,829	18,930	96.8%
Average Roads and Bridges	13,714	18,894	96.8%
New Construction	12,638	17,472	96.7%
Repair Work	14,790	20,317	96.9%
Rail	9,932	14,747	96.9%
Mass Transit	17,784	22,849	96.7%
Aviation	14,002	19,266	96.9%
Inland Waterways / Levees	17,416	23,784	97.3%
School Buildings	14,029	19,262	96.9%
Water	14,342	19,769	96.9%

Table 16	Employment Per Billion Dollar	(Heintz, Pollin and Garrett-Peltier 2009)
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This table indicates the employment effects of various infrastructure investments.

Neighborhood Accessibility and Attractiveness

Housing, retail, office, and tourist industries depend on attracting customers and workers, and therefore on local accessibility and environmental quality. Urban areas tend to be more economically successful if they are compact, multimodal and walkable, with low traffic volumes and speeds (Boarnet, et al. 2017). Residents of such communities spend less on transport, leaving more money to spend on other goods. Many people prefer living and shopping in such areas, raising their property values and sales revenues (Alfonzo 2015; NAR 2023).





Businesses sometimes fear that bike- and bus lanes and traffic restrictions will discourage their best customers by displacing parking and reducing car access, but numerous studies find that such projects usually increase total sales and profits indicating that reduced driver convenience is more than offset by improved access by other modes (Arancibia, et al. 2019). Business managers often overvalue motorists; non-drivers tend to spend less per trip but shop more frequently and spend more in total (Volker and Handy 2021). Parking displaced by bike- and buslanes is often offset by mode shifts that reduce parking needs. For example, Victoria, BC's bikeway network displaced about 200 parking spaces but help increase bicycling about 12,000 daily trips, reduced household car ownership by 6,000 vehicles and about 42,000 fewer daily car trips, so the loss of parking was more than offset by reduced parking demand (CRD 2022).

Summary

The table below summarizes ways that increased vehicle travel can reduce economic productivity and accessibility, and planning strategies to correct them.

Table 3 Summary of Ways that Vehicle Travel Can Reduce Productivity			
Factor	Effects on Productivity	Accessibility Impacts	Productivity Strategies
User costs	Households spend less on other goods, including education and housing that increase future productivity.	Reduces access to economic opportunities such as jobs, particularly for lower- income people.	Improve affordable modes and increase affordable housing in compact, multimodal neighborhoods.
Infrastructure costs	Vehicle infrastructure subsidies increase taxes, rents and the costs of other goods.	Wider roads and larger parking lots degrade walking and bicycling.	Favor modes with lower infrastructure costs. Charge users for roads and parking facilities.
External costs	Vehicle traffic causes congestion, crash and pollution that reduces productivity.	Congestion delays cars and buses. Risk and pollution degrade active travel.	Favor resource-efficient modes. Impose congestion, crash and pollution fees.
Reduced non- auto mobility options	Reduces non-drivers' economic opportunities and increases chauffeuring costs.	Reduces non-auto accessibility.	Create compact, multimodal communities where it is easy to get around without driving.
Sprawl-related costs	Increases travel and public service costs, and reduces agglomeration efficiencies.	Reduces accessibility, particularly for non-auto modes.	Favor space-efficient modes, compact development, plus reduced road and parking supply.
Less productive expenditures	Vehicle and fuel purchases generates less local work and business activity than most other expenditures.	Sprawl encourages regional shopping, reducing local services and jobs.	Improve affordable modes and compact development to reduce unnecessary vehicle and fuel spending.
Neighborhood attractiveness	Heavy traffic and ugly parking lots make an area less attractive to residents and customers.	Wider roads and increased traffic degrade walking and bicycling access and transit efficiency.	Create attractive streets and parking lots with less driving, slower traffic speeds, improved walkability and streetscaping.

This table summarizes ways that vehicle travel can reduce productivity and accessibility, and potential corrections.

The table below summarizes ways that automobile transportation increases and reduces productivity.

	Increases Productivity	Reduces Productivity
•	Increases efficiency of business, delivery and service trips. Expands pool of potential employees.	 Increases traffic and parking congestion. Incurs costs to consumers of owning and operating vehicles.
•	More employees can be available on-call. Employee automobiles allow businesses the cost burden of maintaining fleets.	 Increases external costs, such as road and parking subsidies, crashes and pollution damages. Stimulates sprawled (dispersed) land use patterns,
•	Allows more people to attend school (such as college or professional development courses) while working. Allows retail efficiencies of regional shopping centers	 which increases the mobility required to maintain a given level of accessibility. Reduces travel options (walking, cycling, public transport tend to decline), since alternative modes tend to experience economies of scale.

Table 4Automobile Transport Productivity Impacts

Automobile transportation increases economic productivity in some ways but reduces it in others. Productivity is maximized if public policies limit automobile travel to efficient levels.

This indicates that increased motor vehicle travel can reduce productivity by increasing costs, reducing accessibility, and making neighborhoods less attractive to residents, customers and workers. These impacts can be large. For example, compared with a compact, multimodal community, automobile dependency and sprawl add many thousands of dollars in annually per capita in user, infrastructure and external costs, and by increasing trip distances and chauffeuring burdens total travel times. Similarly, in automobile-dependent areas businesses must subsidize customer and employee parking, have fewer potential customers and workers (those who cannot drive), and operate in less attractive environments. More compact, multimodal communities provide savings and benefits that filter through the economy, increasing productivity, affordability, economic opportunity, property values and tax revenues.

How Much Mobility is Economically Optimal?

According to economic theory, economically optimal mobility is the amount of travel that people would choose if given diverse transportation options (good walking, bicycling, public transit, vehicle rentals, plus accessible community housing options), efficient prices (users pay directly for the infrastructure and external costs imposed by each kilometer they travel), and neutral development policies (Litman 2023; SSTI 2018; Vickerman 2024). Current practices often violate these principles:

- Communities underinvest in non-auto travel. Although typically 20-40% of travellers cannot or should not drive; walking, bicycling and transit have about 15% mode share; use of these modes often increases after they receive more investment; and non-auto mode improvements provide many benefits, most transport agencies spend less than 5% of their budgets on non-auto infrastructure.
- Vehicle travel is underpriced. About half of roadway costs and most parking costs are borne indirectly through general taxes (for road not funded through user fees), housing costs (for residential parking) and higher prices for other goods (for customer and employee parking), and motorists are not charged for imposing congestion, risk or pollution. This significantly increases vehicle travel and total costs.
- *Policies favor automobile-dependent sprawl.* Most communities limit density, mandate offstreet parking and fail to charge for the higher costs of providing public services at urban-fringe locations.

Transportation systems that violate these principles result in economically inefficient vehicle travel, as illustrated below.



Figure 28 Diminishing Marginal Benefits and Linear Costs

To justify their high annual vehicle-miles motorists often cite examples of trips that are most efficiently made by automobile such as a carrying heavy loads, chauffeuring children or seniors, or travelling long distances. However, the fact that driving is the best option for *some trips* does not mean it is best for *all trips*, or that current travel patterns are efficient and optimal.

Consider parking costs. Most jurisdictions currently mandate off-street parking, so costs are borne indirectly and parking is abundant and free at most destinations. This subsidizes driving. To level the playing field some jurisdictions require parking *cash out* – non-drivers receive the cash equivalent of the parking subsidies provided to motorists – so commuters who use nonauto modes receive about \$5 per day for saving parking costs. When this occurs typically 20% of commuters shift from driving to another mode; their preference for driving is less than \$5 per trip. This indicates that current parking policies increase vehicle travel and traffic problems about 20%, while providing minimal benefit since the additional vehicle-miles consist of travellers' least valuable trips. This is just one example of economically-inefficient travel.

A basic economic principle is that efficiency and equity tend to be maximized when prices (what users pay for a good) reflect marginal costs (the incremental costs of producing that good) unless subsidies are specifically justified. This tests consumers' willingness to pay so society does not devote \$2 to produce a good that users only value at \$1. Underpriced transportation infrastructure, such as underpriced parking, congestion, crash risk and pollution emissions are widely-recognized examples of market failures.

There is a well-established vocabulary for overpricing; if prices exceed what consumers consider fare we say that they are gouged, fleeced, cheated or gypped; there is no comparable vocabulary for underpricing although it is equally unfair and inefficient. Since parking is unpriced at most destinations, motorists often complain if they are charged for its use, although the free parking forces non-drivers to subsidize the parking costs of motorists.

The table below summarizes typical transportation policy reform impacts. This suggests that with responsive investments, efficient pricing and better planning, people drive less, use non-auto modes more, choose more accessible locations, spend less time and money on driving, and be more economically productive as a result.

Principle	Efficient Policies	Typical Impacts
Responsive investments	Invest in non-auto modes equivalent to their potential mode shares.	Often doubles non-auto mode shares and reduces vehicle travel 10-30%.
Efficient pricing	Efficiently price fuel, roads, parking, congestion and emissions.	Reduces driving 20-40% and increases non-auto travel.
Better planning	Allow compact development. Eliminate parking minimums. Apply location-based fees.	Compact community residents typically drive 20-50% fewer miles than in sprawl.

Investment, pricing and reforms would reduce vehicle travel and associated costs, increasing economic efficiency.

Because optimal planning and pricing can be technically and politically difficult to implement, second-best solutions are often appropriate. For example, optimal planning analysis considers all possible impacts, but if that is infeasible, a second-best approach is to set strategic targets, such as reducing private vehicle travel 20% by 2030, and require all projects to support those goals. Similarly, optimal pricing requires time and location-based fees but blunter instruments, such as fuel taxes and parking fees, are generally better than existing pricing.

Productivity Impacts of Highway and Parking Expansions

This study finds that productivity tends to decline with urban road and parking facility expansions. Highway expansions had high economic returns during the 1950s and 60s, but this subsequently declined as the most cost-effective projects have been implemented (Boarnet, et al. 2017). The figure below shows this trend.



Figure 29 Annual Highway Rate of Return (Eberts 2009)

Advocates often claim that roadway expansions reduce congestion, which saves travel time and increases productivity, but experience indicates that congestion maintains equilibrium, the additional capacity soon fills with latent demand to the point that delays discourage more peak-period vehicle trips, returning traffic to equilibrium speeds (Metz 2021). Improving non-auto modes reduces the point of equilibrium, reducing total congestion delays (Litman 2022).

Melo, Graham and Canavan (2012) found that between 1982 and 2009 U.S. urban highway expansions increased economic output but other transportation investments provided greater economic benefits. Murray and Welch (2021) concluded that interstate highway expansions do not provide sufficient time savings to justify their cost. Phillips (2014) found that between 2000 and 2010 productivity growth was larger in states with less urban highway expansion: those that added fewer urban road-miles experienced 18% productivity growth, compared with only 9% productivity growth for states that added more than 20% urban road-miles. He concluded,

"While politicians and advocates love to tout the job-creating value of new road and highway capacity, congestion reduction rarely lasts more than five years and widened roads ultimately only succeed in extending the boundaries of wasteful, unproductive sprawl. In the case of road widenings, it's entirely possible that the disruption caused during the construction phase completely erases —or even exceeds — the fleeting benefits of reduced congestion."

This research indicates that, although a basic highway network supports productivity, once that exists urban highway expansions provide only temporary congestion reductions, and by inducing more total vehicle travel and sprawl, increase many costs and reduce overall accessibility. Other strategies – resource-efficient mode improvements, TDM incentives such as efficient road and parking pricing, and smart growth development policies – tend to provide greater productivity gains by reducing the amount of vehicle travel, and associated costs, to provide accessibility.

Wealth and Happiness

An additional factor to consider in this analysis is the degree that increased wealth improves ultimate goals such as social welfare, happiness, life satisfaction or human development. Conventional economics assumes that people are burdened by problems of scarcity so increased wealth increases happiness, but that is increasingly less true. People need some wealth to purchase necessities such as adequate food, housing and healthcare, but once basic material needs are satisfied additional wealth tends to provide diminishing marginal benefits: increases from poverty to middle-incomes can significantly increase happiness but increases from moderate to high incomes provide smaller total gains since the additional purchases are increasingly luxury and positional goods (some people gain but others lose status, and because people increasingly experience problems caused by affluence.

Table 6 Problems of Scarcity and Affluence

	Scarcity		Affluence
•	Lack of independence and privacy. Inadequate or unhealthy food.	•	Competition for social status. Increased traffic crashes. Reduced social interdependencies leading to isolation and loneliness.
•	Inadequate (uncomfortable or unhealthy housing.	•	Inadequate exercise.
•	Inadequate healthcare.	•	Time shortage (e.g., from working long hours).

Conventional economics focuses on addressing the problems of material scarcity, but once our basic needs are satisfied people increasingly face problems of affluence.

The following two graphs illustrate this point. The first shows that self-reported life-satisfaction tends to increase with productivity and affluence, but the productivity scale is logarithmic.



Figure 30 Self-Reported Life Satisfaction Vs. GDP, 2023 (Our World Data)

The next graph shows the same data with a linear scale. It indicates that life satisfaction tends to increase as wealth grows from low to medium levels but peaks about \$50,000 annual GDP per capita, and above that declines a little.



Figure 31 Self-Reported Life Satisfaction Vs. GDP (Our World Data)

These patterns reflect the trade-offs people often face between income and other happiness factors. For example, to increase incomes many people must work more than they want at jobs they dislike, move to less desirable areas, or bear higher living costs. Conventional economics assumes that families are happier if parents work long hours in order to afford middle-class lifestyles that include owning private vehicles and single-family homes, and paying for childcare; it ignores the possibility that some families may be happier with a lower-cost lifestyle – perhaps living car-free in an affordable apartment to allow parents to spend more time caregiving.

Planning decisions often involve money-versus-happiness trade-offs, many related to transportation. For example, conventional economics assumes that most people prefer faster modes (such as driving) and expensive housing (single-family suburban homes) over more affordable alternatives (non-auto modes and multifamily housing). These assumptions cause transportation agencies to invest in highways to benefit motorists, to the detriment of walking, bicycling and public transit. Similarly, these assumptions cause governments to restrict multifamily housing and mandate parking minimums, and in other ways favor sprawl over compact infill. These policies reduce happiness for people who prefer lower-cost travel mode and housing options. This is regressive and harmful to people who cannot or should not drive, and lower-income households who are forced to rely on inconvenient travel options or spend more than they can afford on transportation and housing.

Transportation planning that strives to maximize happiness would prioritize affordability as much as productivity, and respond to demands for non-auto modes and lower-cost housing in compact, multimodal neighborhoods, so any household that wants can find suitable and affordable transportation and housing options.

Implications and Implementation

This section discusses various ways to apply this research.

Implications for Transportation Agencies

This research indicates that agencies can support economic development goals by increasing transportation efficiency so economic activities require less vehicle travel. To support efficiency this some jurisdictions apply street economic performance metrics (NYCDOT 2012), and establish vehicle travel reduction and mode share targets that planning decisions should support (Caltrans 2020). This research suggests that optimal vehicle travel is about 4,000 annual vehicle-miles per capita and 50% auto mode shares, more in rural areas and less in cities and lower-income areas, as illustrated below.



 Figure 32
 Optimal Automobile Mode Shares (Litman 2023)

The following strategies support these goals.

- Apply multimodal transportation planning that prioritizes resource-efficient modes.
- Use street economic performance indicators such as customer visits, employment and property values.
- Apply TDM incentives such as efficient road and parking pricing, commute trip reduction programs and parking management to encourage travellers to choose the best option for each trip.
- Convert fixed and external costs to internal, variable costs, such as parking cash out and unbundling.
- Smart Growth policies that create compact, multimodal, affordable communities.
- Manage parking for efficiency so fewer spaces are needed and subsidies are minimized.
- Streetscaping that creates attractive and multimodal roads.

Implications for Businesses

This research indicates that businesses can be more productive and competitive by locating in districts with more multimodal access for customers and workers, and less vehicle traffic create more attractive environments. They should support these strategies:

- Locate in compact, multimodal areas that has good non-auto access.
- Reduce traffic volumes and speeds to minimize risk, noise and pollution and enhance walkability.
- Support transportation demand management incentives that encourage travellers to choose the best option for each trip, including walking, bicycling and public transit when possible.
- Manage parking efficiently. Price, cash-out and unbundle parking so non-drivers are no longer forced to pay for costly facilities they don't need.
- Support bikeways, even if they displace some on-street parking.
- Provide information to help visitors choose the most efficient travel and parking options.

Implications for Individuals

Most people are more economically successful living in compact, multimodal neighborhoods (Ewing, et al. 2016; Otero, Volker and Rozer 2021). Although automobiles can increase workers' incomes, this is offset by higher costs: one study found that after households obtained a car they typically earned \$2,300 more but spend \$4,100 more on transport annually, making them financially worse off overall (Smart and Klein 2015). Automobile dependency reduces household economic resilience; many hard luck stories begin with a vehicle failure, crash or traffic citation that leads to financial, health and legal crises. Off-street parking typically increases housing costs 12-18% (Gabbe and Pierce 2016).

Households should consider less mobile and therefore less expensive lifestyles, for example, by choosing to be car-lite or car-free, and choosing a home in a compact, multimodal neighborhoods that maximizes accessibility with minimal vehicle travel and associated costs.

Households often face trade-offs between housing and transportation costs such as between a cheaper suburban home with higher vehicle expenses, or a more expensive urban home with lower travel expenses. In the short-run their total costs may be the same but over the long run houses appreciate while vehicles depreciate in value, so spending less on vehicles and more on housing can increase long-term wealth. In a typical example, a household builds \$300,000 more equity over two decades by choosing a \$480,000 urban home that only requires one car over a \$335,000 suburban home that requires two high-annual-mileage vehicles (Litman 2020).

Households can maximize their prosperity in the following ways:

- As much as possible, live, work and shop in compact, multimodal neighborhoods, with Walk Scores of 70 or higher, where it is easily get around without driving.
- Minimize household vehicle ownership; rely on non-auto modes, and share or rent vehicles.
- Walk and bicycle for local errands and use transit when travelling on busy urban corridors.
- Support policies that improve non-auto modes and increase affordable infill housing.
- Support reforms so people are not forced to pay for parking facilities they don't need.

Conclusions

This study finds a paradox: contrary to common assumptions, numerous indicators show negative associations between economic productivity and motor vehicle travel. Productivity tends to *decline* with factors associated with more driving and *increases* with factors that reduce it as summarized in the table below. The results are very consistent; multimodalism, density and urbanization are all positively correlated with productivity.

Tab	e 7 Summary of Impacts		
	Increases Productivity		Reduces Productivity
•	More non-auto travel (walking, bicycling and transit)		
•	More non-auto infrastructure (sidewalks and bikeways)	•	More urban vehicle travel
•	More density and mix (indicated by Walk Score)	•	More urban roadway supply
•	Higher fuel and parking prices	•	More parking supply
•	More traffic congestion	•	Lower fuel and parking prices

This table summarizes key findings.

These patterns occur at national, regional and local scales. Business districts tend to be more successful if they are compact and multimodal, with low vehicle traffic. This maximizes customer, employee, and freight access; attracts more residents, customers and workers; and provides agglomeration efficiencies that increase creativity and productivity. Similarly, most individuals, particularly those with disabilities or lower incomes, can be more successful living in compact, multimodal communities that maximize access and minimize transport costs.

Several factors help explain these relationships. Driving is much more costly than other modes, particularly in cities where vehicle, infrastructure and external costs are particularly high, and automobile traffic degrades other modes and encourages sprawl which increase total costs and reduce overall accessibility, particularly for non-drivers, which increases drivers' chauffeuring burdens. Each additional vehicle adds about \$10,000 in total costs which filter through the economy as higher costs of living, taxes, housing and retail costs, more injuries and disability, and reduced property values, reducing productivity and competitiveness.



Figure 33 Diminishing Marginal Benefits and Linear Costs

Although some vehicle travel is extremely productive, as the price of driving declines the amount of lower-value vehicle-miles grows, while costs increase due to congestion and autodependency, so a growing portion of vehicle travel is economically inefficient: its costs exceed its benefits. Productivity tends to peak at about 4,000 annual vehicle-miles per capita, more in affluent rural and suburban areas, and less in cities and lower-income areas, beyond which more driving is economically harmful. Policies that reduce low-value mobility increase productivity.

This research indicates that the best economic development strategy is to improve transportation efficiency so economic activities – education, employment, commerce – need less vehicle travel. This requires a diverse transportation system to accommodate diverse travel demands, plus policies that favor higher value trips and space-efficient modes over lower-value trips and space-intensive modes so travellers choose the best option for each trip: walking and bicycling for local errands, transit when travelling on busy corridors, and driving when it is truly optimal. This can be achieved with multimodal planning, plus vehicle travel reduction incentives such as efficient road and parking pricing, dedicated bus and bike lanes, and commute trip reduction programs, plus development policies that create compact communities. This is not to suggest that economic productivity requires everybody to live car-free in high rise apartments; some of the largest benefits appear to result from moderate reductions in vehicle ownership and use, and moderate increases in density and non-auto travel. These changes help achieve many goals including affordability, equity, health and safety and environmental quality.

This research primarily reflects North American conditions but has implications for any urban region that wants its transportation policies to support economic development goals.

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Note: this analysis is based on various data sources including the FHWA's Highway Statistics reports that include per capita GDP and other data for <u>states</u> and <u>urban regions</u>, available in spreadsheets.

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