



ANGELO,
GORDON
& CO.

FIFTH | WALL

Driverless Cars:

*Reshaping the Urban Environment and
Creating Real Estate Investment Opportunity*

Brendan Wallace

March 2017

Who We Are: \$212M Venture Capital Fund Focused on Real Estate Tech

Fifth Wall's LPs represent **\$270B+** of real estate under mgmt. and **6.7B+ sq.ft.** across 7 major subsectors of the industry. Our LPs are sector-leading companies; when they adopt a tech it often becomes industry-standard.



Brokerage/Services

Largest Brokerage & Real Estate Services Company in the World



Industrial

Largest Commercial Property Owner in the US & Largest Industrial REIT in the World



Homebuilding

2nd Largest Homebuilder in the US



Apartments

Largest Owner of Apartments in the US



Retail

3rd Largest Mall Owner in the US



Hospitality

Largest Lodging REIT in the US



Office

Largest Developer of Office Buildings in the US

Other LPs:



Individual Investors From:



Who We Are: Founders



Brendan Wallace

Co-Founder & Managing Partner



Real Estate Experience



Real Estate Private Equity

Real Estate Investment Banking

Entrepreneurship / Venture Experience



Co-Founder/CEO of Identified, acquired by Workday in 2014



Co-Founder of Cabify, largest ridesharing service in Latin America



Brad Greiwe

Co-Founder & Managing Partner



Real Estate Experience



Real Estate Private Equity



Real Estate Private Equity



Real Estate Investment Banking

Entrepreneurship / Venture Experience



Co-Founder and CTO of Invitation Homes, largest owner-operator of single family rental homes in US

Board of Directors:



Advisory Roles:





A meteor is coming to the real estate industry that will fundamentally alter the location, value, and form of every real estate asset class

**THAT METEOR:
THE MASS COMMERCIALIZATION OF AVS**

Transportation-Informed Building: The Legacy of Robert Moses



In the mid 20th century, the commercialization of the automobile came to define almost every aspect of American real estate development

- Robert Moses was one of the earliest visionaries of the “*automotive city*” and his vision for city infrastructure was heavily informed by the considerable influence he knew car culture would have on society
- During his time as ‘Master Builder’ (mid 1920s-1968) he built 13 bridges, 416 miles of parkways, 658 playgrounds, and 150,000 housing units, spending over \$150 billion in today's dollars¹

The Automobile has Defined our Modern Built World...

Streetscapes

Rapid adoption of the automobile led to a reshaping of the city street – society had to decide how to accommodate this new form of transportation, and reconstruct future cities to appropriately adapt



Freeways & Suburbanization

Car adoption included a mass movement to now-accessible suburbs and the introduction of urban freeways to accommodate this exodus, and the expansion of major metro areas from 100 sq. miles to 3,000+ sq. miles¹



Urban Sprawl

20th century America was built to facilitate the universal use of cars, and thus saw a tremendous amount of relocation and redevelopment – the advent of driverless cars will have the same impact on 21st century America



...But a Profound Change is on the Horizon

The commercialization of AVs will reshuffle the deck of every major real estate asset class, perhaps even more so than did the automobile itself at the beginning of the 20th century

AV commercialization will create / destroy more value in the real estate industry than it will in the automobile industry itself



KEY QUESTION: When will we have mass Commercialization of AVs?

Technological Progress

Q: When will we actually have cars capable of driving themselves in all driving modalities?

Cost Accessibility

Q: When will the price point of AVs be low enough that the average consumer can afford them?

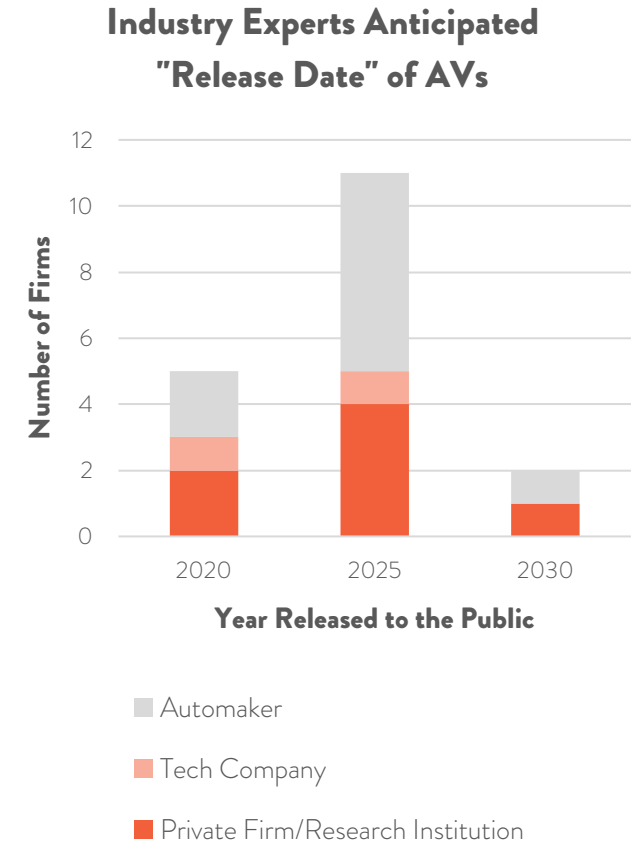
Regulatory Approval

Q: When will federal, state, and local governments build the regulatory / legal architecture to govern a world in which most cars are fully autonomous?

>5
YEARS

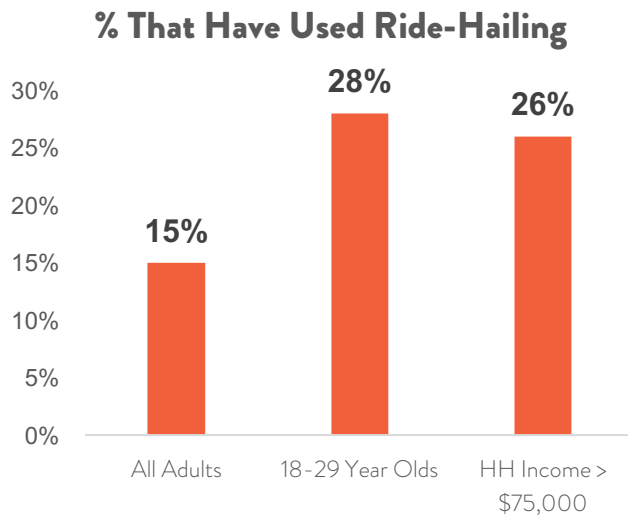
>10
YEARS

???



Uber & Lyft Offer Proof Points on how Dramatic the Effect will be

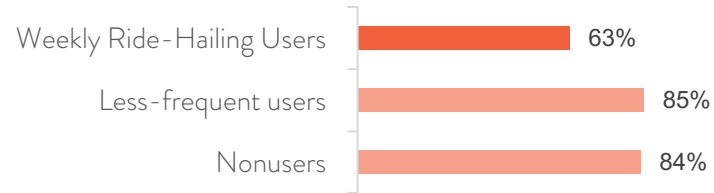
Huge Impact Despite Low Penetration



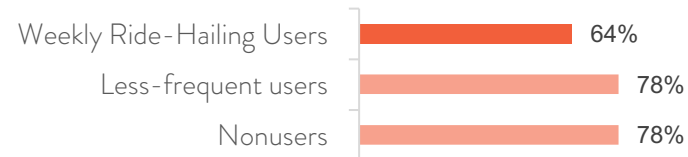
Car Ownership May Be On Decline

For every 1 ride-hailing vehicle in use there are 9 to 13 fewer cars on the road

Drive a Car Daily/Weekly



Own a Personal Vehicle



Demand for Parking is Way Down



Demand / Use of Airport Parking



Demand / Use of Shopping Mall Parking Lots



Demand / Use of Hotel Parking

Driverless Cars will be one of the Largest Change Agents in Real Estate Ever

Autonomous Vehicles (“AVs”) are inevitable and will permanently change how we interact with real estate.

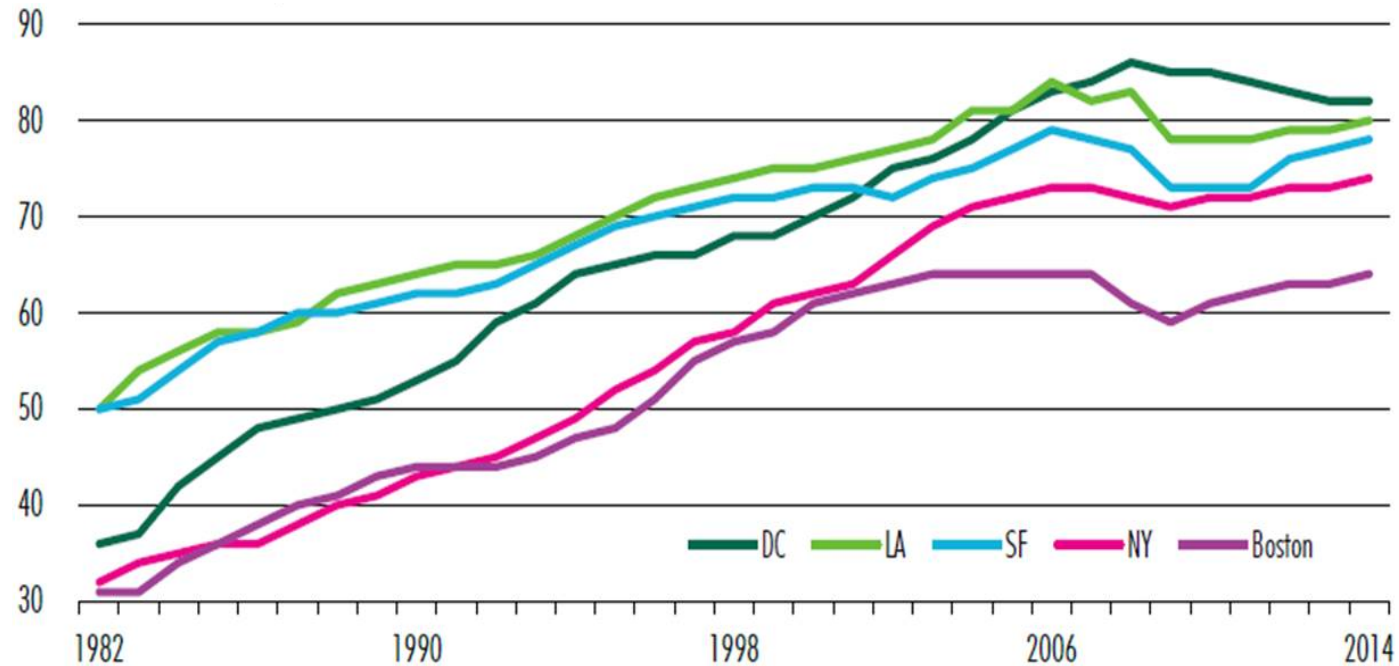
- **How We Commute:** Traveling efficiency and vehicle utilization will dramatically increase; commutes will be far less stressful as both traffic and the need for parking spaces decrease
- **How We Live:** Suburbanization 2.0 and falling premiums for properties near transportation hubs
- **How We Work:** Increased incentive for businesses to move into major cities and CBDs
- **How We Shop:** Further ease of delivery will create disruption and opportunities in retail and industrial
- **How We Get Away:** Use cases for hotels and resorts will evolve as AVs change travel options

This all will result in the repurposing/redevelopment of our existing real estate landscape, and transform how we build for tomorrow

How We Commute: Traffic Today Stifles Productivity

According to the US Department of Transportation, the average American commuter spends **73 minutes driving per day**¹, a loss of productivity with tangible repercussions for the US economy:

Yearly Traffic Delay by Auto Commuter (Hours)²



Economic Impact of Traffic

A 2014 INRIX study quantifying the economic impact of traffic on the US economy found that:

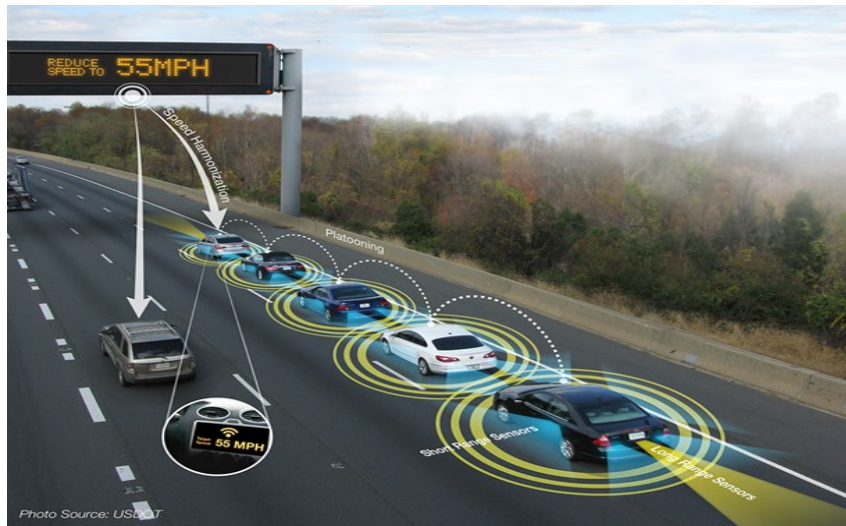
- Traffic congestion robbed the US economy of **\$124B** in 2013
- The 2013 annual cost of traffic for each American household was **\$1,700**
- The monetary value of all carbon emissions caused by US vehicles idling in traffic in 2013 was **\$300M**

How We Commute: Shorter, More Relaxing Trips Drive Economic Gains

AVs have the capacity to reverse this upward trend in traffic delays and positively impact US productivity – a recent Morgan Stanley report predicts **annual productivity gains of \$507B domestically** fueled by:

A Decrease in Traffic

- Cars will not only be independently autonomous, but will also communicate with surrounding vehicles and infrastructure
- This will allow for vehicles to travel faster, closer together, and to recalibrate routes based on congestion, which would **cut delays by 60% or more**



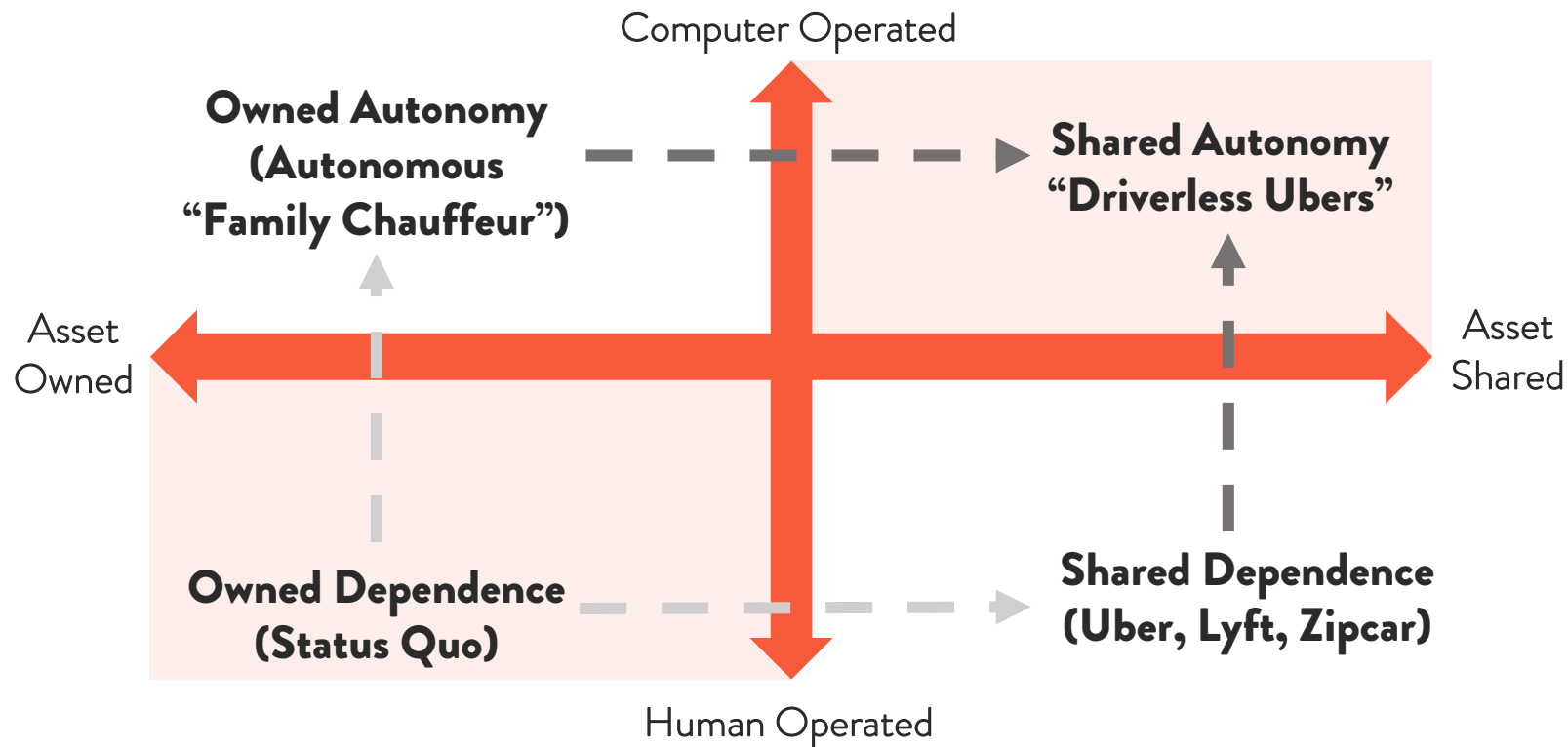
More Comfortable Commutes

- AV form factors will change allowing passengers to completely disengage from the stresses of driving, a task from which American drivers can recapture **75B hours/year**
- Commutes can become productive as previously stationary activities become mobile (office, entertainment, eating, sleeping)



How We Commute: Vehicle Ownership will Change

- The car is a radically underutilized asset, with the **average car sitting parked for 22+ hours¹** of the day
- This inefficient ownership model is already being disrupted by Uber and Lyft, and we will see an ongoing gradual shift from Human-Dependent Owned Vehicles to Autonomous Shared Vehicles



- 1 First, we will witness a shift from the status quo towards either "owned autonomy" and/or "shared dependence" models
- 2 Eventually, everyone will gradually move towards "shared autonomy"

How We Commute: Reduced Parking Needs, Creating RE Opportunities

- Less vehicular ownership, and therefore fewer cars on the roads generally, will result in a **drastic reduction in parking needs**
- Autonomous cars will be able to park themselves more densely, and far from office, retail, or residential assets (as they can be summoned)
- Land for re-development will become available (surface parking lots, structured parking garages, and subterranean parking garages), creating massive new real estate opportunities

Structured Parking Garage



Surface Parking Lots



1B

Parking Spaces in the US, 4 for Every Vehicle

61B

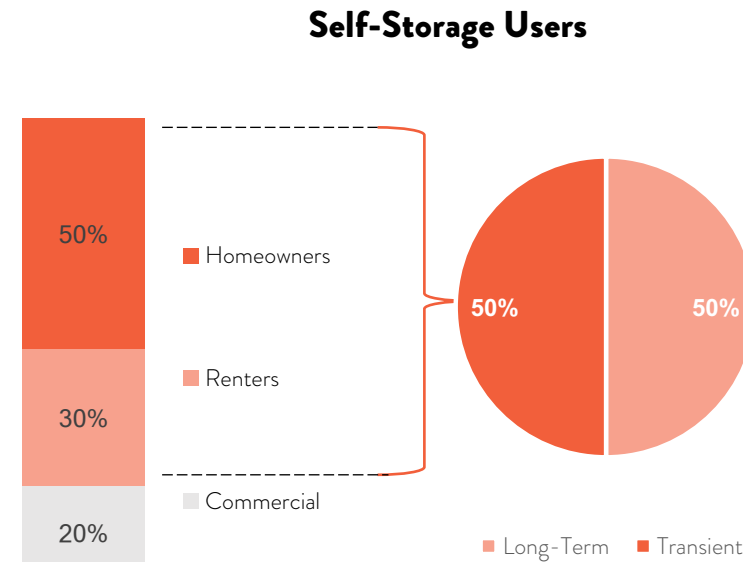
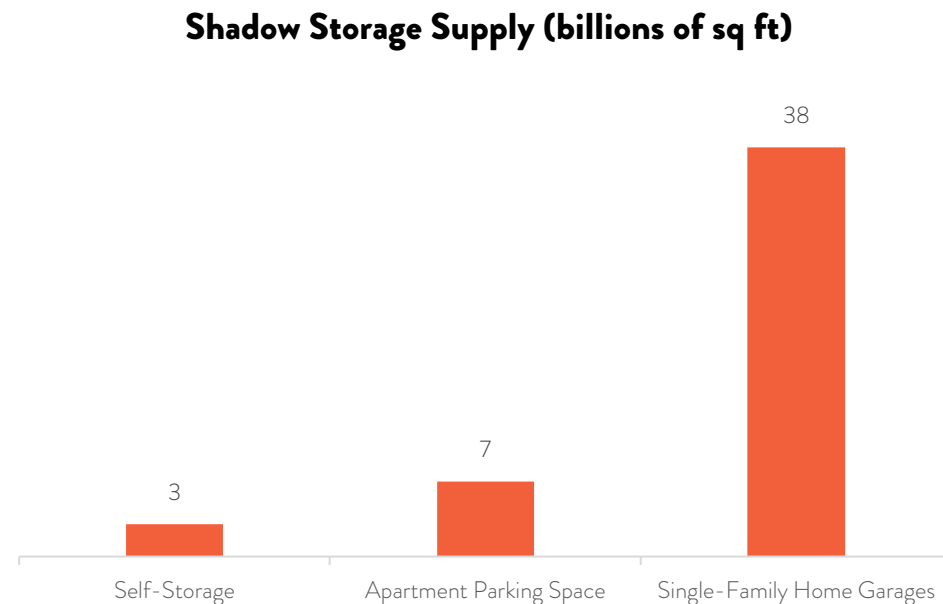
Square Feet of Parking Space Ripe for Redevelopment in the US

50%

Reduction in Parking Requirements in the Next 30 Years

Self-Storage 'Shadow Supply' Comes Online

- Self-storage owners have long enjoyed low cap-ex and attractive NOI growth due to increased urban migration and limited new supply
- To the extent vehicle ownership decreases, single and multifamily garages could be seamlessly repurposed which would have an adverse impact on the sector

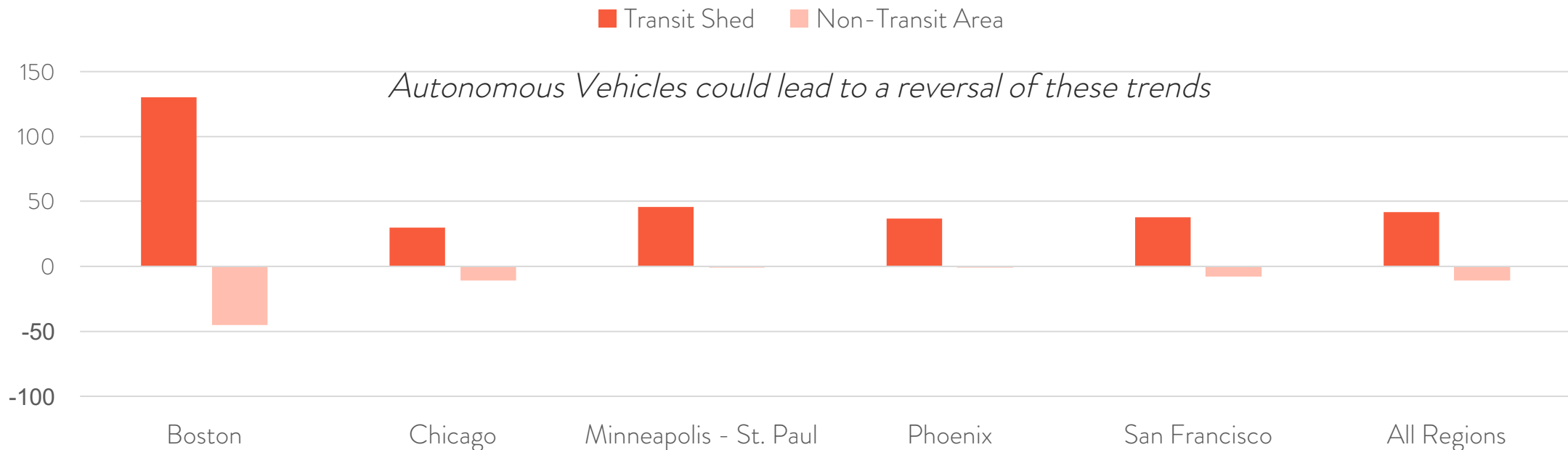


Residential customers, which account for 80% of total, are evenly split between short and long-term.

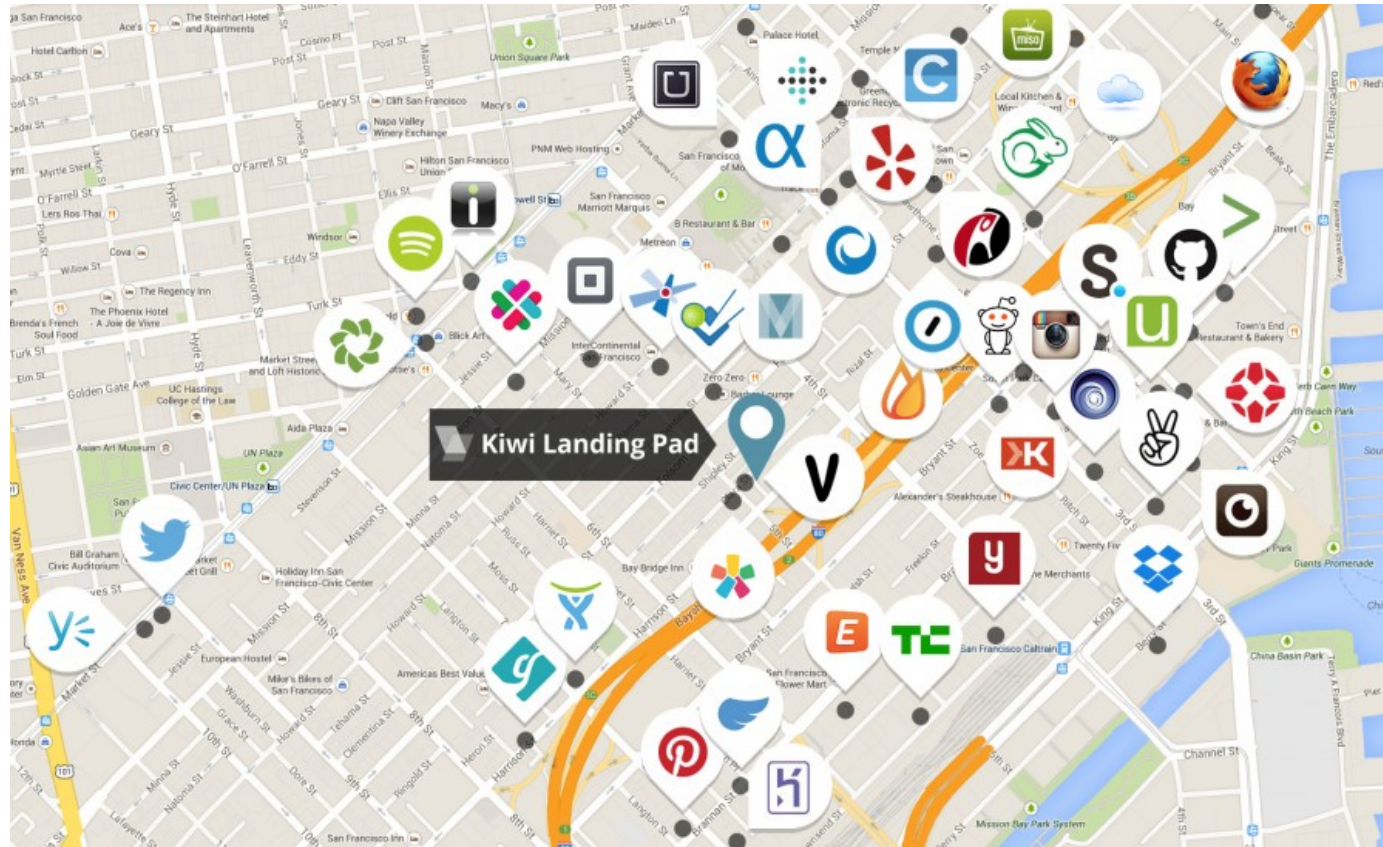
How We Live: Suburbanization 2.0 & the Reversal of Transportation Premiums

- Autonomous Vehicles could reverse the trend of urbanization seen in recent decades (especially by millennials) as the pain of long commutes is reduced in time and mitigated by comfort
- Mass adoption of AVs will allow commuters to reduce dependency on public transportation as they take AVs to work instead. Transit-oriented assets could see **rent premiums diminish by 50% or more:**

% Change: Avg Residential Sales Prices Relative to Region (2006-11)



How We Work: Opportunities in Major Cities and CBDs

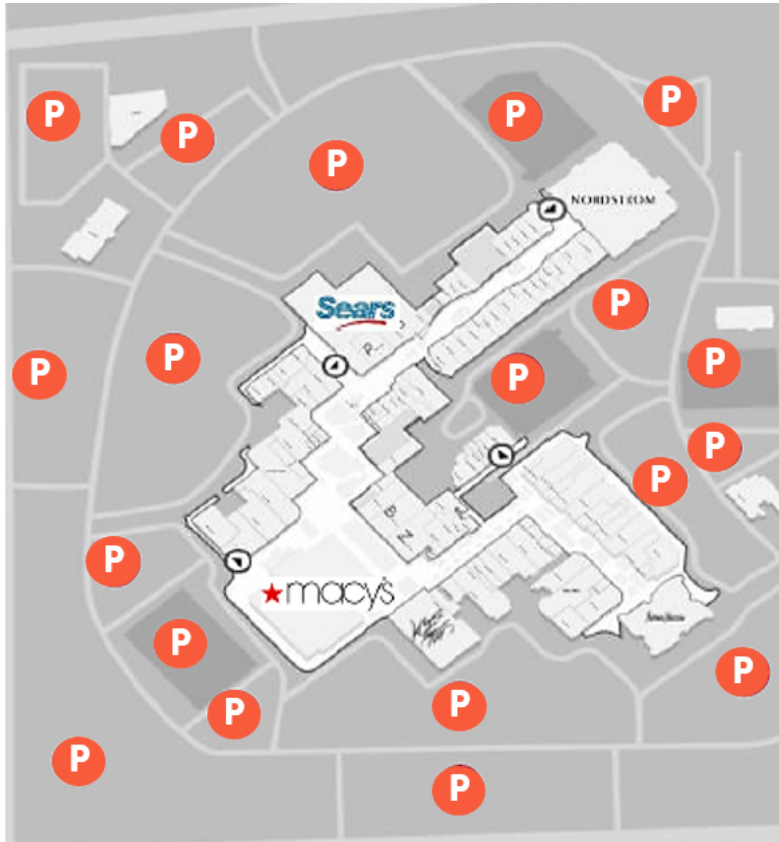


Concentration of Tech Companies in SOMA, San Francisco

City Opportunities

- As AVs make commutes less of an impediment, businesses might increasingly prioritize offices in major cities and CBDs (for the proximity to clients, ability to attract talent, employees, ease of idea exchange, etc.)
- Cap rate spreads between CBD and suburban office properties (historically **75bps on average**¹) may widen
- Opportunities for redevelopment will emerge as parking garages are replaced by purposed commercial real estate and/or AV docking stations / service centers

How We Shop: Densification of High Class Retail Assets



OAKBROOK
CENTER

Property Characteristics	
Owner:	General Growth
Location	Oak Brook, IL
Metropolitan Area:	Chicago
Mall Grade:	A++
Cap Rate:	0.035
Est. Sales/SF	850
Household Income:	88000
Population Density	1.2 million
Future Densification Opportunity	
Land:	130 acres
Mall GLA:	2.4 million SF
Parking Ratio:	5.5 / 1K SF of GLA
Floor-Area-Ratio (FAR):	0.4
(Low FAR = Densification Opportunity) Assume Parking Can Be Cut in Half	
New Parking Ratio	2.75 / 1K SF of GLA
New FAR:	0.75
Potential to Unlock 'Ground Level' Gross Leasable Area:	1.5 million SF!

Retail Opportunities

- Parking requirements will decrease—creating new development / densification opportunities for high quality retail assets, like malls
- The development trend of mixed-used / lifestyle centers (incorporating retail, office, hotel, multifamily, etc.) will likely accelerate
- Entertainment and experiential retail options will increase
- Malls will become distribution centers for home deliveries, shifting some space from floor retail to logistical operations (“last-mile” solution)

Parking Spaces of GGP’s Oakbrook Center Shopping Mall ¹

How We Shop: Further Disruption by eCommerce

- Although experiential and high-end purchase retail concepts (e.g., high quality malls with entertainment options) will be positively impacted, commodity retail (strip malls, convenient stores, drugstores, grocery stores) may face disruption
- Autonomous trucks and cars will help eCommerce businesses solve the “last mile” of the supply chain. Rather than driving to stores, consumers will be able to have all commodity items promptly delivered, and **shipping costs will decline as truck drivers represent 30% of trucking companies’ expenses¹**
- Larger multi-modal facilities will continue to be built due to the cost efficiency of shipping goods by rail and sea. Industrial tenants may also demand several smaller facilities that encircle CBDs

An Autonomous Trucking Fleet



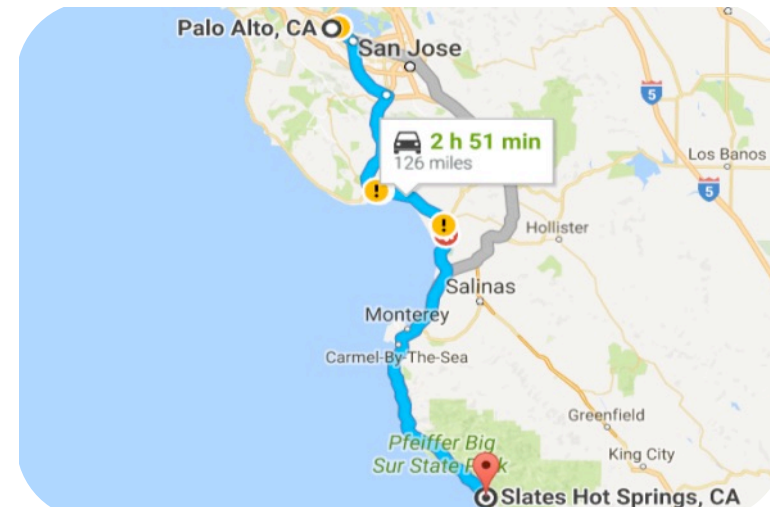
How We Get Away: Hospitality & Lodging will Evolve

- As AVs become more widespread travelers might decide to let their cars drive them to their final destinations as they sleep, rather than stay at hotels overnight
- Shorter-distance, “getaway” vacation real estate will increase in value as the inconveniences of 2-3 hour long drives are replaced by briefer, more comfortable and stress-free autonomous rides
- Additionally select / limited service hotels in rural areas that are reliant on serving as intermediary locations will see their necessity and valuation decline (e.g. a non-stop **LA->NY road trip would take less than 2 days**)

Autonomous Vehicles as “Overnight Hotels”



Autonomous Vehicles for “Local Getaways”



How We Build the Real Estate of Tomorrow will Change

In 1900, New York City's 200,000 horses produced **5 million pounds of manure a day**¹, a logistical nightmare to which urban planning was devoted until automobiles rendered horses obsolete and cities were developed differently – driverless cars will have a similar impact on today's real estate infrastructure

Example: Roadway Spacing

- The amount of roadway needed once AVs are uniformly adopted is drastically lower, leaving more room for greenspace and retail / commercial development
- New community/neighborhood centers will likely be built closer to the road
- New possibilities for commercial developments will also emerge as buildings will not need to have parking structures on-site or nearby

Figure 1: Diagram of 19th Avenue in San Francisco before and after AVs. Source: Gerry Tierney of Perkins and Will; presented on 5/14/2014 at SPUR San Francisco



Actionable Investment Opportunities

Though *full-scale* adoption of AVs is not bound to happen for 20 or more years, prudent real estate investors will position themselves for financial success in a driverless world by investing in those assets least likely to be negatively affected by the autonomous revolution:

Autonomous Car Tailwinds

- Urban parking lots (for redevelopment)
- CBD office space
- Rural warehouses, last-mile storage facilities
- Well located in-fill and/or suburban malls with large surface parking lots
- New development with minimal / no on-site parking (reduced parking ratio)

Autonomous Car Headwinds

- Airport parking lots
- Suburban office (especially transit-oriented)
- In-fill self-storage
- Suburban commodity retail (e.g., strip malls, convenient stores, drugstores, grocery stores)
- Highway-adjacent hotels