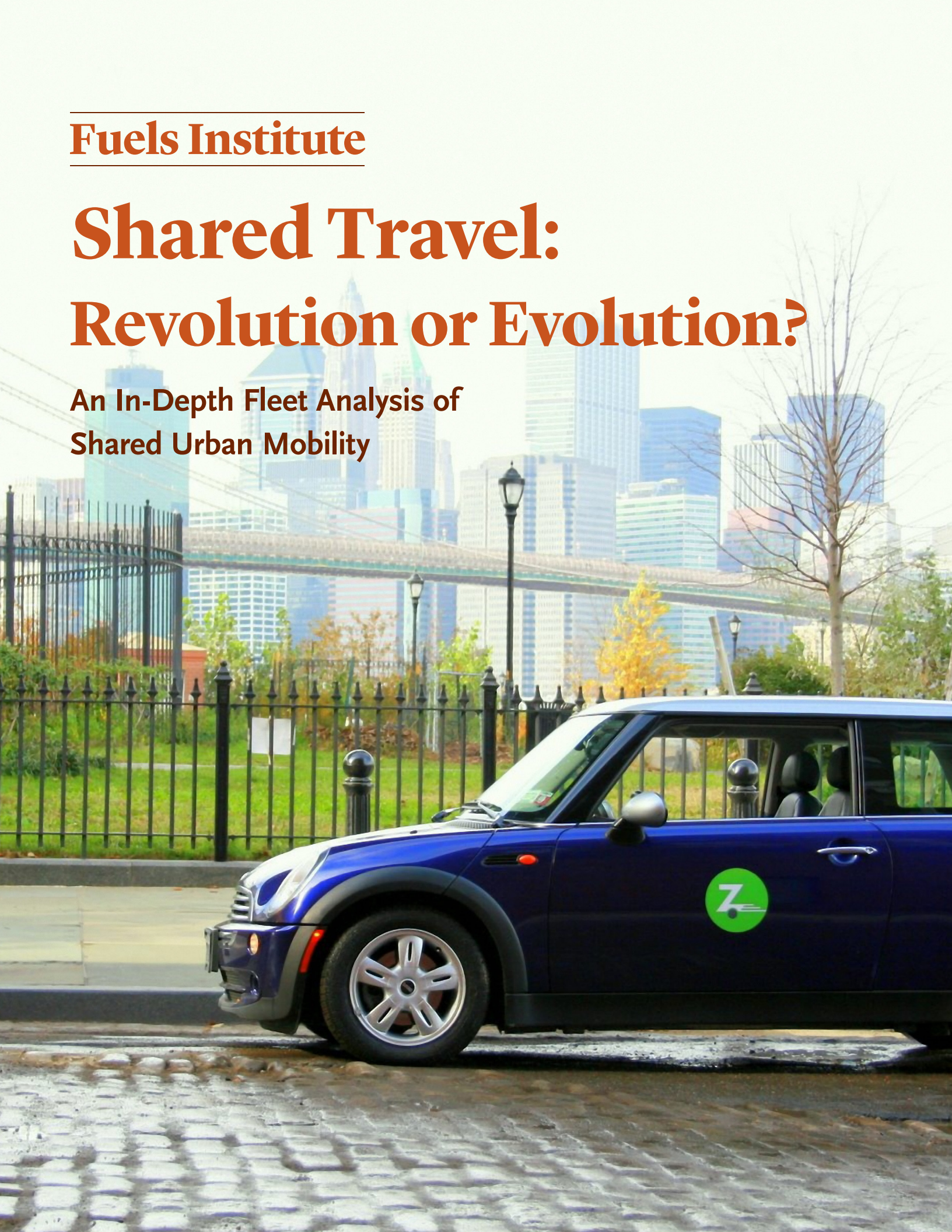
Fuels Institute

Shared Travel: Revolution or Evolution?

An In-Depth Fleet Analysis of Shared Urban Mobility



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Executive Summary: Insight into Business Strategy Context

This report connects fleet and customer analysis. While the customer demographic data represents general locations and not the actual customers, the combination reveals valuable insights because all of the sharing companies must make strategic and tactical choices in where to locate, and therefore must assess the characteristics of those markets.

In that light, strategic insights emerge from connecting the dots:

1. **Car-sharing is a real-estate game.** Zipcar in particular is located in areas with extremely high median home values, and Car2Go and Enterprise are not too far behind. All of these companies include parking in the rental fee, which places the onus on them to affordably acquire parking for a price-per-vehicle so that prices paid by the customer can remain low enough to provide a competitive value proposition. It is a classic business problem of balancing customer prices against all of the costs that must be factored into the price.
2. **Car-sharing goes after the low-hanging fruit and locates in areas with smaller households, fewer vehicles per household, higher income and more education.** In other words, it specifically targets areas where people may not have a car but may still have the money, and tech- savvy, to afford to use the service at a price which will pay for all the costs of providing the service plus a sustainable profit margin.
3. **Car-sharing is a downtown phenomenon.** The vast majority of car-sharing vehicles (Zipcar, Enterprise, Car2Go) are located in the principal city of a metropolitan area. This raises the question of why car-sharing companies do not locate in suburbs, and how the business dynamic would change if they did. How would real-estate costs change, how would rates of suburban vehicle ownership and household size change, and how would this affect the price versus cost optimization problem? One could assume that car-sharing companies not expanding to the suburbs is evidence enough that the price versus cost dynamic would be unfavorable if they were to try a large-scale suburban service, but in absence of data this is open to interpretation.
4. **Turo, the peer-to-peer rental company, appears to have a model that is fundamentally different on some measures than car-sharing.** Turo has a much higher share of vehicles in the suburbs—nearly half its fleet compared to 10% of Zipcar or Enterprise, and 2% for Car2Go. Turo's locations tend to have much higher rates of vehicle ownership, household size and income than those of car-sharing companies.

5. **Both car-sharing and peer-to-peer gravitate towards the largest metropolitan areas—those with a population of one million or more.** All companies profiled have 89% or more of their fleet in metro areas of with more than one million residents.
6. **Another commonality is that car-sharing and peer-to-peer companies contain non-trivial inventories of alternative vehicles in their fleets.** The Toyota Prius appears to be the most popular alternative option for Zipcar (3.2% of fleet), Enterprise (6.0%) and Turo (5.0%).
7. **The market introduction challenges of electric vehicles (EVs) cannot be magically overcome by car-sharing; the car-sharing fleets are not dominated by EVs.** It is possible that range anxiety and the lack of widespread charging infrastructure prevent EVs from playing a larger role. This suggests that with current technology, EVs cannot be introduced by car-sharing companies alone, but rather require cooperation with government to provide the needed infrastructure. The only fleet that has significant inventory of EVs is Car2Go, whose all-electric fleet of 400 vehicles in San Diego depends on a comprehensive EV-charging infrastructure plan by the regional government.

Introduction: Rise of the Sharing Economy

During the past few years, a nexus of new transportation trends has emerged, threatening to redefine urban mobility as we know it. The sharing economy, in which mobile smartphone apps (powered by GPS and broadband wireless Internet) have allowed excess capacity of personal goods to be efficiently shared for commercial profit,[1] lies at the heart of the changes.

Companies such as Uber, Lyft, Zipcar, Car2Go, Enterprise CarShare, Turo and others have many considering whether this is the beginning of the end of personal vehicle ownership. These companies represent four related business strategy models described throughout this study:

- One-way car-sharing
- Two-way car-sharing
- Peer-to-peer rental
- Ride-sourcing

Due to data constraints, Uber and Lyft can only be documented in terms of estimated population served, but detailed fleet analysis is provided on Zipcar, Car2Go, Enterprise CarShare and Turo (formerly RelayRides), including vehicle counts, locations and types.

Overall, this study will provide concrete data on sharing economy urban mobility companies, and to construct analytical frameworks that can serve as a common point of reference for policymakers, business executives, and informed citizens.

Literature Overview

Will new car-sharing and similar services cannibalize a large amount of personal vehicle ownership? A 2014 Alix Partners study of urban drivers versus a national control group of drivers found that car-sharing fleets displace personal vehicles by a ratio of 32 to 1. The study explains that to date, "approximately 500,000 vehicle purchases nationally have been avoided due to car sharing . . . [and] as car sharing grows in popularity, it could account for approximately 1.2 million more purchases avoided through 2020."[2]

Consulting firms have also weighed in. Navigant Research's 2015 "Carsharing Programs" report reveals that as of 2014, "there were well over 40 car-sharing companies

[1] For definitions of the sharing economy, there are many leading sources. For example, see Robin Chase, Peers Inc: How People and Platforms Are Inventing The Collaborative Economy and Reinventing Capitalism, PublicAffairs, 2015. See also Alex Stephany, The Business of Sharing: Making It In The New Collaborative Economy, Palgrave Macmillan, 2015, or Rachel Botsman and Roo Rogers, What's Mine Is Yours: How Collaborative Consumption Is Changing The Way We Live. Collins, 2011. Ms. Botsman gave an overview of her book in a May 2010 TED talk in Sydney, Australia, "The case for collaborative consumption," which can be seen here: https://www.ted.com/talks/rachel_botsman_the_case_for_collaborative_consumption?language=en

[2] AlixPartners press release: "AlixPartners Study Indicates Greater Negative Effect of Car Sharing On Vehicles Purchases. February 5, 2014. Available at http://www.alixpartners.com/en/MediaCenter/PressReleases/tabid/821/articleType/ArticleView/articleId/950/AlixPa rtners-Study-Indicates-Greater-Negative-Effect-of-Car-Sharing-on-Vehicle- Purchases.aspx#sthash.0bHakCbc.AiojwfBk.dpbs

throughout the world with more than 2.4 million members . . . with rising urbanization around the world and increased problems with congestion and pollution, the social and personal costs of private car use will continue to drive demand for alternatives such as carsharing."[3]

Navigant states that additional innovations, such as one-way car-sharing and increased use of plug- in electric vehicles (PEVs), are emerging as market growth drivers.[4]

McKinsey & Company's September 2015 article, "Urban Mobility at a Tipping Point," explains that urbanization is intensifying worldwide, noting that by 2030, 60% of the world's population will live in cities, up from about 50% today.[5] Annual global automobile sales are expected to nearly double between 2015 and 2025, and as such, McKinsey infers that "the existing urban infrastructure cannot support such an increase in vehicles on the road."[6] This will cause an unacceptable increase in problems such as congestion and pollution.

As a result, McKinsey spotlights car-sharing as one of the four big-picture forces that addresses the problems of an urbanizing world. Substantial increases in car-sharing could lead to major changes in vehicle utilization patterns and vehicle ownership: "While the effect of car-sharing on rates of car ownership is still being studied, there is little argument that widespread car-sharing would mean each vehicle gets used more intensively, thereby increasing its annual mileage from 11,700 to 20,400. Extrapolating further, shared, fully autonomous vehicles could lower the cost of personal mobility by 30 to 60 percent relative to private auto ownership."[7]

Media coverage also points to the increasing popularity and impact of car-sharing. For example, Mark Rogowsky of Forbes magazine explained how urbanization has affected car-sharing: "All of this has been made possible by technology smartphone apps most especially that let you reserve a Zipcar or an Uber within seconds. 'Software is eating the world,' famed venture capitalist Mark Andreessen said in 2011. Now, it's taking bites out of the giant global auto industry."[8]

John Zimmer, co-founder of Lyft, has focused on the changing preferences of millennials. He commented in Mashable.com that most millennials may not own a car by 2020. "You could actually start seeing the majority of millennials in the next five years or so saying there's no reason I should get a car," he said. "The car used to be the symbol of American freedom. Now it's like this, and a car is like owning a $9,000 ball and chain, because you have $9,000 in expenses on your car every year."[9]

Research Questions, Method and Sources

The rise of car-sharing has received ample attention, and raised many questions for fuels and vehicle market stakeholders. When you cut past the hype, what are the actual numbers supporting this movement? What is its total scope? Where is car-sharing happening the most and the least, and among which demographic? This report provides objective data to answer these questions.

The Fuels Institute facilitates fact-based, wide-ranging discussions on major trends affecting the future of fuels, and this study is intended to elevate the discussion by presenting data that answers specific and precise questions. Since car-sharing's rise to prominence is so recent, there are strong limitations on the data that can be attained (particularly for Uber and Lyft), but nevertheless many questions can be answered even at this early point in time.

The cornerstone of this study is a trove of fleet data that has never been accessed before. A subcontracted software developer wrote a web-script to download the entire vehicle inventory of Zipcar, Car2Go, Enterprise CarShare and Turo from publicly accessible online reservation systems. From

[3] Lisa Jerram and John Gartner. "Carsharing Programs" 3Q 2015. Executive Summary – page 1. Available at https://www.navigantresearch.com/wp-assets/brochures/CSHP-15-Executive-Summary.pdf

[4] Ibid.

[5] Shannon Bouton, Stefan M. Knupfer, Ivan Mihov, and Steven Swartz. "Urban Mobility At A Tipping Point." McKinsey and Company. September 2015. Available at http://www.mckinsey.com/insights/sustainability/urban_mobility_at_a_tipping_point

[6] Ibid.

[7] Ibid.

[8] Mark Rogowsky. "Zipcar, Uber, And The Beginning Of Trouble For The Auto Industry." Forbes. February 8. 2014. Available at http://www.forbes.com/sites/markrogowsky/2014/02/08/viral-marketing-car-sharing-apps-are- beginning-to-infect-auto-sales/#2715e4857a0b678b72371255

[9] JP Mangalindan. "Lyft president: Most millennials won't own cars in 5 years." Mashable. July 7, 2015. Available at http://mashable.com/2015/07/07/lyft-president-millienials-cars/#xYutJ76rCOqp. Requoted in Dominique Mosbergen, "Most Millennials Won't Own A Car In 5 Years, Says Lyft Co-Founder John Zimmer." The Huffington Post, July 8, 2015.

this download, detailed tables on the number, location, make, model and type of vehicle are presented for each company—three that follow the car-sharing model (Zipcar, Enterprise CarShare, Car2Go) and one that follows a peer-to-peer rental model (Turo).

By using this data, we can answer:

- Cities that have the most car-sharing vehicles
- Whether vehicles are located more in central cities or suburbs
- The make and model most common in each fleet
- Fleets that have the greatest and least proportion of hybrid and all-electric vehicles

Moreover, we attempt to explain the demographic characteristics of each company's operating environment. U.S. Census data has been used in concert with company fleet inventory data to synthesize an understanding of the population density, vehicle ownership, age, income and other characteristics of the locations where each company operates. This synthesis has been attained by using the number of vehicles in each specific location for each company to construct a companywide weighted average for population density, vehicles per household, age, income, education, property value and so forth.

The demographic analysis is limited in that it cannot give a specific picture of the actual customers of an individual fleet—such data is proprietary and confidential. Nonetheless, the companywide weighted averages based on U.S. Census demographics reveal objective, consistent differences between the respective business strategies pursued by each company. As such, these weighted averages can help deepen the understanding of how each company chooses to acquire customers, and together with the fleet data, can provide a kaleidoscopic insight into business strategy and operations. This type of market comparison may not answer every question that could be posed, but it does serve as a useful jumping-off point for public dialogue and discussion, as well as help frame questions for research on the future of fuels.

Unfortunately, Uber and Lyft do not have publicly accessible vehicle inventories, and so comparably detailed data was not attainable. Other than a report released by Uber in January 2015[10], on the weekly hours worked by its drivers,

there is extremely scant public data and virtually no public data for Lyft. Therefore the fleets of these companies are not examined in detail, and weighted averages of demographic characteristics cannot be constructed, since the weighting factor of vehicles per city is unavailable.

An effort has been made to create a comparison between Uber/Lyft and the other companies based on estimated population-served. By using the list of cities on the Uber and Lyft websites, as well as the cities downloaded for the other companies, we can tally and estimate as to how many customers, in theory, are served by each company. Fuzziness of geographic definition limit the accuracy of these estimates—it is unknown whether any of the companies serve entire metro areas or just specific cities—but the estimates may nevertheless produce useful insights insofar as they provide a cohesive framework of analysis that can be built upon in the future.

Finally, the report concludes by using U.S. Census data to estimate answers to two central questions:

- Has vehicle ownership increased or declined in the past few years?
- Has vehicle miles traveled (VMT) increased or declined in recent years?

U.S. Census and Federal Highway Administration data for the years 2005–2014 (for vehicle ownership) and 2005–2013 (for VMT) are used for the 14 urbanized areas that have high levels of car-sharing.

[10] Jonathan Hall and Alan Krueger. "An Analysis of the Labor Market for Uber's Driver-Partners in the United States." January 22, 2015. Uber Technologies. Available at https://s3.amazonaws.com/uber- static/comms/PDF/Uber_Driver-Partners_Hall_Kreuger_2015.pdf

Fleet Analysis

This section addresses the following for Zipcar, Enterprise, Car2Go, and Turo:

- How many fleet vehicles?
- Where are the fleet vehicles?
- What types of vehicles are in the fleet?
- What is the number/percentage of hybrids and EVs?

Fleet data is compiled by a comprehensive download on each company's online booking system in September 2015 and October 2015 to retrieve the entire inventory of each company.

Business Model Definitions

Before proceeding to the fleet composition analysis, it is important to lay the groundwork by clearly defining terms. The four companies for which fleet data has been obtained are Zipcar, Enterprise CarShare, Car2Go and Turo. Each business has a searchable Web app that matches drivers with vehicles; however, there are differences in return method, rental length and pricing.

The key distinction among the companies is that Turo is peer-to-peer rental, meaning the driver rents a vehicle from the vehicle owner through Turo's website or mobile app.

On the other hand, Zipcar, Enterprise and Car2Go are car-sharing companies. Zipcar and Enterprise use a classical two-way model, where each vehicle "lives" in a specific parking spot and must be returned at the end of each rental period. In contrast, Car2Go has innovated a one-way model where cars are spread throughout a home area. A Car2Go can be picked up and dropped off anywhere within the home area. This one-way model offers somewhat more flexibility than the classic two-way model.

For sake of comparison, Uber and Lyft are ride-sourcing companies because the average consumer does not drive the vehicle, but rather uses an app to source a ride.

Business Model Definitions

Company	Return Method	Trip Length + Pricing
Zipcar	2-way	By half-hour, up to one day
Enterprise CarShare	2-way	By half-hour, up to one day
Car2Go	1-way	By minute
Turo	To Owner	Hourly, daily, weekly, monthly

Figure 1: Business Model Definitions
(Source: Company websites)

How Many Fleet Vehicles?

This section introduces the fleet analysis by presenting the total number of vehicles per fleet, as per the comprehensive download from the online fleet reservations systems.

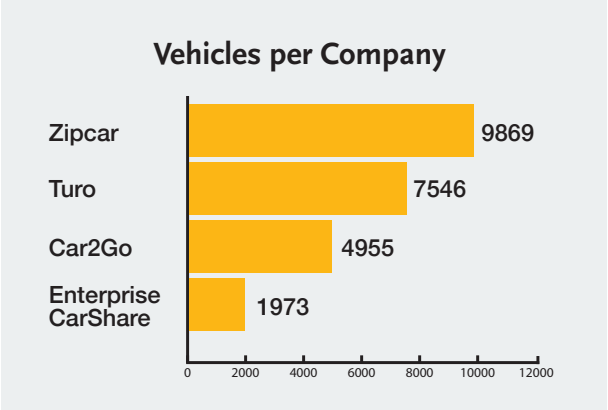


Figure 2: Vehicles per Company
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

Figure 2 contains perhaps the most striking result of all the results that will be presented in this study. Even the largest company, Zipcar, with less than 10,000 vehicles in its fleet, comprises a miniscule proportion of the U.S. vehicle fleet. With more than 250 million registered motor vehicles in the United States as of 2014, the companies in Figure 2 comprise less than 0.1% of the entire U.S. vehicle fleet.

Where Are the Fleet Vehicles?

Are these companies' vehicles distributed throughout the nation, or are they focused in only a very few places? The following map displays the top 10 cities for each company.

The map reveals not only the specific cities with the most vehicles, but also the relative degree of concentration of fleet vehicles. The car-sharing companies all have very similar proportions of vehicles concentrated in the top five metros, although it is striking that Zipcar and Enterprise have near-identical ratios as well as a near- identical two-way sharing model, whereas Car2Go, with its one-way sharing model, has a slightly different ratio. Turo, the lone peer-to-peer company, has a much lower proportion of fleet concentration.

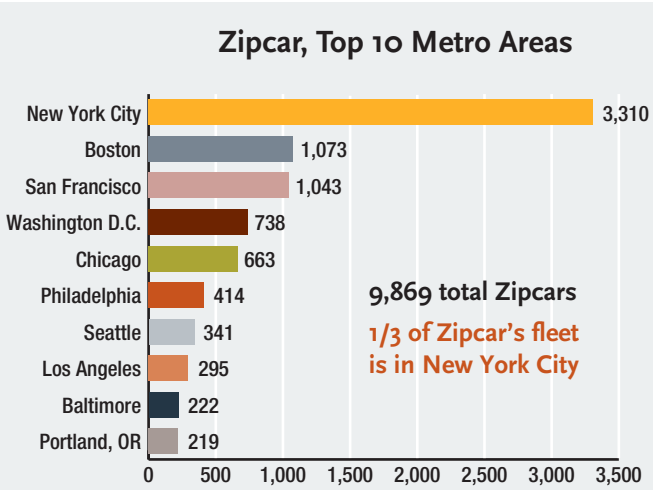


Figure 3: Zipcar, Top 10 Metro Areas
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

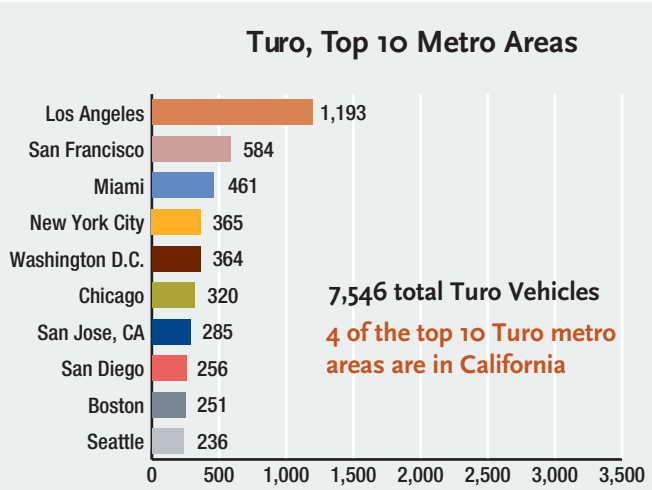
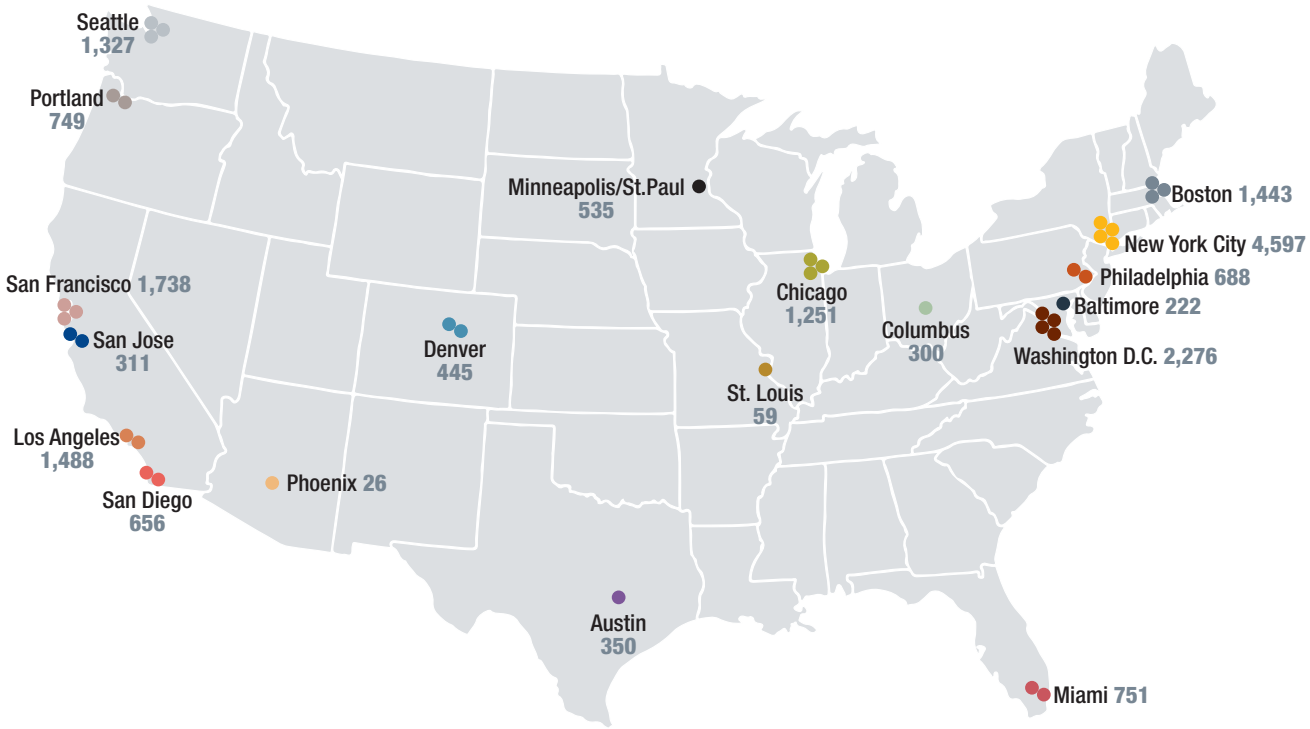


Figure 4: Turo, Top 10 Metro Areas
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

Top U.S. Car Sharing Metro Areas



Car2Go, Top 10 Metro Areas

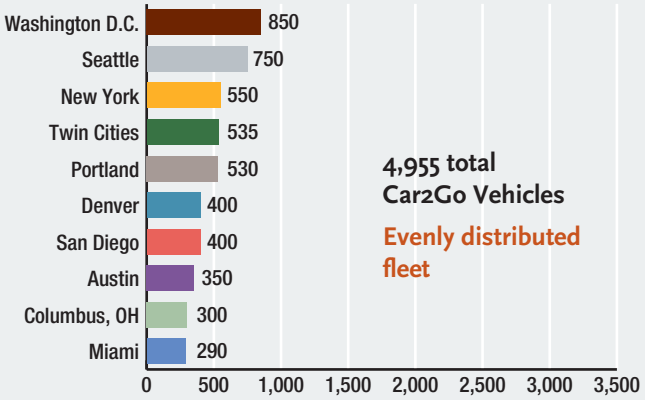


Figure 5: Car2Go, Top 10 Metro Areas
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

Enterprise CarShare, Top 10 Metro Areas

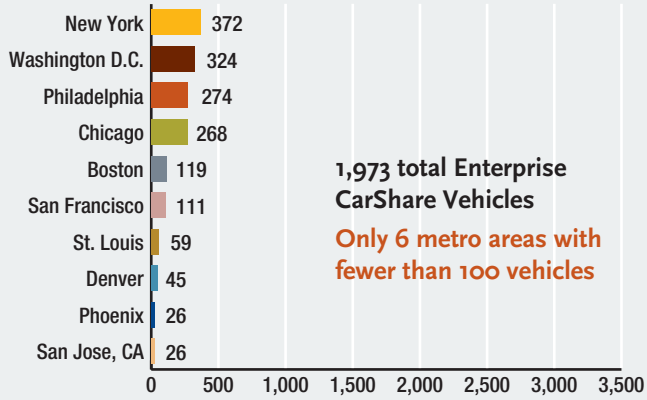


Figure 6: Enterprise CarShare, Top 10 Metro Areas
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

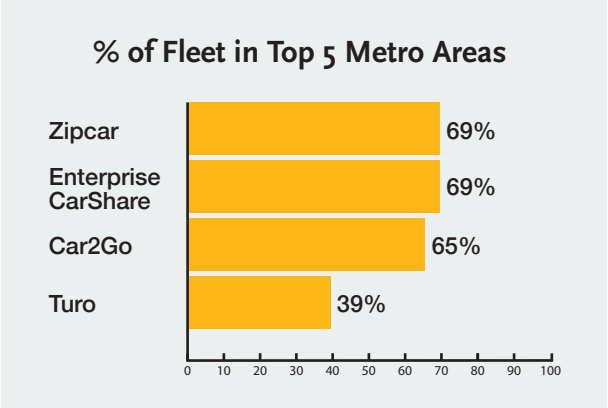


Figure 7: % of Fleet in Top 5 Metro Areas
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

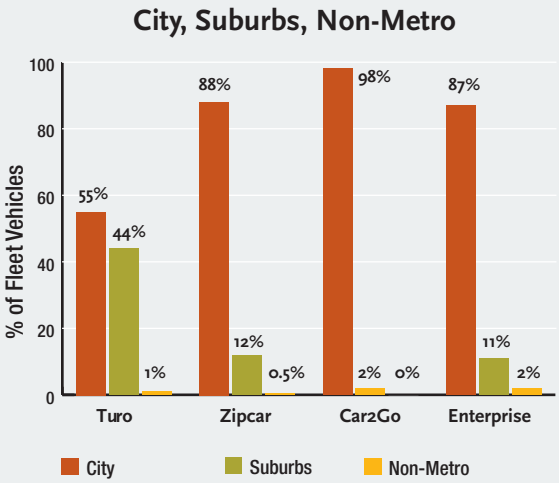


Figure 8: City, Suburbs, Non-Metro
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

The geographic differences, between Turo's fleet and that of the other companies, can be further seen in Figure 8, which separates out according to central city, suburb and non-metro.

Figure 8 reveals an obvious difference in the geographic distribution of the fleets. Whereas nearly half of Turo's vehicles are located in a suburban area, more than 85% of each of the other companies' vehicles are located in the principal city of a metro area. The similarity between Zipcar and Enterprise, the two-way companies, is striking—each company has a near-identical proportion.

The only aspect that all four companies share in common is an extremely low proportion of vehicles in non-metro areas. Car2Go has the lowest, with zero vehicles in non-metro areas, but no other company has more than 2% of non-metro vehicles. As outlined in studies by Alix Partners, Navigant Research and McKinsey & Company, referenced in the Introduction section, sharing economy transportation is an urban and metropolitan phenomenon.

If we deepen the analysis of metropolitan areas even further, it becomes apparent that the sharing economy transportation companies are concentrated in the most populous metro areas.

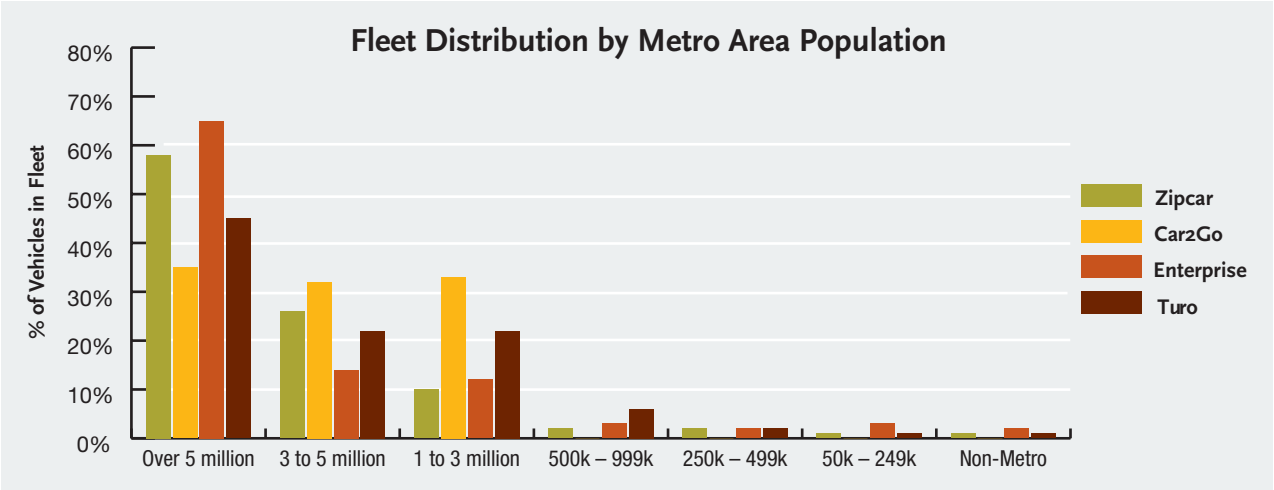


Figure 9a: Fleet Distribution by Metro Area Population
(Sources: U.S. Census; Inventory downloads from online booking systems; September 2015, October 2015)

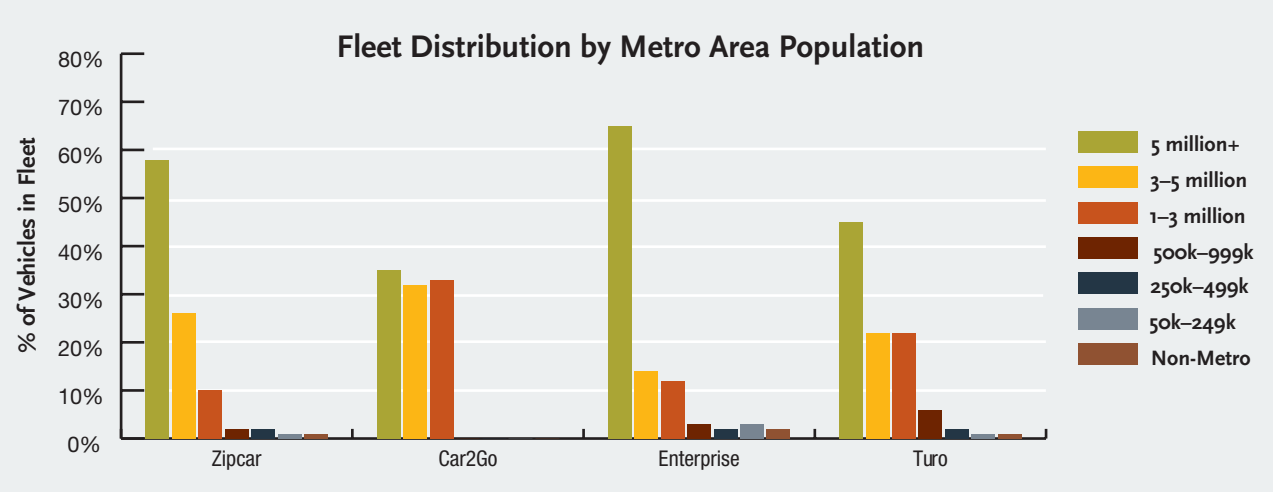


Figure 9b: Fleet Distribution by Metro Area Population
(Sources: U.S. Census; Inventory downloads from online booking systems; September 2015, October 2015)

Figure 9a illustrates that fleet vehicles are located overwhelmingly in metros with one million or more in population. Its counterpart, Figure 9b, is constructed by switching the axes and looking at per-company profiles.

Zipcar and Enterprise, the two-way car-sharing companies, have very similar population profiles, as they are both concentrated in the very largest metropolitan areas, with roughly 60% of their respective fleets in these metros. Car2Go, the one-way car-sharing company, is evenly distributed between metros of 1 million to 3 million, 3 million to 5 million, and more than 5 million, whereas Turo, the peer-to-peer rental company, has close to half of its vehicles in the largest metros, and most of the rest in 1 million to 3 million or 3 million to 5 million population. Figure 10 provides a tabular summary.

Tabulation of Fleet Vehicles by Metro Population

Metro Population	Zipcar	Car2Go	Enterprise	Turo
5 million+	58%	35%	65%	45%
3–5 million	26%	32%	14%	22%
1–3 million	10%	33%	12%	22%
500k–999k	2%	0%	3%	6%
250k–499k	2%	0%	2%	2%
50k–249k	1%	0%	3%	1%
Non-Metro	1%	0%	2%	1%

Figure 10: Tabulation of Fleet Vehicles by Metro Population
(Sources: U.S. Census; Inventory downloads from online booking systems; September 2015, October 2015)

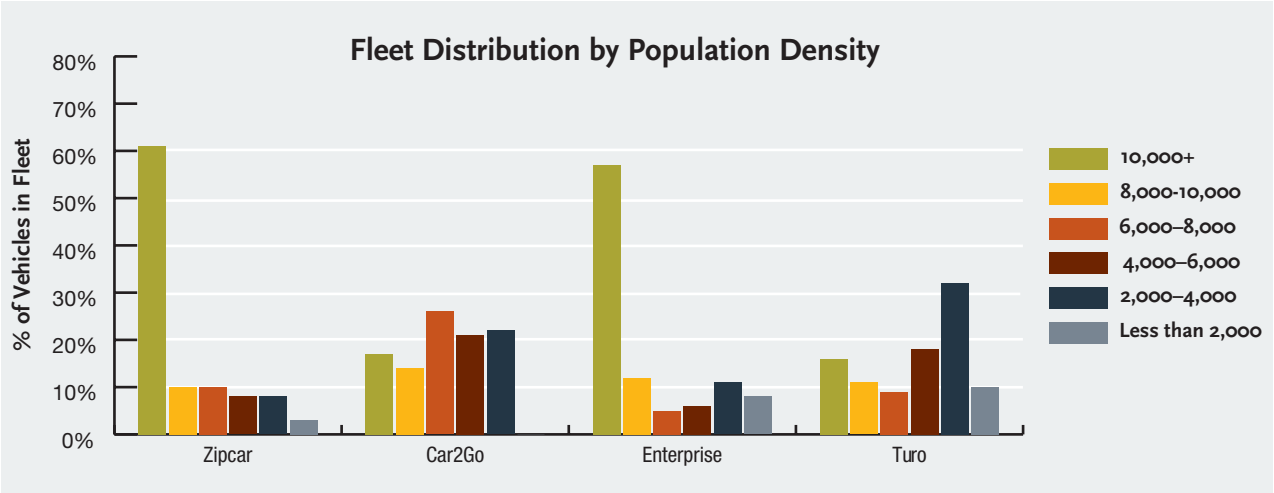


Figure 11: Fleet Distribution by Population Density
(Sources: U.S. Census; Inventory downloads from online booking systems; September 2015, October 2015)

Population density also provides insight on a metro area's geography in terms of describing how many potential customers tend to reside near the average fleet vehicle. Figure 11 breaks out the fleets by population density; this statistic was constructed on a vehicle-by-vehicle, place-by-place basis which took into account different population density levels within the different cities and places of a broader metro area.

Zipcar and Enterprise have extremely similar profiles, with their vehicles overwhelmingly located in the most densely populated places (more than 10,000 persons per square mile). Car2Go has an evenly dispersed density map with slight skew to lower densities. Turo is skewed towards less densely populated places, not surprising when one considers that Turo has the highest proportion of vehicles located in suburban locations. The results are tabulated in Figure 12.

Tabulation of Fleet Vehicles by Population Density

Population/sq mile	Zipcar	Car2Go	Enterprise	Turo
10,000+	61%	17%	57%	16%
8,000–10,000	10%	14%	12%	11%
6,000–8,000	10%	26%	5%	9%
4,000–6,000	8%	21%	6%	18%
2,000–4,000	8%	22%	11%	32%
Less than 2,000	3%	0%	8%	10%

Figure 12: Tabulation of Fleet Vehicles by Population Density
(Sources: U.S. Census; Inventory downloads from online booking systems; September 2015, October 2015)

Top Makes per Fleet

These manufacturers' vehicles have the largest presence in the car-sharing fleets.

Nissan, Toyota, Honda and Ford appear to be the strongest presences in the fleets. Car2Go, owned and operated by Daimler, has only one kind of vehicle, the Daimler Smart fortwo. Figure 17 presents the percentage of each fleet that derives from the top five manufacturers.

The traditional car-sharing companies appear to have the greatest concentration of vehicles from a small amount of manufacturers, while Turo appears to have the least intense concentration.

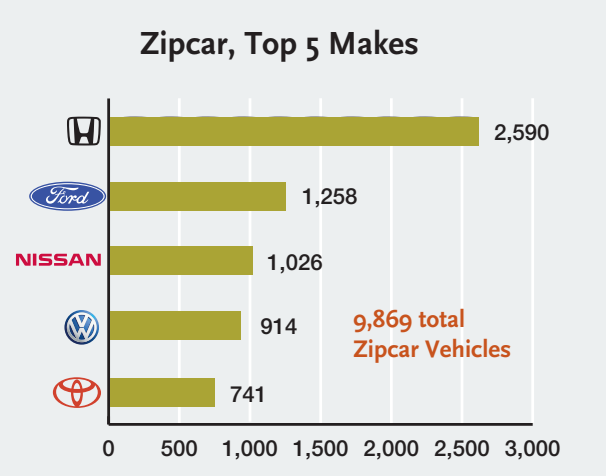


Figure 13: Zipcar, Top 5 Makes
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

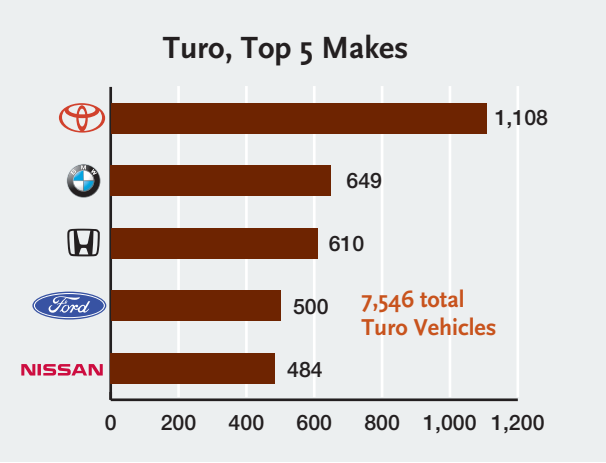


Figure 14: Turo, Top 5 Makes
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

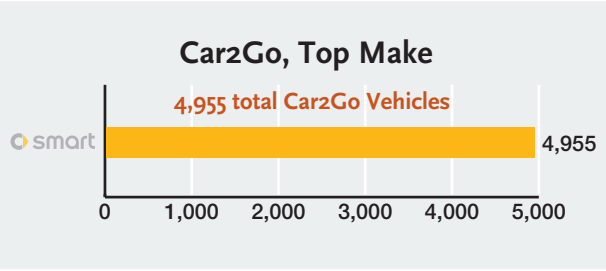


Figure 15: Car2Go, Top Make
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

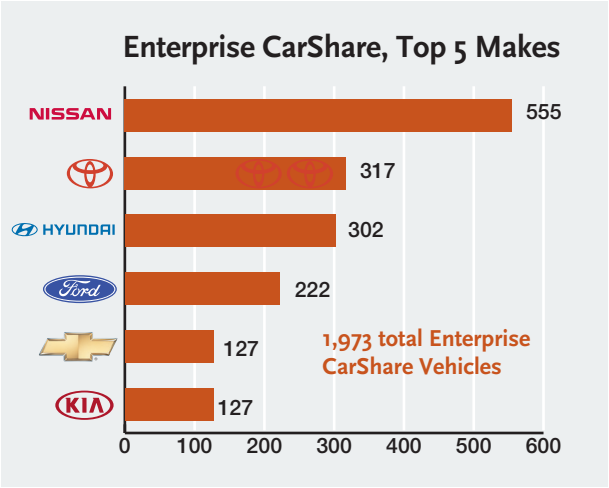


Figure 16: Enterprise CarShare, Top 5 Makes
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

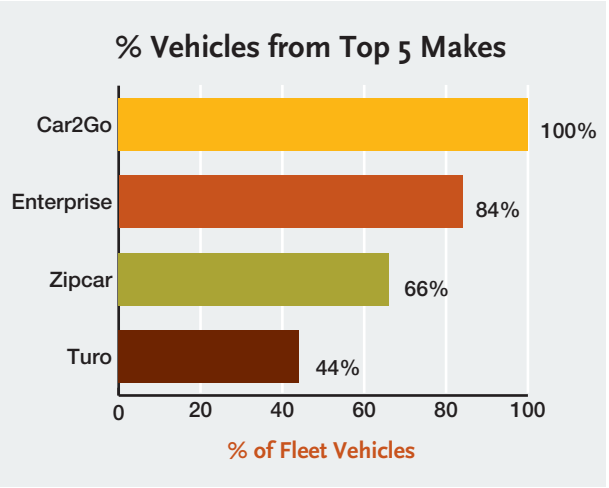


Figure 17: % Vehicles from Top 5 Makes
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

Make and Model

The fleet inventory downloads permit even more detail analysis. Figures 18–21 display the top five make/model combinations for each fleet.

Noteworthy is the appearance of the Toyota Prius in the top-five listing for two different companies, Turo and Enterprise. The Prius is the No.1 vehicle model out of all Turo vehicles. Otherwise, the Honda Civic appears quite popular, placing as the most frequent Zipcar and third-most frequent Turo vehicle.

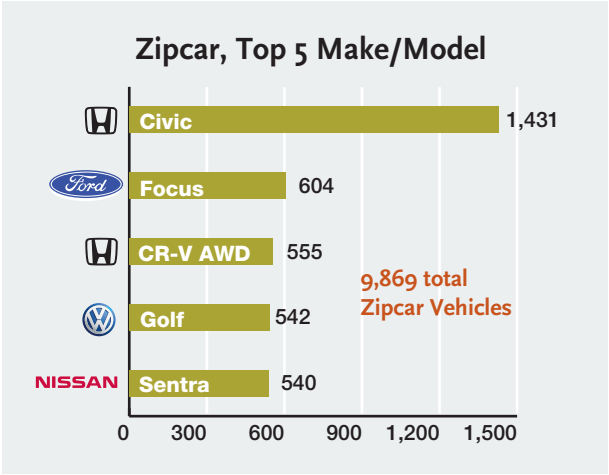


Figure 18: Zipcar, Top 5 Make/Model
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

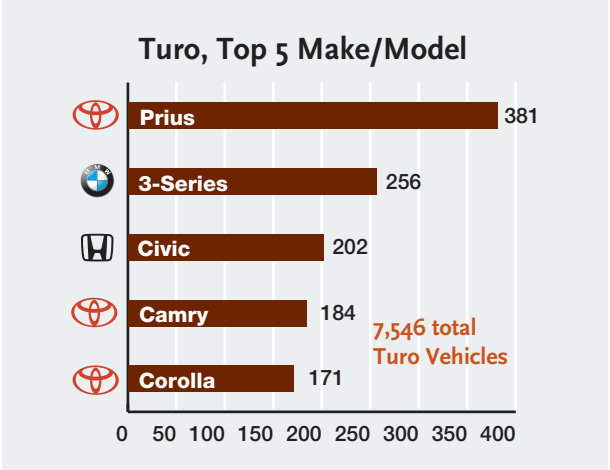


Figure 19: Turo, Top 5 Make/Model
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

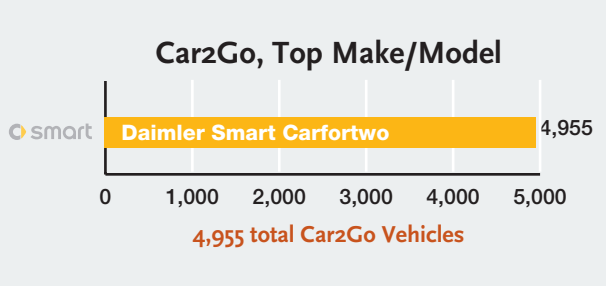


Figure 20: Car2Go, Top Make/Model
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

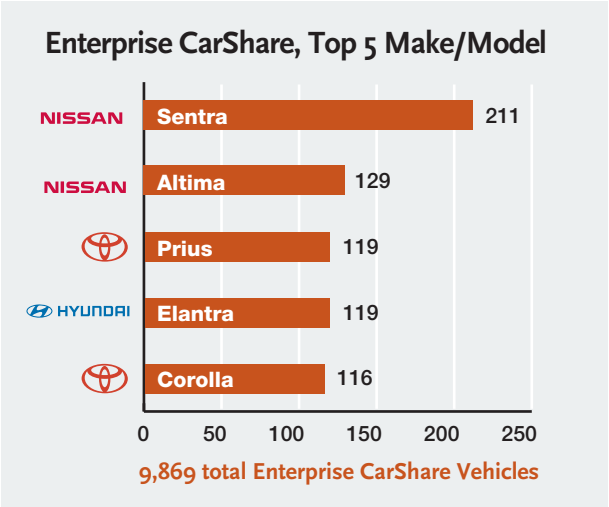


Figure 21: Enterprise CarShare, Top 5 Make/Model
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

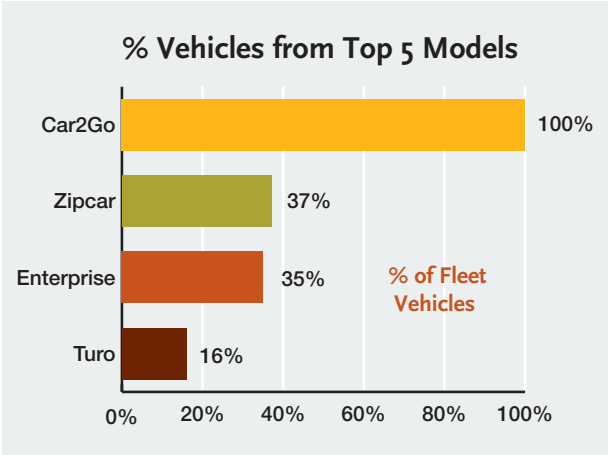


Figure 22: % Vehicles from Top 5 Models
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

What is the relative concentration in the fleets of the top-five vehicles? Figure 22 presents the percentage which the top-five models comprise of each respective fleet.

This chart naturally follows Figure 17, the concentration of top-five manufacturers, as it is a further breakdown of that analysis. Car2Go with only one vehicle type has a 100% concentration; Zipcar and Enterprise have an extremely similar figure, and Turo has by far the lowest proportion of vehicles concentrated in its top five models.

Summary of Make and Model Charts

The previous charts can be telescoped into a single overview chart, by counting the total number of makes and models in each fleet. Figure 23 crystallizes the similarities and differences among the companies' fleet composition. Turo has by far the largest variety of vehicles in its fleet.

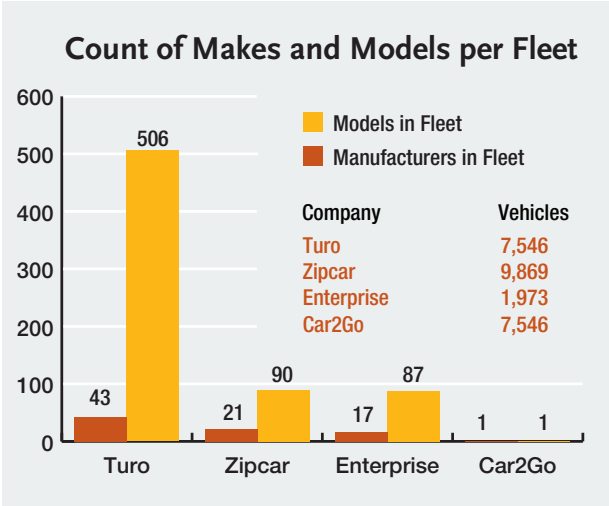


Figure 23: Count of Makes and Models per Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

Zipcar and Enterprise derive their fleets from large traditional car rental companies: Avis Budget Group for Zipcar[11], and Enterprise for Enterprise CarShare. Since these fleets tend to buy vehicles in bulk from a limited number of manufacturers, and since they discard older vehicles from their fleet, the diversity of makes, models, and model-years is more limited than for Turo.

Finally, Car2Go has a single manufacturer and model: the Daimler Smart fortwo.

[11] http://www.zipcar.com/press/overview

Hybrids and EVs

Are the car-sharing fleets introducing new drivetrains and fuel types into the general vehicle fleet? An initial answer to this question can be given by listing the number of hybrids and EVs for each sharing fleet.

The hybrid electric-gasoline Toyota Prius is a popular vehicle in some of the fleets, while Car2Go does not have any known hybrids in its fleet. Figures 24–26 account for all hybrids in each fleet. Note that Car2Go is not listed since it does not have any known hybrids in its fleet.

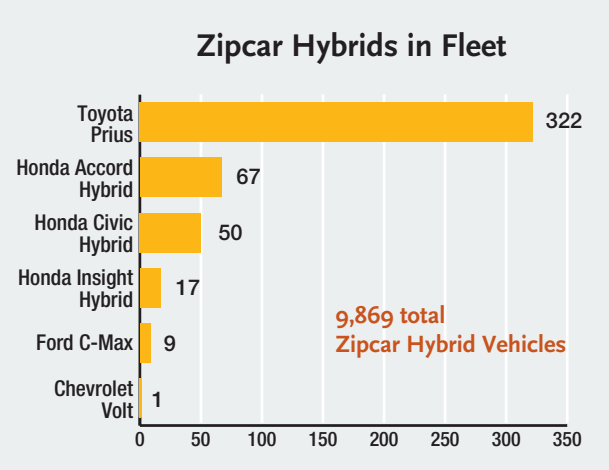


Figure 24: Zipcar Hybrids in Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

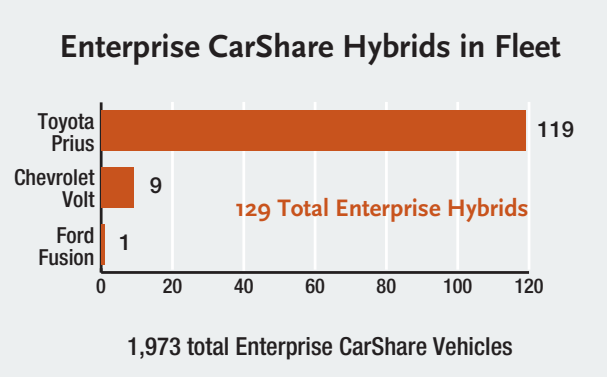


Figure 25: Enterprise CarShare Hybrids in Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

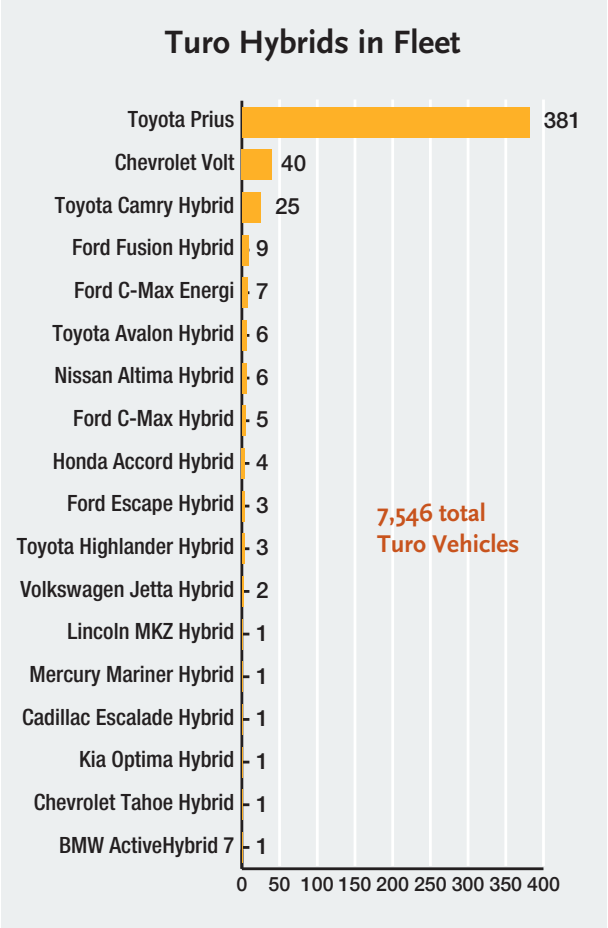


Figure 26: Turo Hybrids in Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

The Toyota Prius is the clear favorite, in terms of hybrid models in the sharing fleets. And given Turo's much greater general diversity of makes and models, it should come as no surprise to see such a large listing of hybrid models represented in the Turo fleet.

Moving along to electric vehicles (EVs), Figures 27–30 present the number and type of EVs in each company's fleet.

Zipcar and Enterprise have the lowest proportion of EVs in their respective fleets. Car2Go's EVs derive from its San Diego fleet of 400 all-electric vehicles. The presence of ample EV- charging infrastructure in San Diego led Car2Go

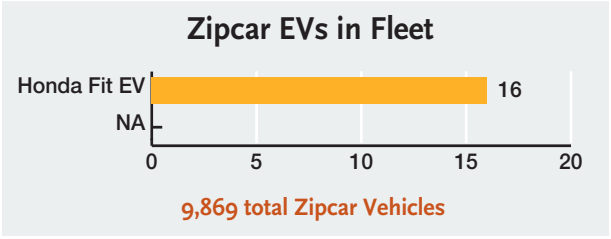


Figure 27: Zipcar EVs in Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

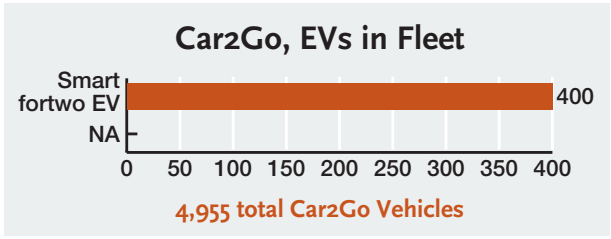


Figure 28: Car2Go, EVs in Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

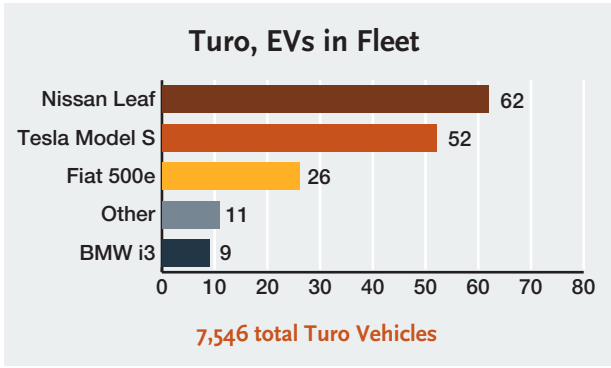


Figure 29: Turo, EVs in Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

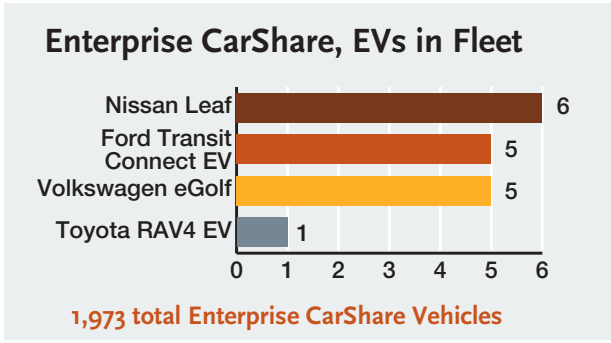


Figure 30: Enterprise CarShare, EVs in Fleet
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

to implement an all-electric fleet in 2010, which was upgraded in 2014.[12] It is unknown whether any other Car2Go vehicles are all-electric.

Finally, Turo has the second-most EVs, with more than 50 each of the Nissan Leaf and Tesla Model S.

Summary of Make and Model Charts

Fleet-wide aggregates are compared in Figures 31–33.

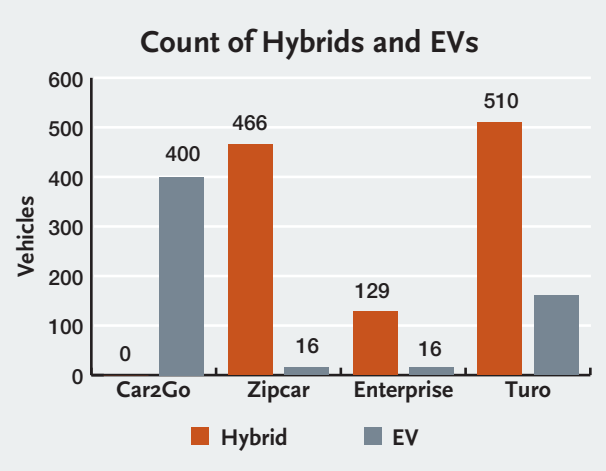


Figure 31: Count of Hybrids and EVs
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

The Turo fleet has the largest combined total of hybrids and EVs, when expressed as a proportion of the fleet. It is the only company with above 2% in each of hybrids and EVs. Does Turo's innovative ownership model attract people who are also drawn to innovative vehicles? Could it be that innovative ownership models attract tech-savvy people who are also drawn to the latest high-tech vehicles?

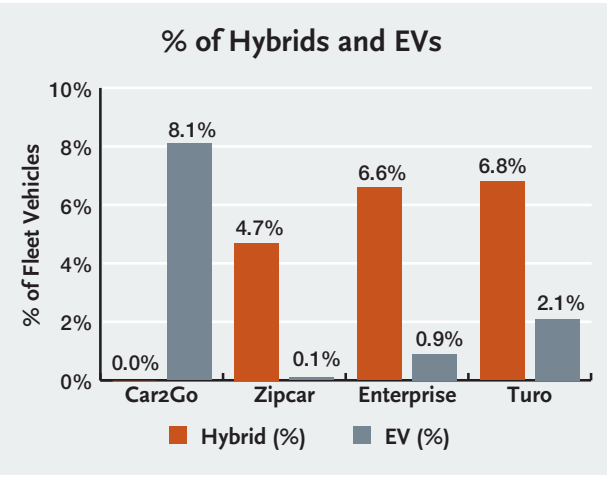


Figure 32: % of Hybrids and EVs
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

Tabulation of % Hybrids and % EVs in Sharing

Company	Hybrid (%)	EV (%)	Hyrbid + EV (%)
Turo	6.8%	2.1%	8.9%
Car2Go	0.0%	8.1%	8.1%
Zipcar	4.7%	0.1%	4.8%
Enterprise	6.6%	0.9%	7.5%

Figure 33: Tabulation of % Hybrids and % EVs in Sharing Fleets
(Source: Inventory downloads from online booking systems; September 2015, October 2015)

[12] Richard Allyn. "Car2Go Rolls Out New Electric Fleet In San Diego." CBS News 8. January 29, 2015. Available at http://www.cbs8.com/story/27976839/car2go-rolls-out-new-electric-fleet-in-san-diego. See also, San Diego Association of Governments, "San Diego Regional Plug-In Electric Vehicle Infrastructure Working Group (REVI)," available at http://www.sandag.org/index.asp?projectid=413&fuseaction=projects.detail. See also San Diego Association of Governments and Center for Sustainable Energy California, "San Diego Regional Plug-In Electric Vehicle (PEV) Readiness Plan: Preparing the San Diego Region for Plug-In Electric Vehicles." January 2014.
Available at https://energycenter.org/sites/default/files/docs/nav/programs/pev-planning/san- diego/San_Diego_PEV_Readiness_Planning_Guide-2013_low-resolution.pdf

Market Demographics

This section will focus on who the customers are by profiling the demographics of the places where the companies are located. This can yield insight by providing objective perspective on the fleet-locating strategies of the respective companies.

The key tool has been the construction of weighted averages for key demographic statistics, by using the number of vehicles per city as the weighting factor for each fleet.

The demographic statistics include:

- Population density
- Vehicles per household
- Persons per household
- Median age
- Median household income
- Home value
- Rate of college education, ages 25+

All demographic data has been sourced from the U.S. Census Bureau. The source for population density is the 2010 Decennial Census, and the source for all other variables is the 5-year, 2009–2013 American Community Survey (ACS).

The data presented in this section constitutes an imperfect measure; the metrics reflect citywide or place-wide characteristics drawn from the U.S. Census and do not specifically describe the specific customer lists of the sharing fleets. Thus, the analyses in this section are meant as an initial step towards constructing an analytical framework that future research can build upon, as customer data becomes more available in future. A Census-based overview of market demographics can provide a sense of wider perspective and more deeply illuminate the context of more specific customer data that may become available in the future.

It should be noted that these statistics are averages on a place, city and metro basis. If future research were conducted at the extremely detailed geographic level of census tracts or block groups, the averages would come back differently.

It should also be noted that for Turo's peer-to-peer rental model, its vehicle locations denote the location of the owner and not the customer. It is unknown whether Turo customers live close to the Turo vehicle owners.

Population Density

The fleet-wide weighted averages presented in Figure 34 boil population density down to a single index number per company. This can help to crystallize the population density distributions which were presented in the Fleet Analysis section in Figures 11–12.

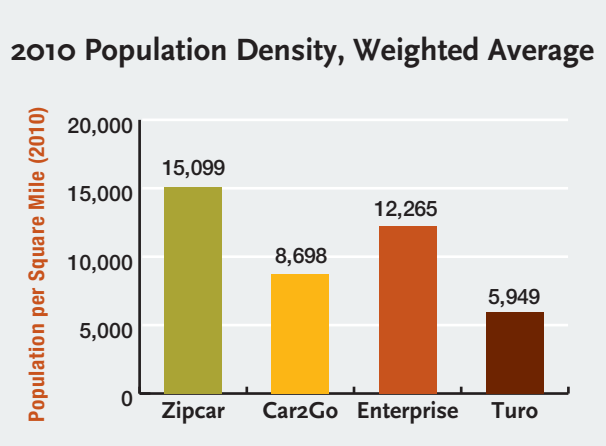


Figure 34: 2010 Population Density, Weighted Average *(Sources: U.S. Census, 2010 Decennial Census; Inventory downloads from online booking systems; September 2015, October 2015)*

Zipcar and Enterprise locate in the densest areas, followed by Car2Go. Turo locates in the least dense areas, which makes sense given that Turo has the greatest proportion of suburban vehicles.

Vehicles per household and persons per household are interrelated, in that they both convey the density of potential customers per fleet vehicle within the coverage area.

Figures 35–36 show that the car-sharing companies tend to locate in places with much lower vehicles and persons per household than the U.S. average. In contrast, Turo locations have the most vehicles available as well as the largest households.

The differences between car-sharing and peer-to-peer, in vehicles per household and household size, make sense considering that peer-to-peer depends on one party to the transaction already possessing a vehicle, whereas car-sharing depends on the fleet company providing a vehicle. Thus, the car-sharing companies would have greater incentive to look for customers in places of low vehicle ownership, whereas peer-to-peer would be more likely to provide vehicles to its customers in places that have higher vehicle ownership statistics and a higher likelihood that some of these vehicles are seen as excess capacity by their owners.

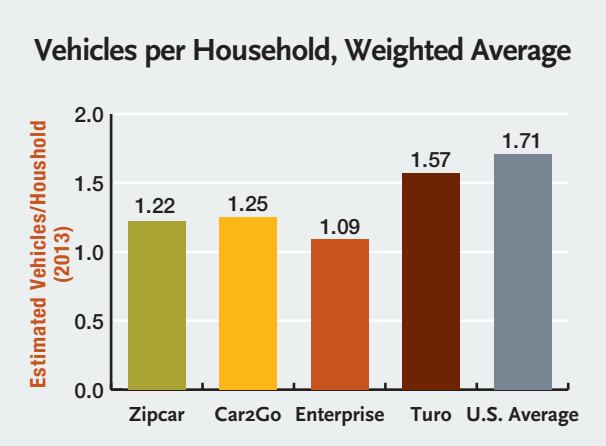


Figure 35: Vehicles per Household, Weighted Average *(Sources: U.S. Census, 2009-2013 American Community Survey, 5-Year Estimates; Inventory downloads from online booking systems; September 2015, October 2015)*

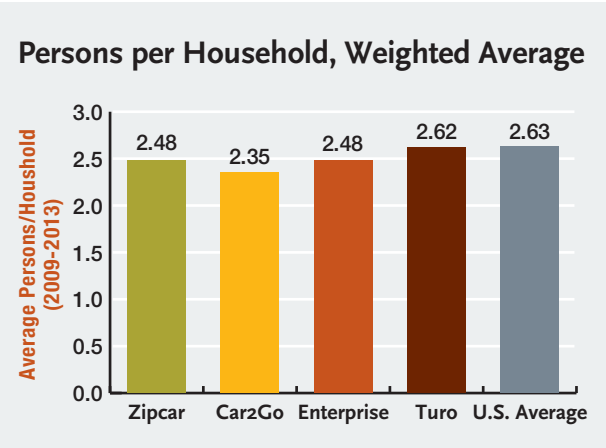


Figure 36: Persons per Household, Weighted Average *(Sources: U.S. Census, 2009-2013 American Community Survey, 5-Year Estimates; Inventory downloads from online booking systems; September 2015, October 2015)*

Median Age

Are the sharing services used mostly by younger people?

Figure 37 reveals a pattern: The places where all of the companies are located, including both car-sharing and peer-to-peer, exhibit a younger median age than the U.S. average.

Another question is whether car-sharing companies focus on locations with more highly-educated individuals. Figure 38 shows that all four of the fleets are located in places with higher rates of college education than the U.S. average.

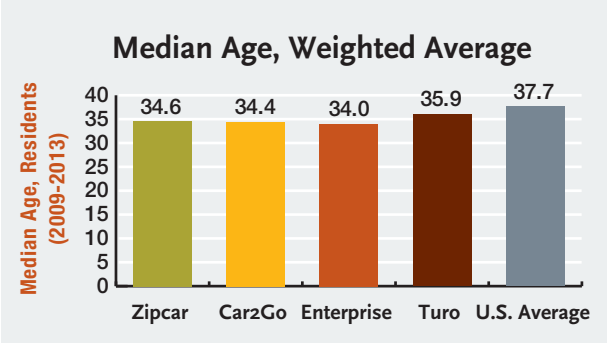


Figure 37: Median Age, Weighted Average
(Sources: U.S. Census, 2009-2013 American Community Survey, 5-Year Estimates; Inventory downloads from online booking systems; September 2015, October 2015)

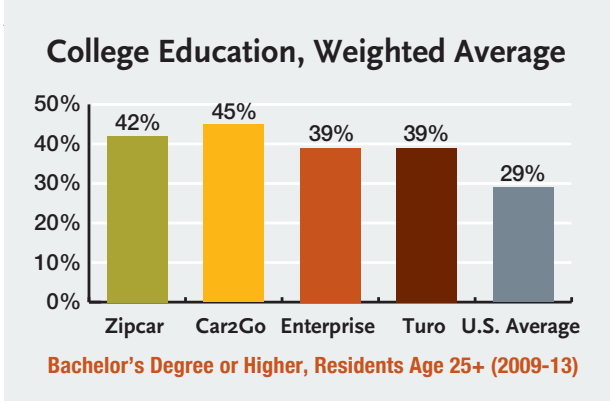


Figure 38: College Education, Weighted Average
(Sources: U.S. Census, 2009-2013 American Community Survey, 5-Year Estimates; Inventory downloads from online booking systems; September 2015, October 2015)

Household Income, Home Value

If sharing economy services hypothetically make vehicle ownership more affordable, then would one expect to find fleets mostly located in less-wealthy areas?

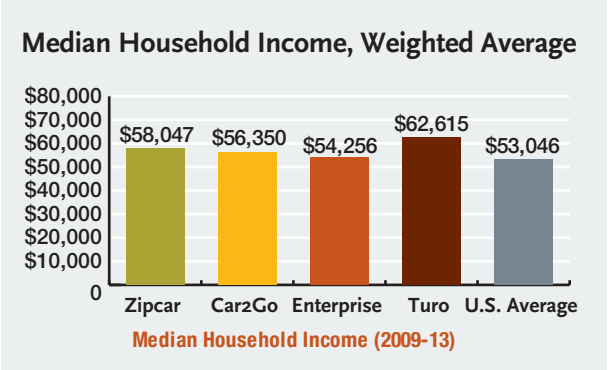


Figure 39: Median Household Income, Weighted Average
(Sources: U.S. Census, 2009-2013 American Community Survey, 5-Year Estimates; Inventory downloads from online booking systems; September 2015, October 2015)

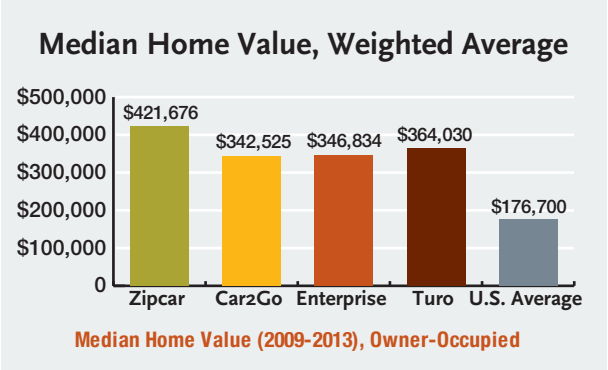


Figure 40: Median Home Value, Weighted Average
(Sources: U.S. Census, 2009-2013 American Community Survey, 5-Year Estimates; Inventory downloads from online booking systems; September 2015, October 2015)

To the contrary, Figures 39–40 demonstrate that on two common measures of household wealth— income and home value—all of the sharing services are located in places wealthier than the U.S. average.

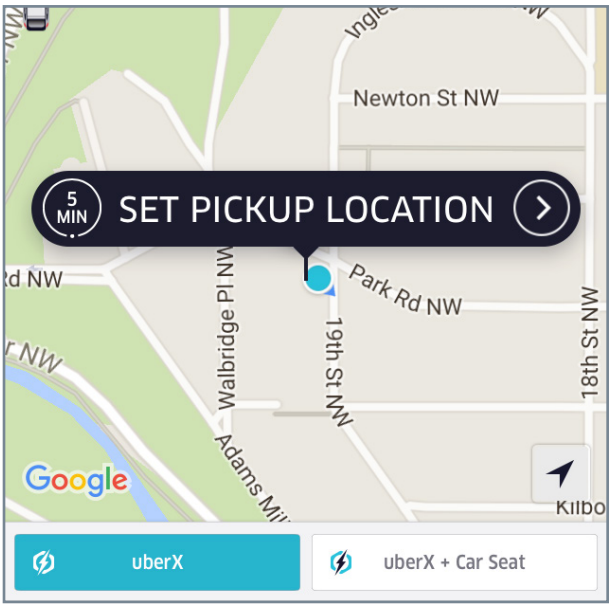
The home values in Figure 40 are particularly striking, since for each company they are double, or more than double, the U.S. average. This is likely due to the heavy concentration of services in large, dense metropolitan areas, such as New York City, Chicago or San Francisco, and these cities tend to have high land values.

Uber and Lyft: Population Comparisons

The obvious missing piece in the above insights has been the ride-sourcing model of Uber and Lyft. The rising popularity of these companies may eventually put into question all that is known about car-sharing and peer-to-peer. It is unknown whether the Uber and Lyft model will supersede car-sharing and peer-to- peer, or whether all three models will coexist in the marketplace.

Objective, independent data has been mostly unavailable on ride-sourcing, other than anecdotal newspaper articles. Uber self-published a paper in January 2015 on the demographics of its driver-partner workforce, "An Analysis of the Labor Market for Uber's Driver-Partners in the United States," providing the only publicly available source of fleet size for Uber[13]. There is no comparable document for Lyft. This section attempts to fill this knowledge gap.

The variable of population has been chosen for an objective comparison between Uber, Lyft and the other companies already profiled in this study. Population has been chosen since the city list that Uber and Lyft place on their websites provides an anchor for tallying a very basic market-sizing estimate, which can be compared with the other companies. The number of persons residing in a given



area provides a rudimentary basis for comparing market size, or potential market size, and "notional" is used in Figure 41 to imply that the total population of an area is likely larger than the actual amount of customers served.

As a technical note, the statistics for Turo, Zipcar, Car2Go and Enterprise have been calculated on the basis of specific cities and places, and not on a metro-wide basis, whereas the statistics for Uber and Lyft were tallied on a metro-wide basis. This is to emphasize the distinction between business models, where Uber and Lyft can be hailed

[13] Jonathan Hall and Alan Krueger. "An Analysis of the Labor Market for Uber's Driver-Partners in the United States." January 22, 2015. Uber Technologies. Available at https://s3.amazonaws.com/uber- static/comms/PDF/Uber_Driver-Partners_Hall_Kreuger_2015.pdf.

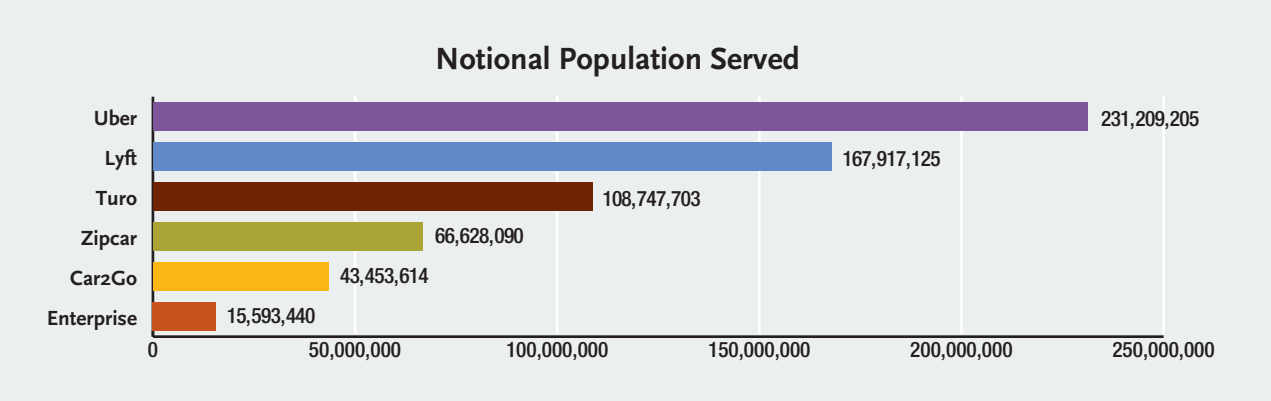


Figure 41: Notional Population Served
(Sources: Company websites, September 2015, for locations; U.S. Census for populations)

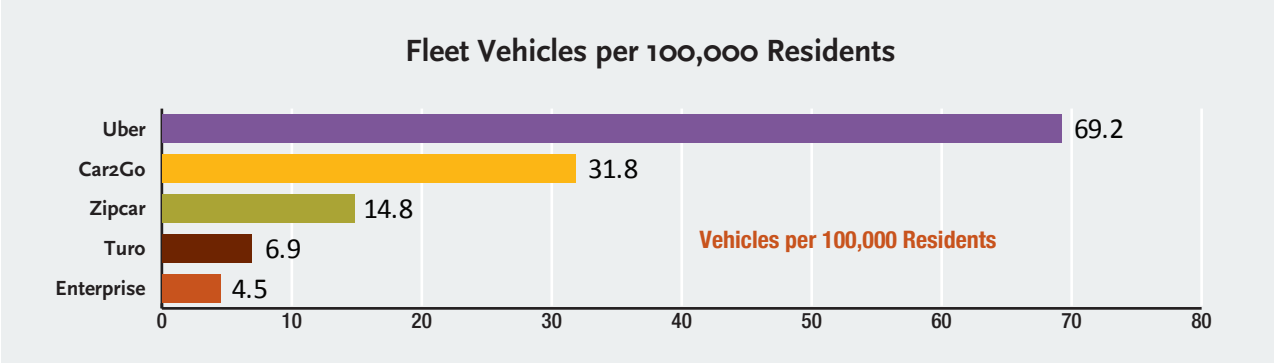


Figure 42: Fleet Vehicles per 100,000 Residents
(Sources: Data downloads from Zipcar, Enterprise, Car2Go and Turo booking systems; Uber's "An Analysis of the Labor Market for Uber Driver-Partners in the United States" report, January 2015; U.S. Census for populations)

by passengers at a specific location, whereas car-sharing and peer-to-peer services are anchored to the specific places where the vehicles nest.

In less technical terms, ride-sourcing (Uber, Lyft) population-served is higher because Uber and Lyft drivers can do a pickup and drop-off anywhere within a metro area, whereas car-sharing and peer-to-peer all require returning the vehicle to a specific place (or home area, in the case of Car2Go).

This highlights a broader point: The avoidance of parking means that ride-sharing facilitates many permutations of pickups and drop-offs which are not otherwise possible, such as suburb-to-suburb. This versatility may in the long-run be a source of competitive advantage for ride-sourcing by providing competences which the other business models cannot match.

The population figures in Figure 41 can be transformed into per-capita, as shown in Figure 42.

The total scope of Figure 42 is made clear in the denominator of "per 100,000 residents." The proportion of vehicles per person remains so tiny that it seems there is a long way to go before any of these sharing models becomes the main source of transportation for all persons or households in the areas of service.

All in all, Figure 42 shows non-trivial differences between population-served per capita for each of the services. Ride-sourcing (Uber) comes in first, and one-way car-sharing (Car2Go) second. Lyft is absent from the graph since no data on its vehicle fleet was available.

Effect on Vehicle Ownership, VMT and Fuel Demand

Have the new sharing services had any noticeable impact on vehicle ownership and VMT, either nationwide or else in specific cities which have a lot of services? Have these trends had any impact on long-term fuel demand, or will they have an impact in the future?

For vehicle ownership, statistics have been drawn from the household vehicles data of the U.S. Census, collected annually by the American Community Survey's one-year estimates from 2005–2014.

Table B08201, Household Size by Vehicles Available, of the U.S. Census permits one to construct an estimate of the number of vehicles per household in all metro areas, as well as in specific metro areas, by multiplying the number of households with one vehicle, by two times the number of households with two vehicles, by three times the number of households with three vehicles, and so forth, and then dividing the sum by the total number of households. This is necessarily a slightly conservative estimate since for households with "4 or more vehicles" the multiplier could only be four and doesn't include the "or more" count.

Nevertheless, since this affects only a very small amount of households and the overall estimates were all derived from a consistent method and source, the numbers presented below are held to be valid for purposes of comparing vehicle ownership levels over time. Any notable changes will be accounted for in the resultant trend-lines.

The first step is to create a national benchmark by looking at all U.S. metro areas. Non-metro areas were ignored because Figure 8 revealed how few car-sharing or peer-to-peer fleet vehicles are located in non-metro areas: 2% or fewer per company.

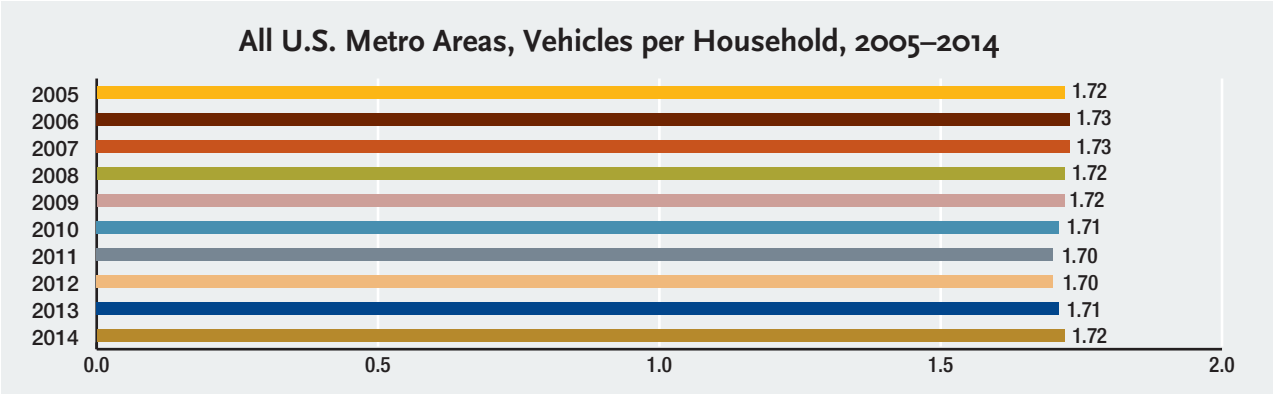


Figure 43: All U.S. Metro Areas, Vehicles per Household, 2005–2014
(Source: U.S. Census, American Community Survey 1-Year Estimates)

Figure 43 reveals that the trend for vehicles per household has been completely flat, at a national benchmark level, covering all metro areas in the United States. Figure 44 tabulates Figure 43.

However, perhaps if one focuses on cities with a relatively large concentration of sharing services, a directional trend would appear. Figure 45 presents trend-lines for fourteen selected metro areas.

The trend is totally flat; Figure 46 tabulates the data in Figure 45.

One additional layer of analysis will be attempted. It is possible that the central cities of these metro areas may exhibit a different trend than the metro area as a whole, since Figure 8 showed that the central cities are where a very large proportion of car-sharing vehicles are located. Figure 47 presents the trend-lines.

These lines are once again flat, although with more variation between the central cities than between the entire metro areas (in Figures 45–46). The data for Figure 47 is tabulated in Figure 48.

Tabulation of Vehicles per Household, All U.S.

Year	Estimated Vehicles per Household
2005	1.72
2006	1.73
2007	1.73
2008	1.72
2009	1.72
2010	1.71
2011	1.70
2012	1.70
2013	1.71
2014	1.72

Figure 44: Tabulation of Vehicles per Household, All U.S. Metro Areas, 2005–2014
(Source: U.S. Census, American Community Survey 1-Year Estimates)

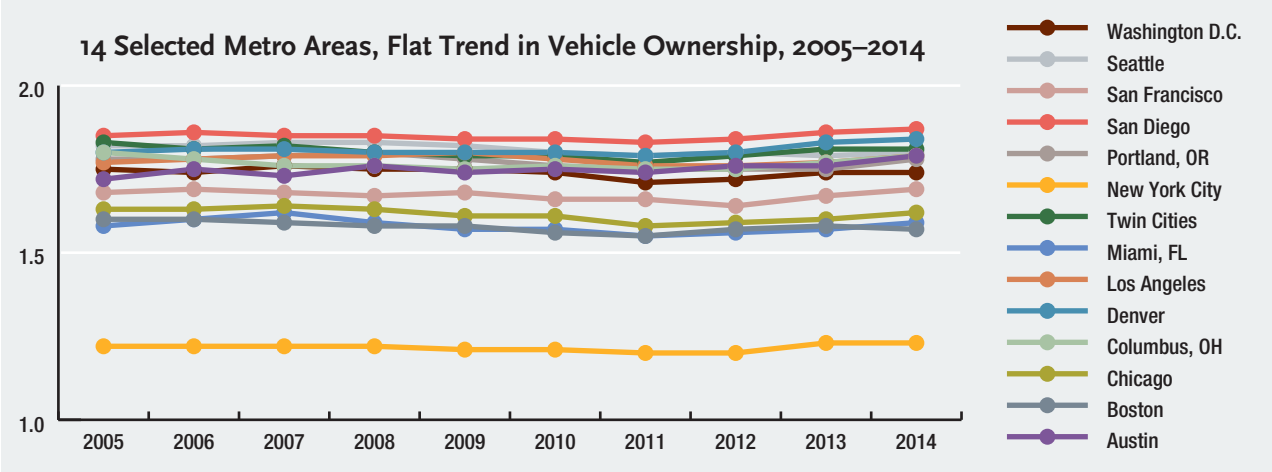


Figure 45: 14 Selected Metro Areas, Flat Trend in Vehicle Ownership, 2005–2014
(Source: U.S. Census, American Community Survey 1-Year Estimates)

14 Selected U.S. Metro Areas, Vehicles per Household: 2005–2014

	Austin	Boston	Chicago	Columbus, OH	Denver	Los Angeles	Miami, FL	Twin Cities	New York City	Portland, OR	San Diego	San Francisco	Seattle	Washington D.C.
2005	1.72	1.60	1.63	1.80	1.80	1.77	1.58	1.83	1.22	1.78	1.85	1.68	1.82	1.75
2006	1.75	1.60	1.63	1.78	1.81	1.78	1.60	1.81	1.22	1.78	1.86	1.69	1.82	1.74
2007	1.73	1.59	1.64	1.76	1.81	1.79	1.62	1.82	1.22	1.79	1.85	1.68	1.83	1.76
2008	1.76	1.58	1.63	1.76	1.80	1.79	1.59	1.80	1.22	1.80	1.85	1.67	1.83	1.75
2009	1.74	1.58	1.61	1.75	1.80	1.80	1.57	1.79	1.21	1.78	1.84	1.68	1.82	1.75
2010	1.75	1.56	1.61	1.76	1.80	1.78	1.57	1.79	1.21	1.76	1.84	1.66	1.80	1.74
2011	1.74	1.55	1.58	1.75	1.79	1.76	1.55	1.77	1.20	1.75	1.83	1.66	1.79	1.71
2012	1.76	1.57	1.59	1.75	1.80	1.76	1.56	1.79	1.20	1.75	1.84	1.64	1.80	1.72
2013	1.76	1.58	1.60	1.77	1.83	1.77	1.57	1.81	1.23	1.75	1.86	1.67	1.79	1.74
2014	1.79	1.57	1.62	1.79	1.84	1.79	1.59	1.81	1.23	1.78	1.87	1.69	1.80	1.74

Figure 46: 14 Selected U.S. Metro Areas, Vehicles per Household: 2005–2014
(Source: U.S. Census, American Community Survey 1-Year Estimates)

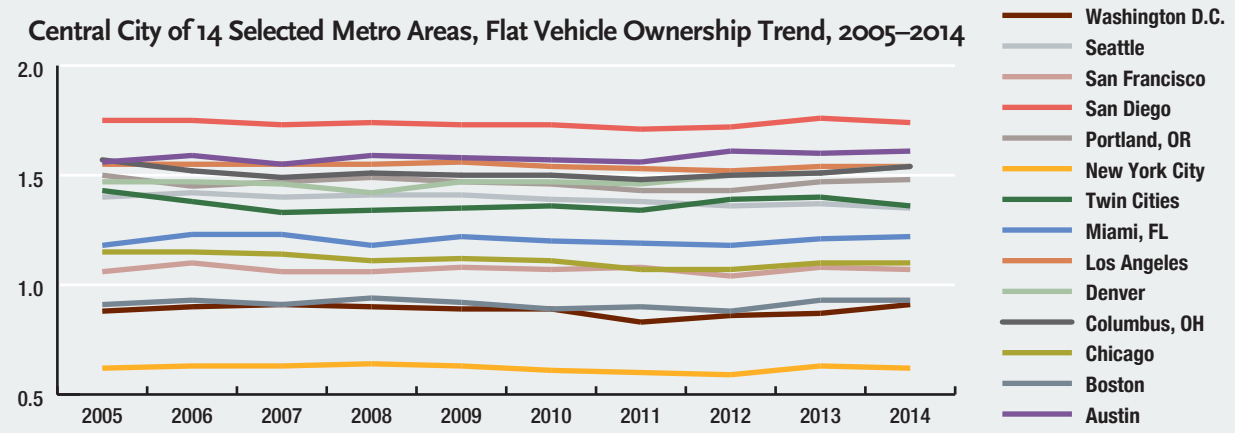


Figure 47: Central City of 14 Selected Metro Areas, Flat Vehicle Ownership Trend, 2005–2014
(Source: U.S. Census, American Community Survey 1-Year Estimates)

Central City of 14 Selected U.S. Metro Areas, Vehicles per Household, 2005–2014

	Austin	Boston	Chicago	Columbus, OH	Denver	Los Angeles	Miami, FL	Twin Cities	New York City	Portland, OR	San Diego	San Francisco	Seattle	Washington D.C.
2005	1.56	0.91	1.15	1.57	1.47	1.55	1.18	1.43	0.62	1.50	1.75	1.06	1.40	0.88
2006	1.59	0.93	1.15	1.52	1.47	1.55	1.23	1.38	0.63	1.45	1.75	1.10	1.42	0.90
2007	1.55	0.91	1.14	1.49	1.46	1.55	1.23	1.33	0.63	1.47	1.73	1.06	1.40	0.91
2008	1.59	0.94	1.11	1.51	1.42	1.55	1.18	1.34	0.64	1.49	1.74	1.06	1.41	0.90
2009	1.58	0.92	1.12	1.50	1.47	1.56	1.22	1.35	0.63	1.47	1.73	1.08	1.41	0.89
2010	1.57	0.89	1.11	1.50	1.47	1.54	1.20	1.36	0.61	1.46	1.73	1.07	1.39	0.89
2011	1.56	0.90	1.07	1.48	1.46	1.53	1.19	1.34	0.60	1.43	1.71	1.08	1.38	0.83
2012	1.61	0.88	1.07	1.50	1.50	1.52	1.18	1.39	0.59	1.43	1.72	1.04	1.36	0.86
2013	1.60	0.93	1.10	1.51	1.51	1.54	1.21	1.40	0.63	1.47	1.76	1.08	1.37	0.87
2014	1.61	0.93	1.10	1.54	1.54	1.54	1.22	1.36	0.62	1.48	1.74	1.07	1.35	0.91

Figure 48: Central City of 14 Selected U.S. Metro Areas, Vehicles per Household, 2005–2014
(Source: U.S. Census, American Community Survey 1-Year Estimates)

Vehicle-Miles Traveled (VMT)

Have aggregate VMT numbers changed in urban areas since 2005? In brief, the results are much the same as with vehicle ownership trends. VMT statistics have been virtually as flat as vehicle ownership since 2005.

The most recent city-by-city VMT data by the Federal Highway Administration's Office of Highway Statistics is through 2013. The administration's website provides "Urbanized Area Summaries" of VMT on an annual basis.

Note that an Urbanized Area (UZA) is a slightly different concept than a metropolitan area. Whereas a metro area covers all of the counties surrounding a principal city of 50,000 or more persons, an urbanized area is not county-based, instead covering all built-up areas in the vicinity of a principal city of 50,000 or more in population. It is a small difference but the practical effect is that urbanized areas are more compact and cover less land area than metropolitan areas.

To begin with, a national trend-line can be tallied. Figure 49 graphs annual VMT aggregated for all urbanized areas in the United States since 2005.

Figure 49 shows a flat trend-line with a very slight uptick in 2012 and 2013. This upslope in 2012 and 2013 is largely due to a small increase in the official number of urbanized areas. Figure 50 tabulates the graph from Figure 50 and adds an annual count of urbanized areas.

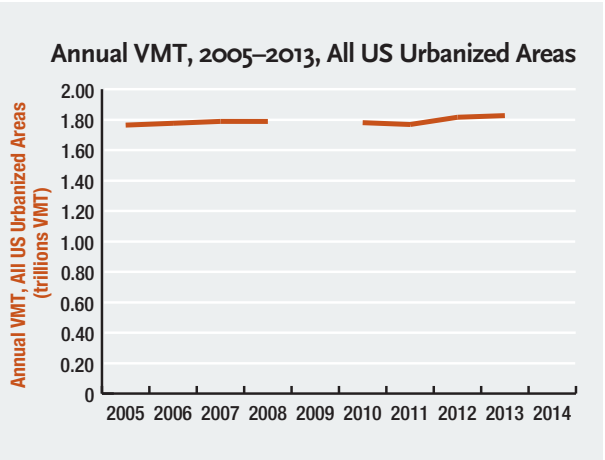


Figure 49: Annual VMT, 2005–2013, All US Urbanized Areas *(Source: Federal Highway Administration, Office of Highway Statistics, Table HM 71)*

Annual VMT, 2005–2013, All US Urbanized Areas

	Total UZA VMT (trillions VMT)	Number of UZAs (with available data)
2005	1.75	441
2006	1.78	444
2007	1.79	443
2008	1.79	454
2009	NA	NA
2010	1.79	445
2011	1.76	442
2012	1.80	458
2013	1.85	473
2014	NA	NA

Figure 50: Annual VMT, 2005–2013, All US Urbanized Areas *(Source: Federal Highway Administration, Office of Highway Statistics, Table HM 71)*

When focusing only on selected urbanized areas—the same 14 as for vehicle ownership—the trend remains flat, as show in Figures 51–52.

Reading the columns downward, there is very little change over time in the aggregate VMT for each urbanized area.

The only possible exceptions are Austin, Texas, which has known significant population growth between 2005 and 2013, and San Francisco, where VMT shows a large drop from 2012 to 2013 (from 26.0 to 21.8 billion annual VMT). As San Francisco is one of the hubs of the sharing economy, this finding is the only one in this section that shows a potential effect of the sharing economy on the actual amount of vehicle transportation.

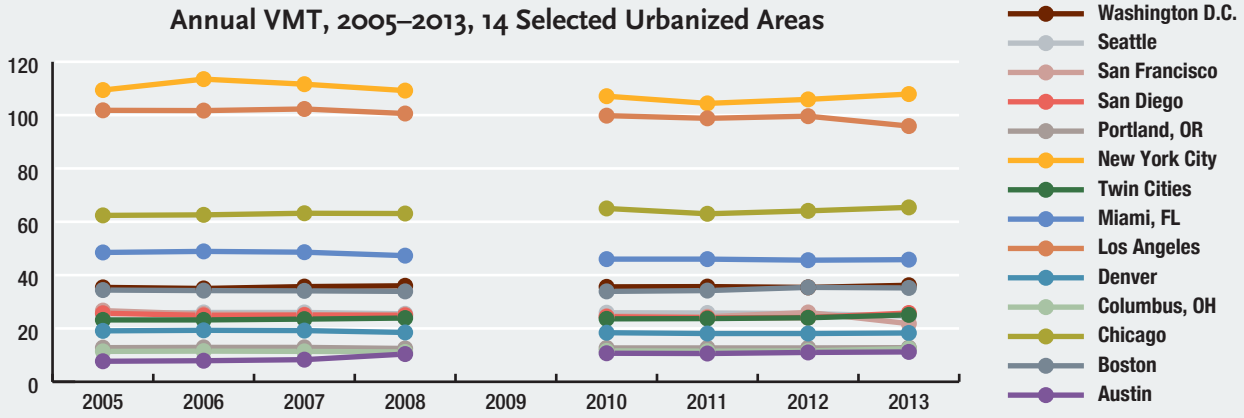


Figure 51: Annual VMT, 2005–2013, 14 Selected Urbanized Areas
(Source: Federal Highway Administration, Office of Highway Statistics, Table HM 71)

14 Selected U.S. Urbanized Areas, Annual VMT (billions): 2005–2014

	Austin	Boston	Chicago	Columbus, OH	Denver	Los Angeles	Miami, FL	Twin Cities	New York City	Portland, OR	San Diego	San Francisco	Seattle	Washington D.C.
2005	7.7	34.4	62.4	11.4	19.1	101.8	48.5	23.2	109.4	12.8	25.7	26.7	25.5	35.4
2006	7.9	34.2	62.6	11.5	19.3	101.7	48.9	23.2	113.5	12.9	24.9	25.4	26.0	35.0
2007	8.3	34.1	63.2	11.4	19.2	102.3	48.6	23.5	111.6	12.9	25.0	25.2	26.0	35.7
2008	10.4	33.9	63.1	11.2	18.5	100.6	47.3	23.9	109.2	12.5	24.9	25.2	25.5	36.0
2009	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2010	10.7	33.9	65.0	11.6	18.4	99.8	46.0	23.6	107.1	12.7	24.4	24.6	25.9	35.6
2011	10.6	34.2	63.0	11.5	18.1	98.8	46.0	23.7	104.4	12.7	24.0	24.4	25.8	35.7
2012	11.0	35.4	64.1	11.6	18.1	99.6	45.6	24.0	105.9	12.7	24.1	26.0	25.6	35.4
2013	11.2	35.2	65.4	12.4	18.3	95.9	45.8	25.1	107.9	12.8	25.8	21.8	24.6	36.2

Figure 52: 14 Selected U.S. Urbanized Areas, Annual VMT (billions): 2005–2014
(Source: Federal Highway Administration, Office of Highway Statistics, Table HM 71)

Interpretation of Vehicle Ownership and VMT Trends

These vehicle ownership figures seem to contradict the AlixPartners report mentioned in the Introduction section, which estimates that 500,000 vehicle purchases have been foregone since the inception of car-sharing.[14] If this were true, then why has there been no change at all in household vehicle ownership in metropolitan areas? On the other hand, it could also be that AlixPartners is accurate and these avoided purchases were indeed avoided, but 500,000 vehicles is such a tiny proportion (0.2%) of the total U.S. vehicle fleet of 250 million that the flat trend for vehicle ownership per household could actually factor in the avoided purchases and still remain flat.

A similar logic could apply to the flat VMT trend-line. It may be that sharing economy companies have caused changes in VMT magnitudes or utilization patterns, but that these changes have been so focused in narrowly targeted micro-areas that they do not show up in aggregate numbers for the VMT of all U.S. urbanized areas. One must keep in mind that aggregate urbanized-area VMT occurs on the order of trillions, surpassing 1.8 trillion in 2013.[15] Within the context of these trillions, the millions of VMT for the sharing services cited in so many breathless media articles are not actually all that much.

Nevertheless, this admonition to be cognizant of the total scope should not be read as dismissive of the impact, or possible future impact, of sharing economy transportation services. The fact is that it is way too soon to tell what the long-term effect will be on either vehicle ownership or VMT as these services grow and mature into the future. It is truly

anybody's guess. The next five, 10 or 15 years of data may turn out to be quite telling, if these new services continue to expand in popularity.

For both vehicle ownership and VMT, the data presented in this study should thus be seen as a very basic starting point for future tracking. It is helpful to look at aggregates, since they do define the total scope or universe of what is being studied, but it is not enough. Some amount of research is starting to be done, but has mostly been limited to surveys with a small sample size and has not been done systematically on a nationwide basis.[16] The critical long-term question will be whether measurable changes in narrowly targeted micro-areas, if found to exist, will scale up into large-scale macro trends.

[14] See note 2.

[15] Federal Highway Administration, Office of Highway Statistics, Table HM-71.

[16] See for example, Chen, Mislove, and Wilson, "Peeking Beneath The Hood Of Uber," Proceedings of the 2015 ACM Conference on Internet Measurement, pp. 495 – 508, (available at http://dl.acm.org/citation.cfm?id=2815681) which distributed 43 copies of the Uber app to service-users in San Francisco and tracked their ridership and payments for four weeks. See also Rayle, Shaheen, Chan, Dai, and Cervero, "App-Based On-Demand Ride Services: Comparing Taxi and Ridesourcing Trips and User Characteristics in San Francisco," University of California, Berkeley, August 2014. Available at http://www.uctc.net/research/papers/UCTC-FR-2014-08.pdf

Fuel Demand

A related question has been what effect the sharing economy services will have on vehicle fuel demand in the United States. Conceptually, fuel demand is derivative from two main factors: vehicle travel and fuel efficiency. The following equation expresses this derivation:

Fuel Consumption = (VMT) / (miles per gallon)

Fuel consumption increases when one of two things happens: (1) VMT increases or (2) fuel efficiency (measured in miles per gallon) declines.

For one, VMT, the flat trend-line, as shown in Figures 49–52, seems to indicate that nothing has changed, at least not yet, with respect to the sharing economy, VMT and effect on fuel demand. The caveat to this finding is that VMT trends—and thus fuel demand—may still have changed in narrowly targeted areas that were missed by the aggregate VMT measures used in this study.

Second, for fuel-efficiency, it is necessary to look at hybrids and EVs, which have much higher fuel-efficiency than standard gasoline-powered internal combustion vehicles. The sharing fleets with available data—Zipcar, Enterprise, Car2Go, Turo—contain non-trivial amounts of alternative-fueled vehicles (Figures 31–33), with the Toyota Prius appearing the most frequently of any alternative vehicle, but the total amount of shared hybrids and EVs still does not amount to more than a few hundred of each.

A few hundred shared hybrids or EVs seems unlikely in the short-term to revolutionize the general vehicle fleet, but this must be placed in broader perspective in imagining long-run scenarios which could indeed cause a marked increase of fuel-efficiency, and thus decrease fuel demand. If the shared fleets were to eventually concentrate a large amount of driving in a small amount of vehicles, and if the sharing fleets were to eventually become either all hybrid or all-electric, then a large amount of aggregate VMT could conceivably achieve a very high fuel-efficiency, since hybrid vehicles have an efficiency of 50 mpg and plug-in battery EVs (BEVs) of 132 mpg.[17]

The scenario of an all-alternative, extremely high fuel-efficiency set of shared fleets would require a convergence of multiple trends. Both vehicle ownership and the composition of the fleets would need to shift radically; while unlikely in the short-term, it is anybody's guess whether this scenario will become reality in the long-term. If it did become reality, it could be an elegant solution to a very difficult chicken-and-egg mass market creation problem for alternative vehicles.

The explosive growth of the Uber fleet does give some credence to the future plausibility of this scenario: What if Uber were to make a deal with automakers and provide incentives for all of its driver-contractors to acquire inexpensive hybrids or EVs? Credence is lent also by Car2Go's successful experiment with an all-electric fleet in San Diego, a city which has made comprehensive efforts to develop an electric vehicle charging infrastructure[18]. What if other cities were to follow in San Diego's footsteps? Studying the driving patterns of the Car2Go San Diego fleet could possibly serve as a good case study on the future possibility of an all-electric shared fleet nationwide.

[17] Alternative Fuels Data Center, US Department of Energy. "Average Fuel Economy at Different Road Grades." Available at http://www.afdc.energy.gov/uploads/data/data_source/10601/10601_road_grade_MPG.xlsx.

[18] See note 12.

Conclusion

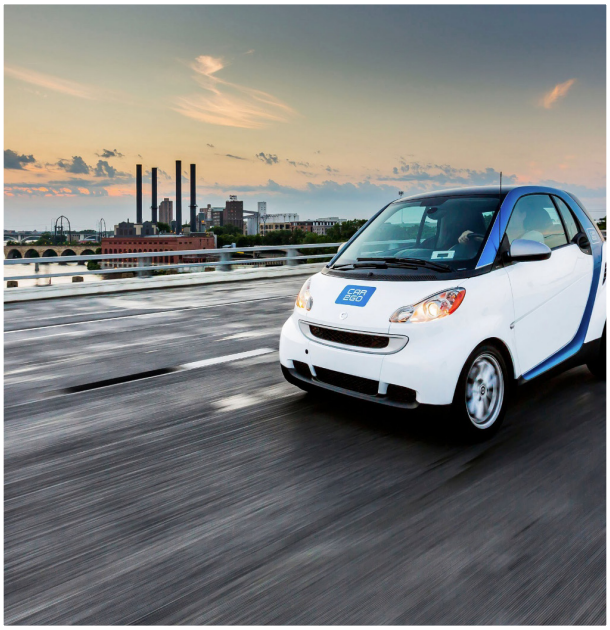
As the car-sharing market grows and competition heats up between competing business models, between the four companies profiled in-depth in this study as well as Uber and Lyft, it becomes more important to have an objective framework and objective data for understanding what is occurring.

This point is made, for example, by online publication GreenBiz, "Zipcar, Google, and why the car-sharing wars are just beginning,"[19] which assesses the likely market wars to occur during the next several years as sharing vehicles becomes more popular. A related type of article that has often appeared tends to look at specific decisions made in specific market segments by a single company. For instance, in March 2012, Forbes magazine's article, "Zipcar Hits College Campuses to Attract Young Drivers,"[20] examines the intensification of Zipcar's efforts "to become the favorite among young drivers" and speculates on the impact this could have on the rest of the shared transportation market.

[19] Lauren Hepler, "Zipcar, Google, and why the carsharing wars are just beginning." GreenBiz. July 14,2015. Available at http://www.greenbiz.com/article/zipcar-google-and-why-carsharing-wars-are-just-beginning

[20] Trefis Team. "Zipcar Hits College Campuses To Attract Young Drivers." March 25, 2012. Forbes. Available at http://www.forbes.com/sites/greatspeculations/2012/03/25/zipcar-hits-college-campuses-to-attract-young-drivers/#2715e4857a0b2a36769e4d8a

The analysis in these and similar media articles is compelling, but would be strengthened if it contained concrete specifics on the market traits of each company. The current study is meant to fill this knowledge gap by serving as a general resource for future analyses of the shared urban transportation market space.



About the Fuels Institute

The Fuels Institute, founded by NACS in 2013, is a 501(c)(4) non-profit research-oriented think tank dedicated to evaluating the market issues related to vehicles and the fuels that power them. By bringing together diverse stakeholders of the transportation and fuels markets, the Institute helps to identify opportunities and challenges associated with new technologies and to facilitate industry coordination to help ensure that consumers derive the greatest benefit.

The Fuels Institute commissions and publishes comprehensive, fact-based research projects that address the interests of the affected stakeholders. Such publications will help to inform both business owners considering long-term investment decisions and policymakers considering legislation and regulations affecting the market. Our research is independent and unbiased, designed to answer questions, not advocate a specific outcome. Participants in the Fuels Institute are dedicated to promoting facts and providing decision makers with the most credible information possible, so that the market can deliver the best in vehicle and fueling options to the consumer. For more about the Fuels Institute, visit www.fuelsinstitute.org.

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