

**Collaborative mobility services in
European cities - a comparison**



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Obtaining data

The most challenging part in the work process was obtaining the needed data. To obtain the desired data providers were contacted directly via phone, social media and LinkedIn.

Although several providers were willing to share their data, others withheld their data and stated that they had no interest in participating. This was justified by having expansion plans or being in the process of expanding and not wanting to openly communicate their numbers to the competitors. A few providers did not respond at all. To nevertheless enable a comparison, metadata was used in the following paper.

By comparing numbers from previous studies with recent newspaper articles and press releases, an approximate number of vehicles was determined. This determined number was sent back to the providers. If no objection was made, the numbers were declared valid and are marked as metadata in the paper.

Disclaimer

The employed currency is the euro. An exception is the U.S. dollar for the Big Mac Index. The exchange rates used are from the 8th October 2018.

The reference date used for reporting the number of vehicles is the 31st August 2018. Providers exiting before or entering the market or expanding after the record date were not included in this paper. An exception was made for the electric-kick scooter-sharing. The record date was moved to the 31st October 2018 because most of the providers started their service after the 31st August 2018.

The "Peer-to-peer"-carsharing metadata was obtained in an online count on the 22nd/27th and 29th November 2018.

If a subscription was needed to use a certain type of sharing it was included in the cost. The cost of the subscription was broken down to a single use. Packages, discounts through external memberships and registration fees were not taken into account.

Whenever a gender-specific term is used, it should be understood as referring to both genders, unless explicitly stated. This is done solely for the purpose of making the text easier to read, and no offense or sexism is intended.

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1 Sharing economy – an ever-changing market



“An economic system that is based on people sharing possessions and services, either for free or for payment, usually using the internet to organize this.”^[1]

The sharing economy market is developing progressively and playing an increasing role in people’s thinking. Especially in today’s world, where resource scarcity and environmental awareness are major topics, the option of consuming a good at the time it is required can be an interesting alternative to ownership. Is it worth buying a new car? Can one’s own car be used to capacity? Is it necessary to own and maintain a bicycle that only serves commuting between the railway station and the place of work?

Urban planning as well as increasing settlement density are causing parking spaces for vehicles to disappear, motorised vehicles being banned from certain roads and congested major routes. Vehicle sharing offers residents not only the possibility of car use when needed but also a solution for the first and last mile. If a commuter reaches his or her workplace faster by railway and electric-motor scooter sharing than by car, the traffic on major routes can be reduced.

Such advantages show the potential of sharing. Initially praised as a revolution and through the constant integration of new sharing offers in the cities, sharing repeatedly made its way into the media and the minds of people. But is sharing as big as it seems? Do invasions and subsequent disappearances of bike sharing providers hinder the market? Are sharing cities emerging in Europe? Or summarising: Is the sharing-hype only an illusion?

These questions will be followed up in the following study. This paper marks the fourth edition of the study on sharing services in Europe published by the third semester students in transportation system of the ZHAW School of Engineering.

2 Sharing mobility

Mobility can be shared in many ways. Apart from sharing vehicles, rides are also offered. Ridesharing includes people offering other people a ride from A to B for a fixed price. This kind of sharing as well as classic rental services, ride hailing services, or services provided only during business hours are not included in this study.

In this study each of the five sharing types carsharing, P2P-carsharing, motor-scooter sharing, bike sharing and e-kick scooter sharing will be compared across seven European cities.

Carsharing



When living in a city owning a car is hardly profitable. Destinations within the city can be reached more efficiently and environmentally friendlier by bike or public transport. If a car is needed it easily can be hired from one of the carsharing-providers. These providers offer a wide range of different vehicles and depending on the renting system, the vehicle can be parked anywhere in a defined zone. To achieve a convenient access to the chosen vehicle it can be booked, opened by a “smart door-opening system” and paid by App. A physical exchange of keys is not required.

P2P-carsharing



The difference from “peer-to-peer-carsharing”, in short “P2P-carsharing”, to carsharing lies in the ownership. While a carsharing provider rents out its own cars, a P2P provider offers an online platform where individuals can rent out their private car. This offers car owners to earn some money while not using the car. The price is set by the car owner. Booking, opening and paying happen the same way as in carsharing. The ignition key is placed in a defined spot inside of the car.

Motorised-scooter sharing



To reduce car traffic in city centres and offer inhabitants a convenient way to cover short distances motorised scooters are suiting. These can be rented everywhere at any time. To be permitted to use a motorised scooter a driving license is mandatory. Locating and renting a motorised scooter is done by App. Usually two helmets of different size are stored in the top case. Motorised-scooter-sharing still is a new service and most providers offer electric motor scooters.

Bike sharing



Bike sharing is similar to carsharing and also quite established. Especially free-floating services are becoming increasingly popular, thanks to the development of smart locks. The Smartphone is essential for unlocking and paying for the bike. New innovative providers are entering the market permanently leading to high competition. Hardly surprising every year providers vanish again. One of the biggest changes on the bike sharing market were the e-bikes which gaining in popularity because of their additional comfort.

E-kick scooter sharing



For the first time in this series, electric-kick scooter are analysed. Being the newest of all sharing vehicles this sharing offer also benefits strongly from digital developments. To rent an e-kick scooter, simply an app is required to locate and unlock it. Generally, a user is free to park the scooter anywhere, but a few cities have already introduced no-parking-zones. To charge the batteries the e-kick scooters are collected and reactivated by external companies. Reaching speeds up to 25 kilometres per hour a helmet is not mandatory. Providers don't offer helmets directly with the e-kick scooter but are recommended. E-kick scooters must be ridden on the streets.

2.1 Terms and symbols

The different sharing vehicles are provided in various renting systems and sizes (cars). These will be listed, defined and provided with a symbol to mark them in the paper.

Renting systems



Round-trip: The rented vehicle has a fixed parking spot. Renting starts and ends at the same spot.



One-way: A provider operates at several locations. Vehicles can be moved freely between these locations.



Free-floating: Vehicles can be rented and parked anywhere within a defined area.

Vehicle sizes



Small: A small city car without a lot of loading space. Excellent for one to two people and short distances. E.g.: VW Polo, Ford Fiesta, Renault ZOE



Medium: A sedan or station wagon with enough loading space and legroom for one to four people. E.g.: Ford Focus wagon, Toyota Auris wagon, Skoda Octavia



Large: A compact, multi-purpose vehicle with enough loading space and the possibility to fold open two additional seats in the loading compartment. E.g.: VW Touran, Opel Zafira, Seat Alhambra

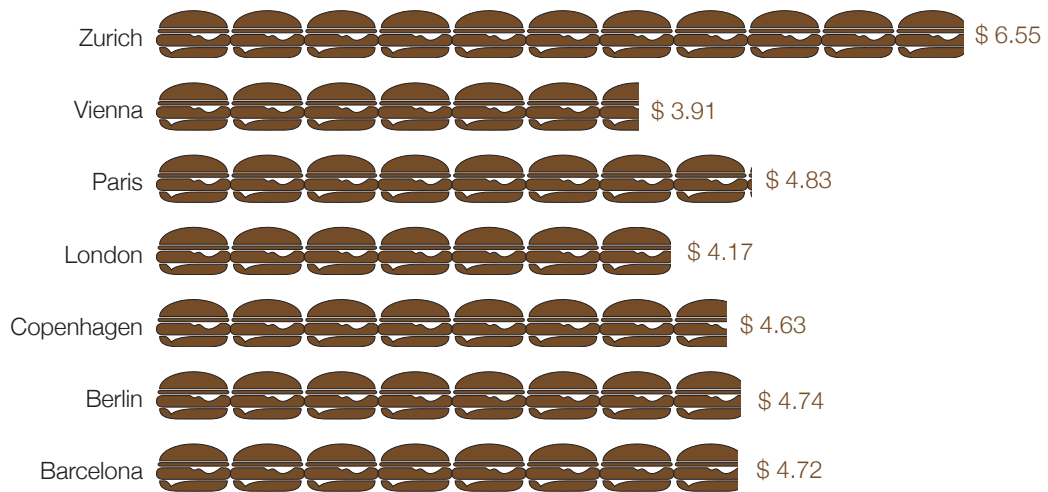
2.2 Big Mac Index



Directly comparing the different prices for sharing in the seven cities is difficult. Every country has an individual purchasing power. To put the prices into perspective the Big Mac Index, invented by the British weekly “The Economist”, was chosen.^[2]

The McDonald's Big Mac is a worldwide standardised product made from local ingredients. To compile the Big Mac Index the local price for a Big Mac is converted into U.S. dollars. Employing the Big Mac Index enables the price for a sharing offer in the respective city to be converted to the number of Big Macs that would be able to be bought for the same price. This facilitates the interpretation of the price in terms of purchasing power and as how expensive it is perceived locally.

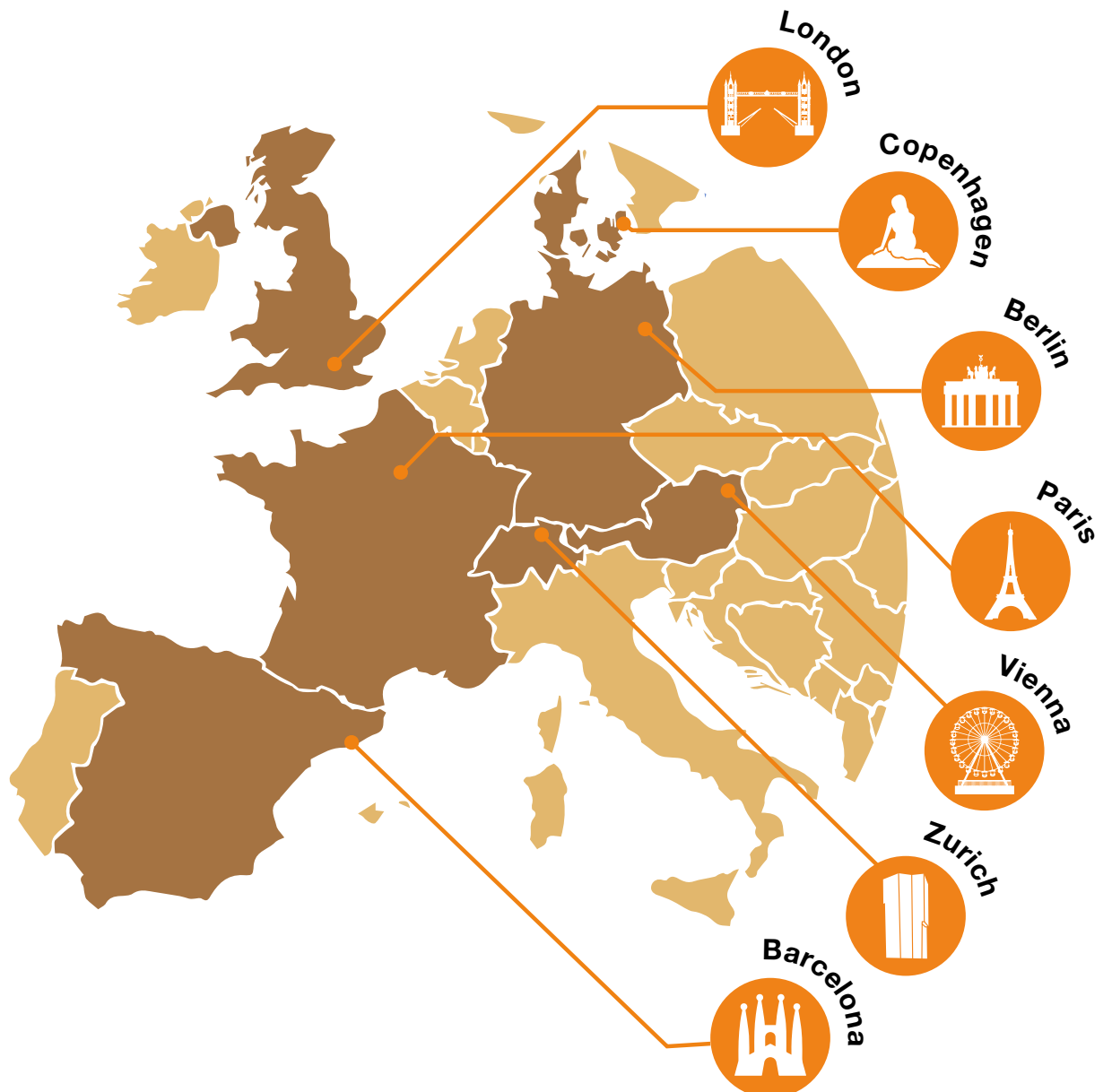
Price per Big Mac 2018 according to «The Economist»



3 City characteristics



The sharing offers of the following cities will be analysed in this study: Barcelona, Berlin, Copenhagen, London, Paris, Vienna and Zurich. These cities have been investigated in the previous studies, providing a basis for a comparison of the development of the sharing services.



Zurich



Price per Big Mac:	\$ 6.55
Population:	428 000
Population density:	4660/km²
Wet days per year:	134
Transported passengers per year:	302.7 M
Tram	203.6 M
Trolleybus	54.5 M
Bus	44.6 M

Zurich is the largest city of Switzerland and hometown of this study. Furthermore, Zurich, which provides an above average public transport, is the smallest of the compared cities. This is reflected in the proportion of public transport to the whole transport. 63% of the population use the public transport daily – more than anywhere else in the world.

Vienna is the second largest city in the German-speaking areas and for the ninth consecutive time was awarded the title of “most liveable city worldwide” by the American human resources consulting firm Mercer. It is praised for its cultural offerings and above average local public transport. The 7% of cyclists are provided with 1400 km of cycling routes in and around the city.^{[3][4]}

Vienna



Price per Big Mac:	\$ 3.91
Population:	1.87 M
Population density:	4502/km²
Wet days per year:	160
Transported passengers per year:	954.2 M
Metro	440.1 M
Tram	305.8 M
Bus	208.3 M

Paris is the most densely populated metropolis in Europe. In May 2016, the program “Paris respire” (Paris breathes) was launched. For defined times on Sundays and public holidays, streets and areas in the city centre are closed to cars.^[5] Once a month this also applies to the famous Champs-Élysées. The aim of the program is to reduce the traffic in and around the city centre and make it less attractive to use the car. At the same time the city government is promoting the use of (shared) bikes, to reduce congested streets, smog and the number of days on which the maximum ozone limits is exceeded.^[6]

Paris



Price per Big Mac:	\$ 4.83
Population:	2.22 M
Population density:	21 067/km²
Wet days per year:	111
Transported passengers per year:	4385.0 M
Metro	2740.0 M
Bus	1280.1 M
Tram	365.0 M

London is the most important financial hub and the most visited tourist destination in Europe.^[7] Moreover, London is home to one of the most frequently used public transport systems. Instead of banning certain cars from the city centre, London introduced the Congestion Charge, successfully reducing cars in the city centre. Nevertheless, in comparison London’s modal split still features a high percentage of private motor vehicle use.

London



Price per Big Mac:	\$ 4.17
Population:	8.79 M
Population density:	5590/km²
Wet days per year:	153
Transported passengers per year:	3942.1 M
Bus	2247.0 M
London Underground	1357.0 M
London Overground	190.0 M
Docklands Light Rail	119.0 M
TfL Rail	45.3 M
Tram	29.1 M

Copenhagen



Price per Big Mac:	\$ 4.63
Population:	613 000
Population density:	7114/km²
Wet days per year:	171
Transported passengers per year:	192.4 M
S-train	130.3 M
Metro	62.1 M
Bus	N/A

Copenhagen is, climatically speaking, not very attractive for cycling. However, 30% of the overall traffic is made up of cyclists, not one of the analysed cities comes close to this. In general, Copenhagen is a very environmentally aware city. From January 2019, registering new diesel vehicles will be prohibited and a surcharge for parking a car with a combustion engine is being discussed. Moreover, the whole bus fleet of the local public transport is planned to be upgraded to electric buses.

Berlin is one of the largest cities in Europe and the largest as well as fastest growing German-speaking city. Thanks to the city's flat topography, the bike is quite popular and with only 341 registered cars to 1000 inhabitants, Berlin has the lowest car density of all German provinces.^[8] Furthermore, cars reaching defined levels of particulate emissions are banned from certain inner-city zones.

Berlin



Price per Big Mac:	\$ 4.74
Population:	3.72 M
Population density:	4176/km²
Wet days per year:	113
Transported passengers per year:	1505.8 M
Metro, Bus, Tram	1064.0 M
S-Bahn Berlin	441.8 M

Barcelona



Price per Big Mac:	\$ 4.72
Population:	1.62 M
Population density:	15 984/km²
Wet days per year:	78
Transported passengers per year:	571.2 M
Metro	381.0 M
Bus	190.0 M
Tram	0.2 M

Barcelona enjoys international recognition due to its importance as a major European tourism destination. Compared to other cities it has a high population density and very mild climate. In the city centre there are temporarily activated "green zones" with restricted access. These are announced when there is smog. Additionally, so called "superblocks" were defined, creating traffic-free blocks between major routes.^[9] Because of high parking charges in the city centre, park-and-ride systems are popular.

4 Groups of users

For each sharing type two groups of users were fixed. The weekly or daily usage, the covered distance, the duration of use and if necessary, the size of vehicle was defined. These serve the overall price comparison in chapter 5.

Carsharing

Weekly shopper



For the weekly shopping on Saturday a medium sized car with enough loading space is required. Depending on the week additional shopping must be done increasing the average duration of use to 2 hours and the distance travelled to 20 km. The weekly shopper can either use carsharing or P2P-carsharing. Both options are considered.



Freelancer



The freelancer usually uses a bike or public transport to get from A to B. However, for certain tasks in the region or next city he is dependent on a car. A small car is enough for his needs. He covers 60 kilometres in 2.5 hours and rents it from a carsharing provider. This way he does not have to get used to a new car each time.



P2P-carsharing

Weekly shopper



For the weekly shopping on Saturday a medium sized car with enough loading space is required. Depending on the week additional shopping must be done increasing the average duration of use to 2 hours and the distance travelled to 20 km. The weekly shopper can either use carsharing or P2P-carsharing. Both options are considered.



Family



For everyday needs, the family is not dependent on a car but once a month they want to visit their grandparents who live 150 kilometres away. Because there are enough large cars available in the neighbourhood the family uses P2P-carsharing. This has the advantage of a short distance to pick up the car and a high level of comfort for the 12-hour daytrip.



Motorised-scooter sharing

Tourist



To explore as much of the city as possible the tourist rents a motorised scooter. In the two days visiting the city the tourist uses the motorised scooter ten times, covering 3 kilometres on average and taking 9 minutes. The motorised scooters can also be used by two people, so they are also ideal for a couple on a weekend trip.



Occasional user



The bicycle and public transport are the usual means of transport for the occasional user. However, to quickly visit a friend in the evening he uses a motorised scooter. Without having to invest any muscle strength he reaches his destination 7 kilometres away, in 21 minutes.



Bike sharing



Tourist

The easy-going tourist is not in a rush. To experience the city's atmosphere while heading from one sight to the next he chooses a bike. The bike allows him to explore the city freely. During a day he cycles seven times, averaging 5 kilometres and 20 minutes each time.



Optimiser

The optimiser arrives at the train station late at night. Instead of waiting for the next bus, he rents a bike and departs immediately. The purchase of an own bicycle would hardly be worthwhile, because this route of 9 minutes and 3 kilometres is the only stretch he uses it for.



E-kick scooter sharing



Tourist

The trendy tourist uses an electric kick scooter for short distances, because the public transportation network cannot cover all his needs. That way, the 1.5 kilometres to the next tourist attraction can comfortably be covered in 6 minutes.



Commuter

Instead of taking the crowded bus to the office, the commuter rents an electric kick scooter. That way, he can cover the last mile without breaking a sweat and start the day in a relaxed manner. In 4 minutes, he covers the distance of one kilometre.



5 Providers, fleets and their prices

In the following chapter, the provider and their number of vehicles are illustrated for all five types of sharing: carsharing, P2P-carsharing, motorised scooter sharing, bike sharing and e-kick scooter sharing. Furthermore, the prices for the defined user groups are listed and compared, once in euros and once in Big Macs. In the diagram, the price in Big Macs represents the cheapest deal.

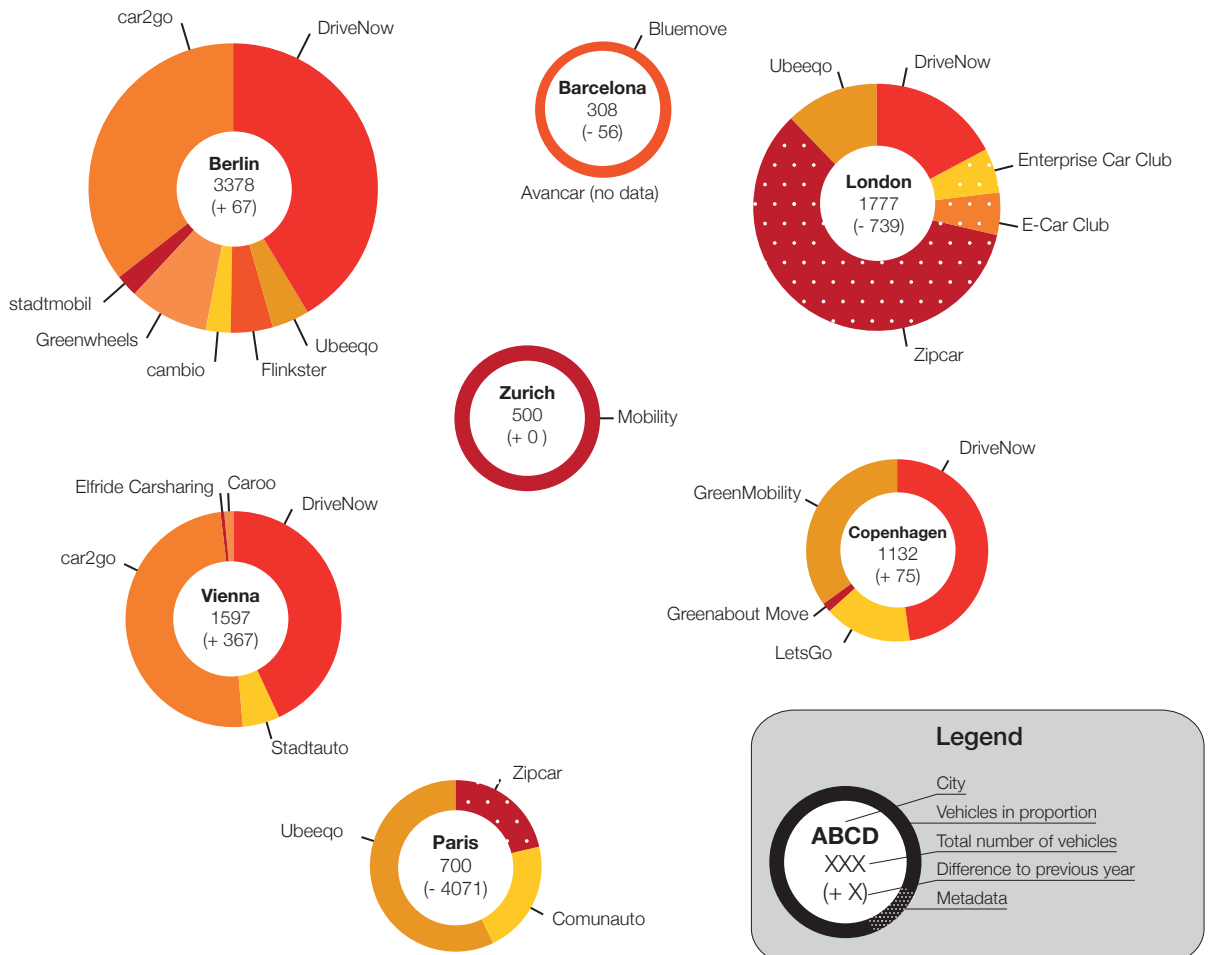
5.1 Carsharing



The total number of carsharing vehicles in the researched cities has decreased compared to the previous year. This is mainly due to the cities of Paris and London, with both recording a considerable decline in the number of carsharing vehicles. The decline of more than 4000 vehicles in Paris was caused by the disappearance of the carsharing provider “Autolib”. During 2018 their concession was withdrawn by the city government.^[10] Berlin, Copenhagen and Vienna recorded an increase in carsharing vehicles.

In Vienna “Caroo” and “Elfride” are exceptions on the carsharing market. “Caroo’s” fleet comprises six vehicles, “Elfride’s” a single one. “Elfride” is an association working according to the cost recovery principle. In order to use the vehicle, you must be part of the association, which meanwhile has a waiting list. Therefore, “Elfride” has not been considered in the price comparison.

Not all providers were willing to provide their data and especially for London metadata was used. This was already the case in the previous study. With that in mind the extent of the decline in London should be considered with caution. Depending on the provider, carsharing is available as a round-trip, one-way or free-floating system.



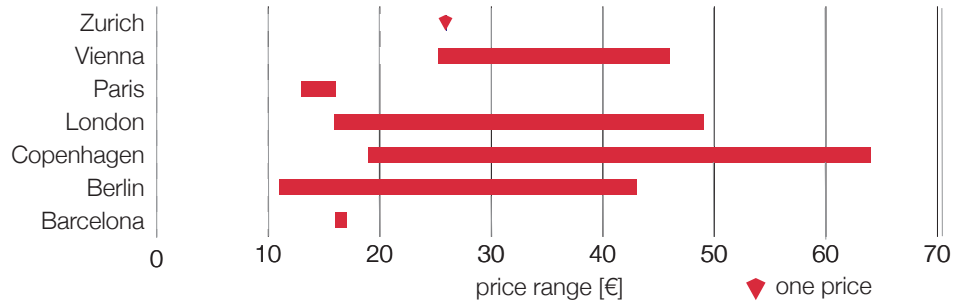
Weekly shopper



The price ranges for the “weekly shopper” differ greatly between the different cities. While the price ranges in Barcelona, Paris and Zurich are small, larger price differences can be found in the other cities. Due to the fact that only one provider operates in Zurich, only one price is listed.

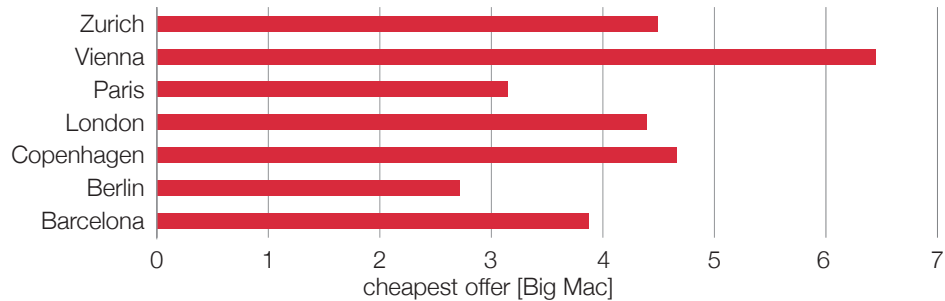


Price range “weekly shopper” per use



In the following diagram it is apparent that, taking local purchasing power into account, the costs in Copenhagen, London and Zurich are on a similar level. A weekly shopping trip with a carsharing vehicle is most expensive in Vienna. In contrast, an inhabitant of Berlin pays 2.5 times less for the same trip.

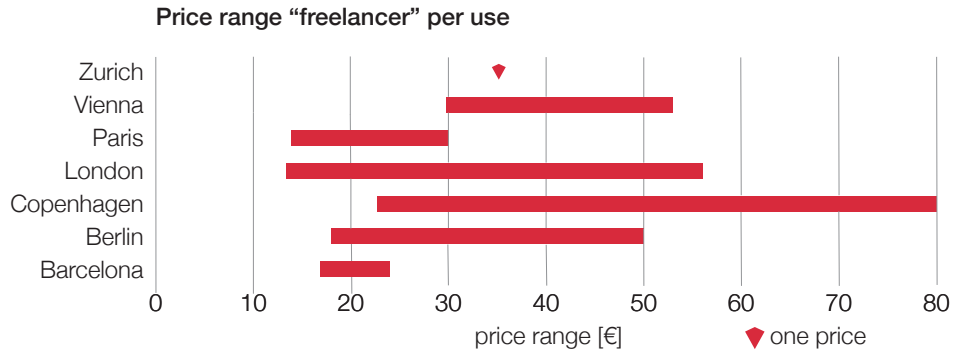
Cheapest offer “weekly shopper” in Big Macs



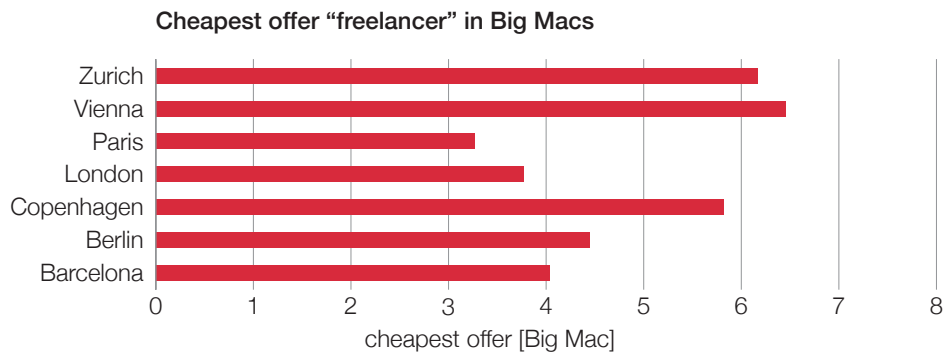
Freelancer



Within the cities, the “Freelancer” can experience price differences of up to 55 euros. Moreover, it is noticeable that with exception of Vienna and Zurich, the lowest prices are all below 24 euros, while the highest prices vary greatly.



Considering the purchasing power of each city, it becomes evident, that this type of carsharing is the most expensive in Vienna. Converted, a trip for the “freelancer” almost costs 6.5 Big Macs. Inhabitants of Paris on the other hand pay half of that price.



Change in use, change in provider



Especially in Barcelona, Berlin and Paris it is worth comparing the different providers when using the car for other purposes. Furthermore, the cheaper providers accordingly provide cheaper vehicles, while the more expensive providers offer car brands such as BMW or Mercedes-Benz. Customer satisfaction and customer service were not part of this analysis. Accordingly, no statement can be made regarding additional factors influencing the price.

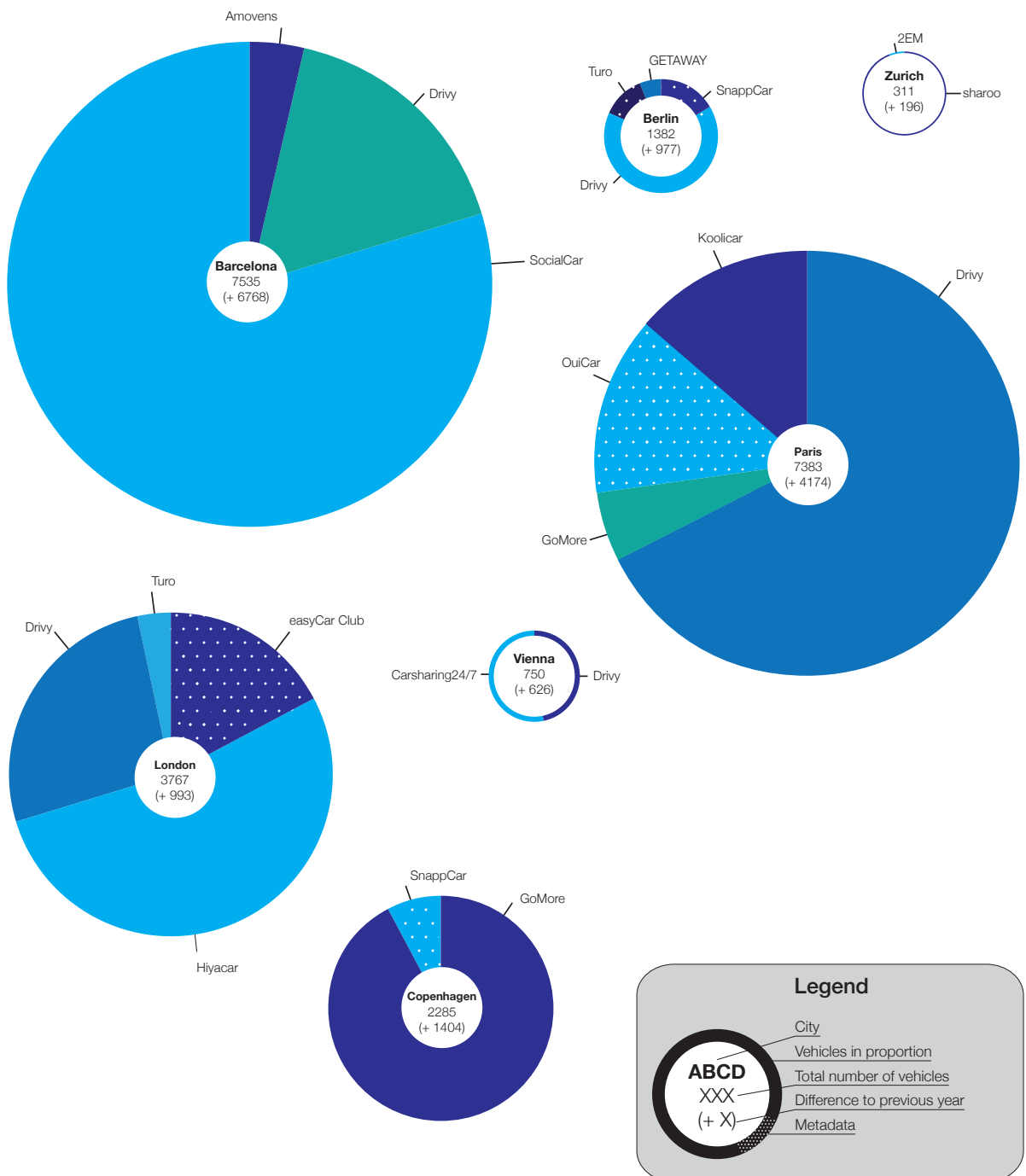
5.2 P2P-carsharing



P2P-carsharing has continued to grow in the researched cities. This is evident in the diagram. Increasingly more car owners are willing to rent out their private vehicle and earn some money in the process. Barcelona is by far the city with the most growth within a year, with an increase of over 6500 vehicles, followed by Paris with an increase of over 4000 vehicles. However, the number of P2P-platforms has developed variably. New providers have entered, while other providers have disappeared from the market. Some platforms have also joined forces.

As online platform operators without own vehicles, the P2P-carsharing market is in any case a rapidly changing segment of the vehicle sharing market. Thus, the number of vehicles can vary at short notice.

P2P-carsharing is only available as a round-trip system.



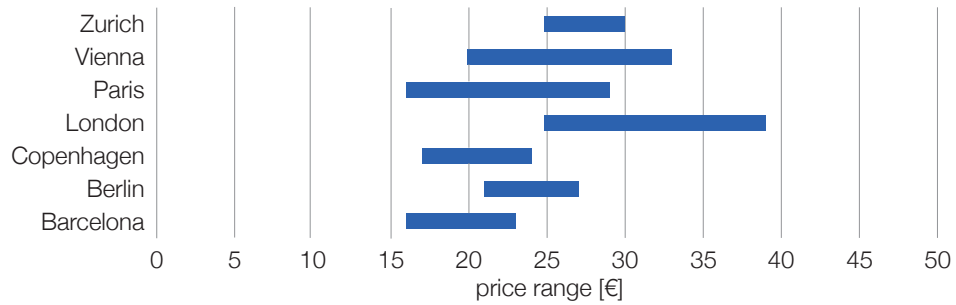
Weekly shopper



For the “weekly shopper”, the price ranges in the examined cities are comparatively small. This is due to the short period of use. The largest price difference between the cheapest and the most expensive offer is found in London and adds up to 14 euros. The cheapest offers in London and Zurich are 9 euros more expensive than those in the cheapest cities, Barcelona and Paris.

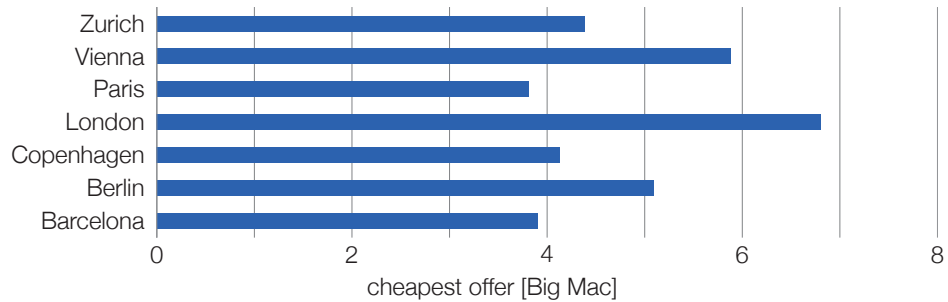


Price range “weekly shopper” per use



As noticeable in the diagram below, the use of P2P-carsharing in London is the most expensive for this user group, even when adjusted for purchasing power. Meanwhile, the costs in Zurich are on a similar level as in Barcelona, Paris and Copenhagen.

Cheapest offer “weekly shopper” in Big Macs



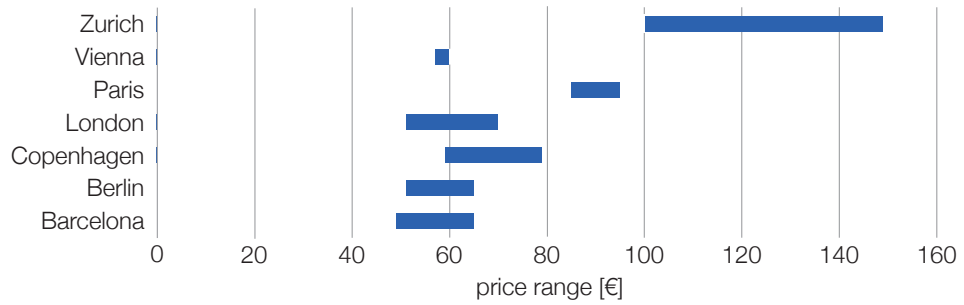
Family



Compared to other cities, the user group “family” has rather small price differences. Only Paris and above all Zurich, with a price range of 100 to 149 euros, are significantly more expensive. With a price difference of 4.50 euros between the cheapest and the most expensive offer in Vienna, the search for a suitable vehicle with regard to the price is easy for “families”.

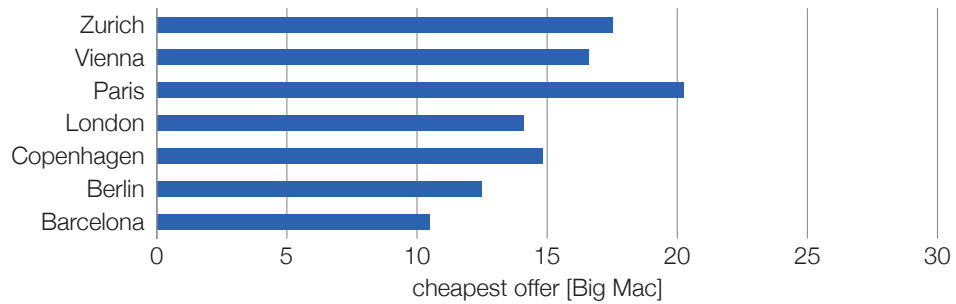


Price range “family” per use



Considering the purchasing power of each city, inhabitants of Paris pay the most for a weekly shopping trip with a P2P-Sharing vehicle. The cheapest offer for this user group costs twice as much as in Barcelona. Furthermore, the comparatively expensive absolute price in Zurich is put into perspective. Nevertheless, even after adjusting for purchasing power, Zurich residents pay more than in five of the other cities.

Cheapest offer “family” in Big Macs



Day trip - right round with P2P-carsharing



For round-trips, P2P-carsharing offers a good alternative to carsharing. With the exceptions of Berlin and London, the best offers are in the same range as the cheapest prices for carsharing. In addition, the price ranges are generally smaller than those in carsharing. It is assumed that individuals who register their car on a P2P-platform adjust their prices more to the prices of similar vehicles than carsharing providers.

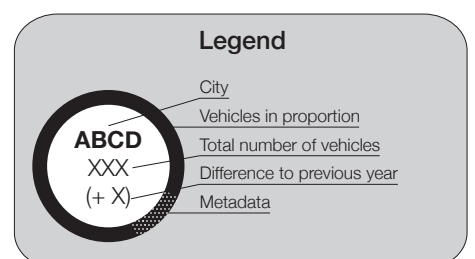
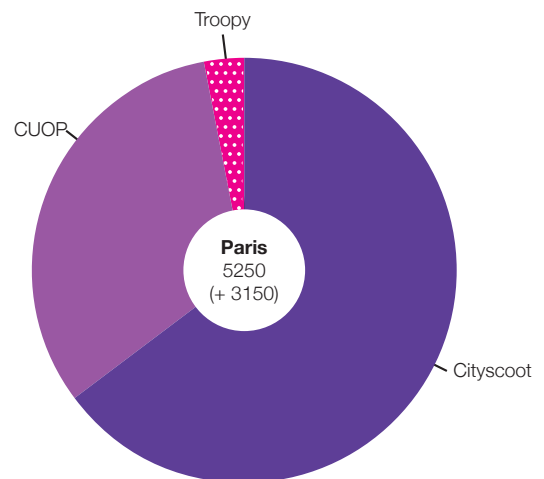
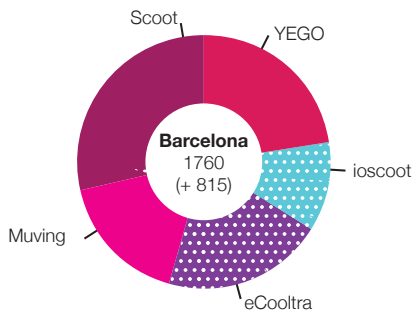
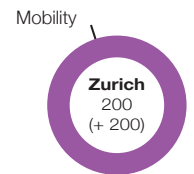
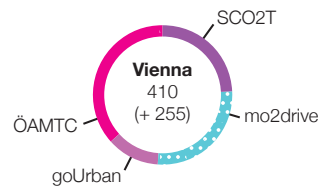
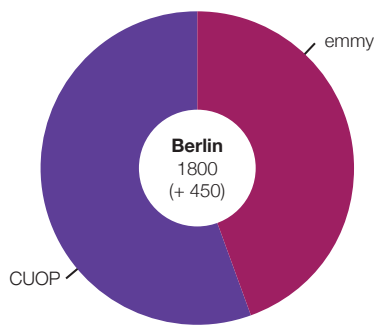
5.3 Motorised-scooter sharing



In recent years, motorised scooters have emerged as a new sharing vehicle. As in 2017, the largest scooter fleet is found in Paris, where it more than doubled in the last year. Over 5000 motorised scooters are available there. The fleets in the other cities have also increased. As a pioneer in Zurich, "Mobility" is newly providing 200 vehicles. The greatest diversity of providers is found in Barcelona. Apart from "Troopy" in Paris and "mo2drive" as well as "SCO2T" (partially) in Vienna, all motorised scooters are powered by electricity. Before winter, some providers collect all their vehicles and store them during the winter.

In the cities of Copenhagen and London no motorised scooter sharing has been launched.

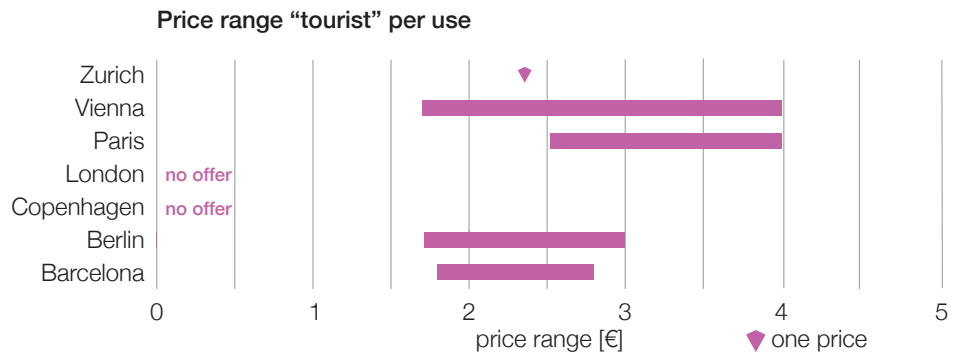
Motorised scooter sharing is available as a one-way and free-floating system.



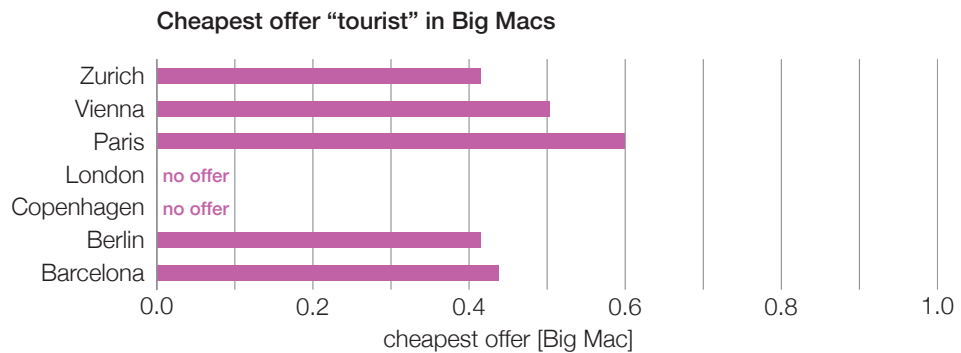
Tourist



While the use of a motorised scooter in Barcelona, Berlin and Vienna costs around 1.75 euros, it reaches up to 2.50 euros in Paris and Zurich. The price range of the five providers in Barcelona is noteworthy. While the price range in Barcelona is 1 euro, the difference of the four provider's prices in Vienna is more than 2 euros. This leads to the fact that the most expensive offer costs 2.3 times the amount of the cheapest one.



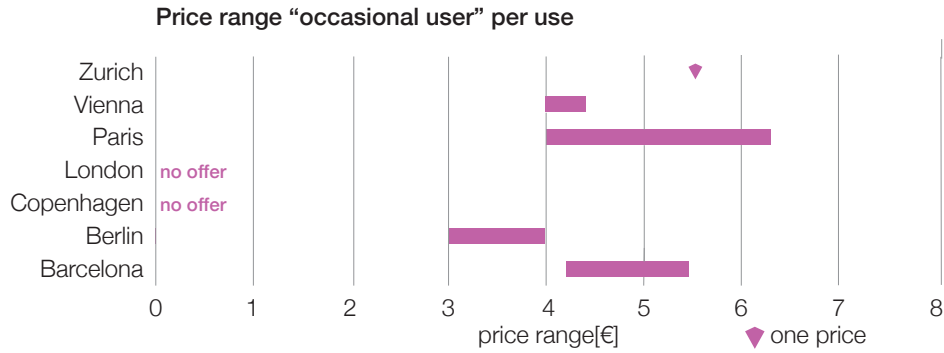
Adjusted for purchasing power, the expensive price in Zurich is put into perspective. According to the Big Mac Index, motorised scooter use in Berlin and Zurich is equal in price. However, the difference to Paris is only 0.2 Big Macs.



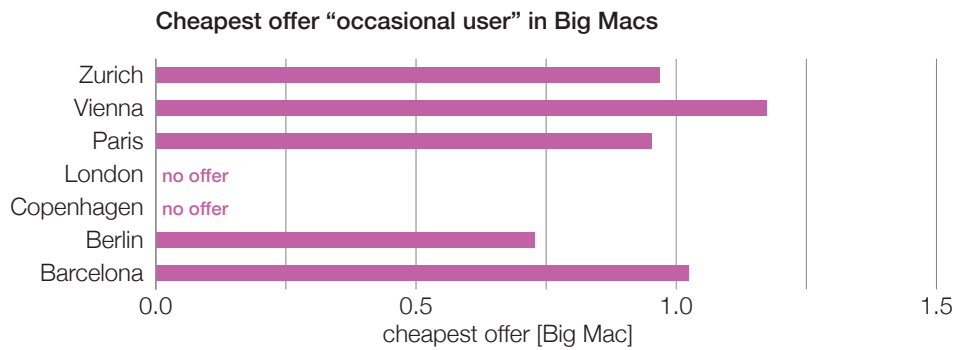
Occasional user



The striking fact in this comparison is that the most expensive offer for the “occasional user” in Berlin is equal to the cheapest offers in the next-cheapest cities, Paris and Vienna. In the most expensive city, Zurich, the “occasional user” has to pay over 5.50 euros.



In Barcelona, Paris and Zurich, the inhabitants pay a similar amount in relation to purchasing power. In contrast to the comparison with absolute prices, Vienna is the most expensive city.



107 % growth in the amount of motorised-scooters provided



In the past year, the total fleet of sharing scooters has more than doubled. It is assumed that this trend will continue but to a lesser extent. A pleasant fact is that the majority of all motorised sharing scooters are electrically powered. Considering acquisition costs for individuals, the prices are in a reasonable range.

5.4 Bike sharing



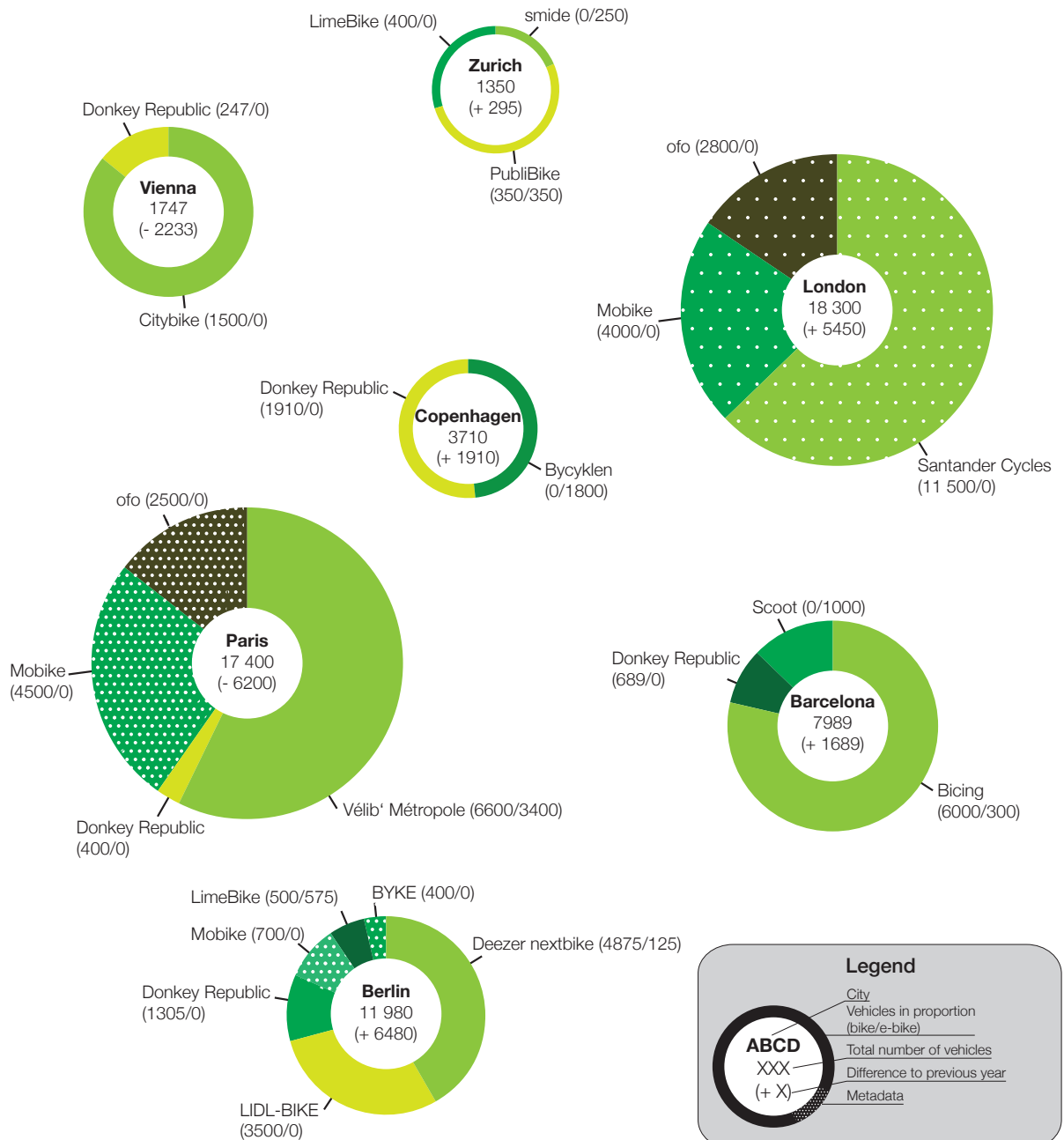
The bike sharing market is continuing to behave dynamically. Reasons can be found in the great competition between established and new providers as well as their respective financial situation.

Compared to 2017, “Vélib’ Métropole” in Paris provides over 10 000 bikes less. This is due to the delayed delivery of new bikes and bike stations after a change in supplier. According to information from “France Bleu”, a radio network, on the 15th of November 2018, “Vélib’ Métropole” should be providing 16 000 (e-)bikes by the end of 2018 and 20 000 by the end of March 2019.^{[11][12]}

While “oBike”, which operated in London, Vienna and Zurich, became bankrupt “Donkey Republic” expanded. In Barcelona, Berlin, Copenhagen and Vienna the fleets were increased and the market in Paris was entered.

Due to the desire of the people wanting to move faster and more conveniently from A to B, increasingly more providers are providing e-bikes. On the one hand, new providers focusing on e-bikes are entering the market and, on the other hand, existing providers are adding e-bikes to their fleets. Apart from London and Vienna, every city has a provider providing e-bikes.

Bike sharing is available as a one-way or free-floating system.



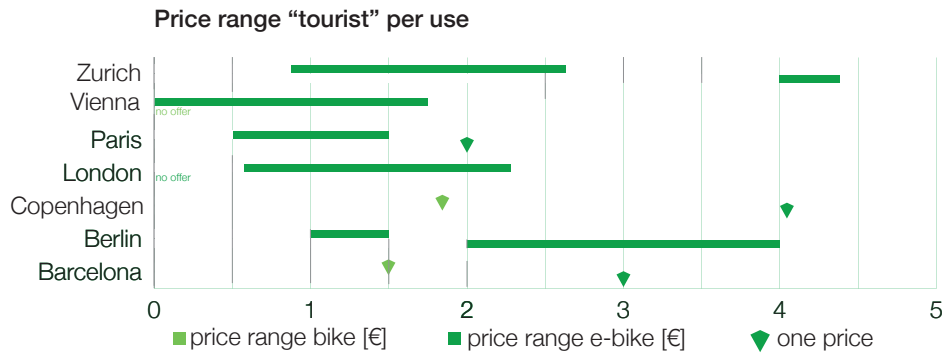
Tourist



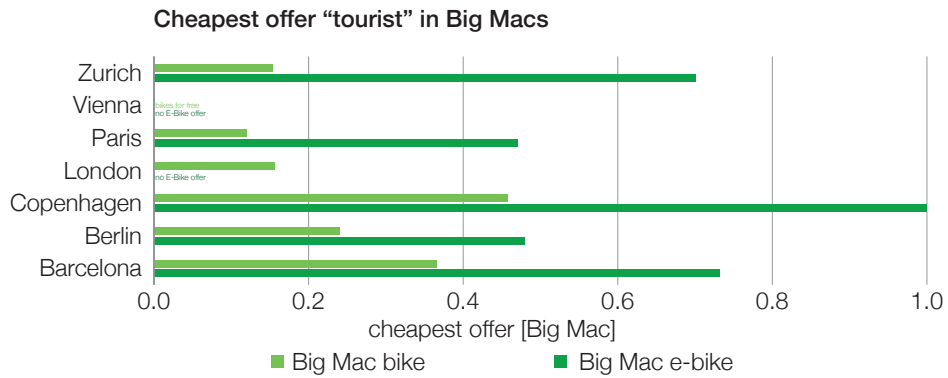
Despite two e-bike and bike sharing providers in Barcelona the “tourist” can only use “Donkey Republic” and “Scoot” offers. To access (e-)bikes from the cheaper provider “Bicing” it is required that the user lives in Barcelona. The largest price range for e-bikes is found in Berlin. This is due to a difference in billing. In the other cities the prices for e-bikes vary less. Furthermore, the comparatively expensive price in Copenhagen stands out. In contrast, it is possible to rent a bike for free in Vienna.



It is common that the first 20-30 minutes of bike sharing use has a fixed price. Afterwards a minute-by-minute billing may be applied. With e-bikes it is much more common to have minute-by-minute billing from the first minute on.



As already seen with the prices in euros the e-bikes are more expensive. While in Paris and Zurich an e-bike costs up to 4-4.5 times more than a standard one, the price difference in the other cities is around double the standard bike price.



Optimiser



For the “optimiser”, a single use of a bike costs less than a euro, Copenhagen is an exception. Additional subscription costs are minimised by frequent use. For inhabitants of Vienna it is possible to use a bike sharing bike for free. The price range for bikes within a city can reach up to 1.75 euros. This results in the most expensive offer in London corresponding with four usages of the cheapest offer.

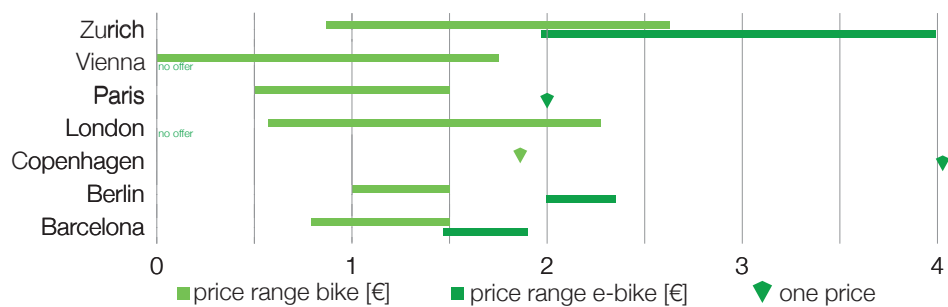
Comparing the prices for a single use of an e-bike in the cities a wide range is evident. While the providers in Barcelona charges 1.50 euros, those in Berlin, Paris and Zurich charge 2 euros and in Copenhagen even 4 euros.

In Barcelona and Zurich it can be cheaper to use an e-bike compared to a regular bike.

It is common that the first 20-30 minutes of bike sharing use has a fixed price. Afterwards a minute-by-minute billing may be applied. With e-bikes it is much more common to have minute-by-minute billing from the first minute on.



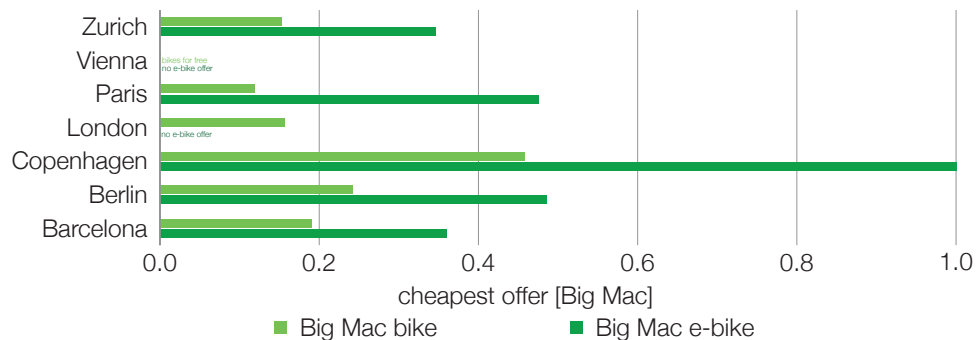
Price range “optimiser” per use



Copenhagen also stands out in the Big Mac comparison. The relativised prices in the other cities are at least half the price of those in Copenhagen. The comparatively small differences in the price differences in the other cities are explainable by the low costs.

In the diagram no price is shown for Vienna as the cheapest bike offer is free and no e-bikes are provided.

Cheapest offer “optimiser” in Big Macs



Quick and inexpensive



The bike still is a cheap vehicle on the sharing market. With the inclusion of e-bikes, bike sharing has become even more attractive and may attract new users. The high prices in Copenhagen can have various reasons. It is assumed that the city wants to regulate additional external bike use within the city or that the maintenance costs are higher due to the rougher weather conditions.

5.5 E-kick scooter sharing



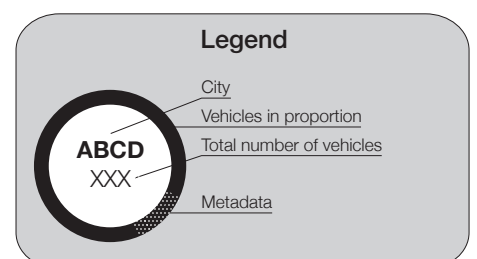
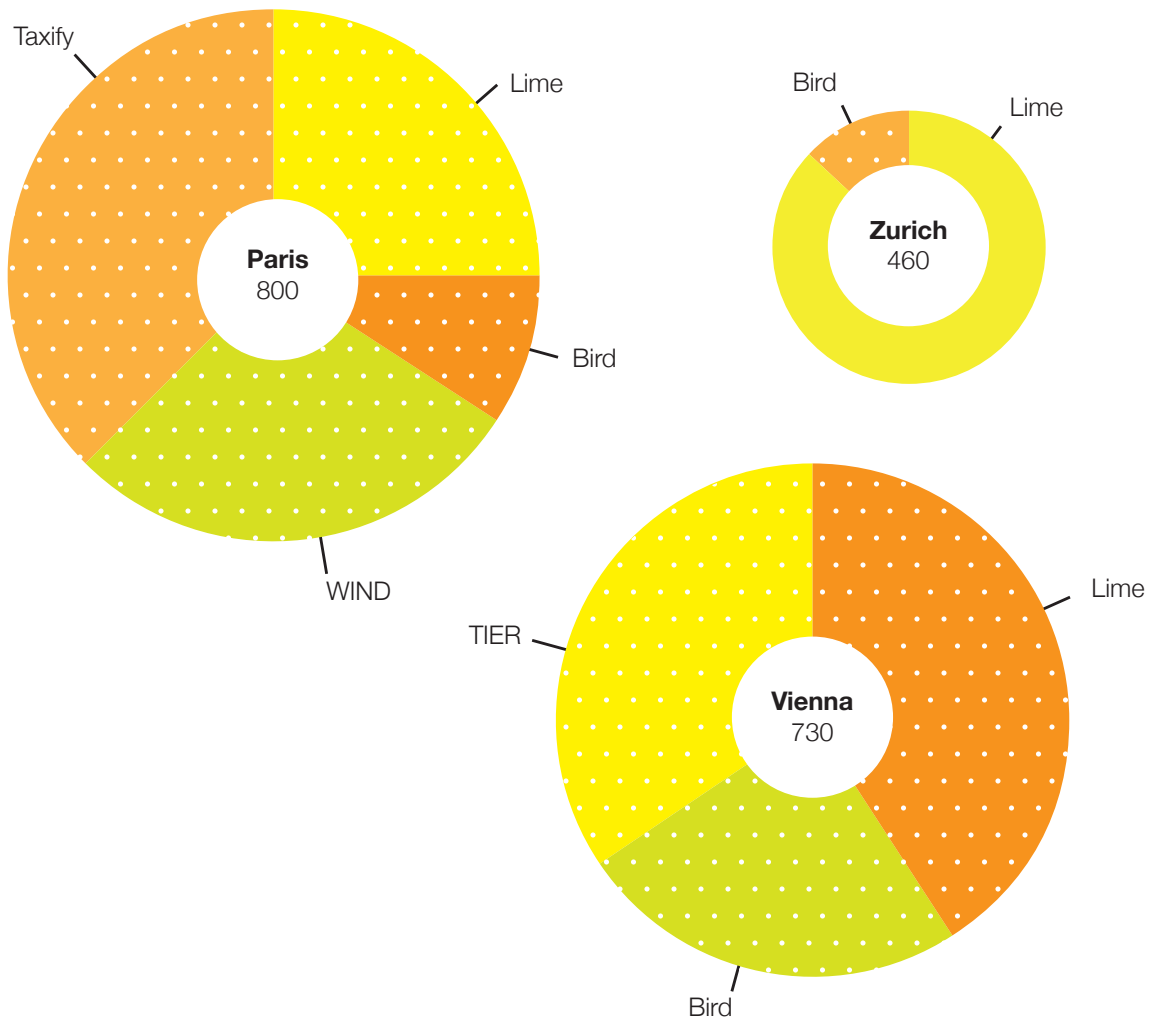
For the first time in the series of the sharing studies the data of electric kick scooters are analysed, hence the lack of data for comparison.

E-kick scooter sharing is not widely spread. Starting off in the United States of America it has found its way to Europe and is entering the sharing market for the first time. Of the researched cities, Paris, Vienna and Zurich are the only ones offering e-kick scooters. While Berlin and London have not authorised e-kick scooters in public spaces, Barcelona and Copenhagen do not provide this service.^{[13][14]}

Having recently started providers were hesitant to communicate numbers. Therefore, most of the data is based on metadata.

Together the four providers in Paris provide 800 e-kick scooters, the largest fleet of the three cities. “Lime” and “Bird” have entered all three markets, where “Lime” provides a larger fleet than “Bird”.

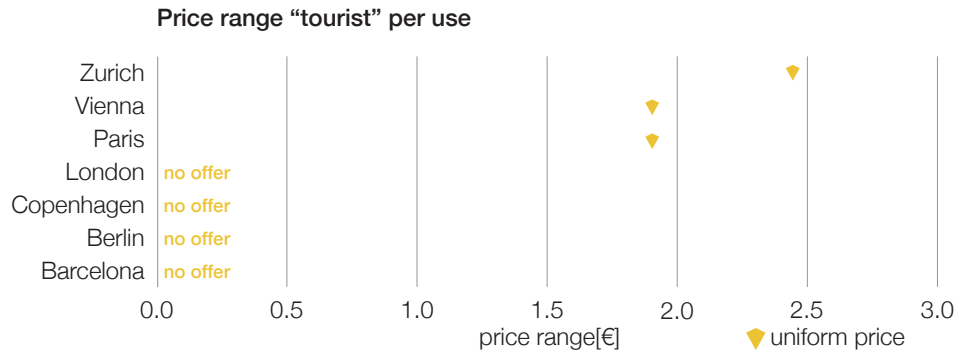
E-kick scooter sharing is available as a free-floating system.



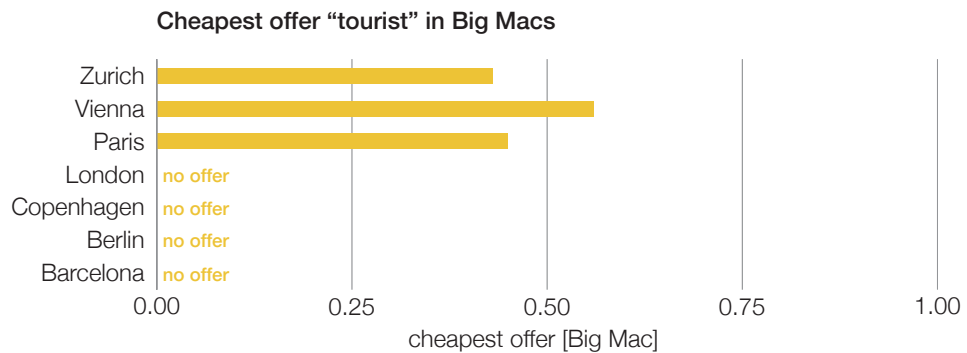
Tourist



The price for using an e-kick scooter is made up of a fixed price for unlocking it and an additional expense for every minute in use. The fixed price is set at 1 euro (in Zurich 1 Swiss franc = 0.88 euro), every minute costs 0.15 euro additionally (in Zurich 0.30 Swiss francs = 0.26 euro). It is unknown why all providers offer their product for exactly the same price. It is assumed this correlates with an economically optimised initial price and this price will vary in the future.



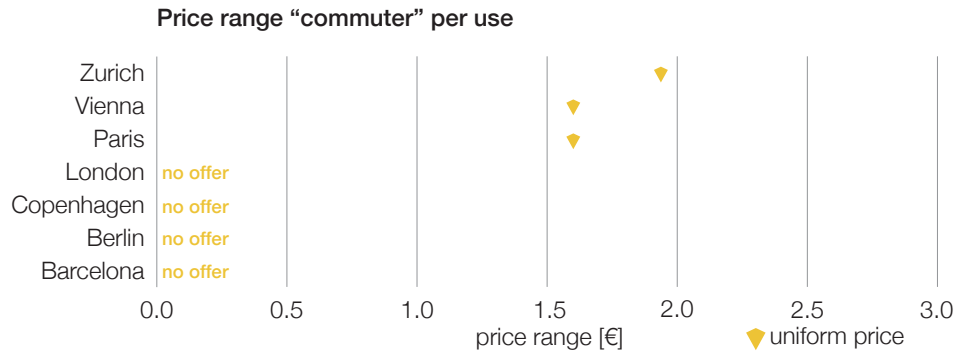
Adjusted for purchasing power, the use of an e-kick scooter is cheapest in Zurich. Compared to bike sharing, a user of an e-kick scooter pays triple the price for the same distance, in Paris for times as much.



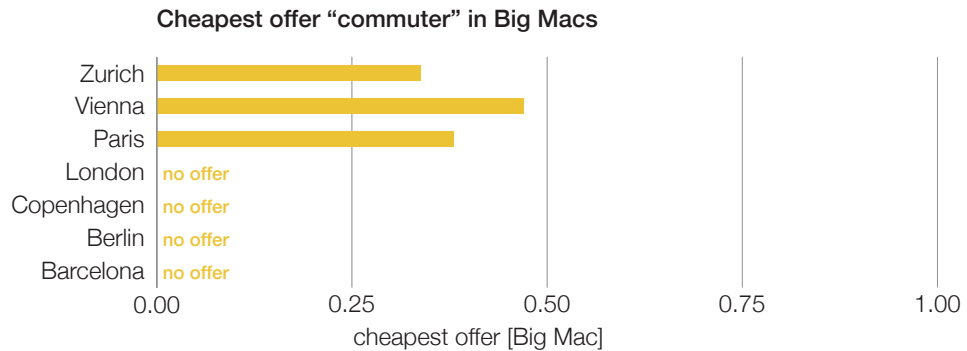
Commuter



The price for using an e-kick scooter is made up of a fixed price for unlocking it and an additional expense for every minute in use. The fixed price is set at 1 euro (in Zurich 1 Swiss franc = 0.88 euro), every minute costs 0.15 euro additionally (in Zurich 0.30 Swiss francs = 0.26 euro). It is unknown why all providers offer their product for exactly the same price. It is assumed this correlates with an economically optimised initial price and this price will vary in the future.



Adjusted for purchasing power, the use of an e-kick scooter is cheapest in Zurich. Compared to bike sharing, a user of e-kick scooters pays double the price for the same distance.



Here to stay?

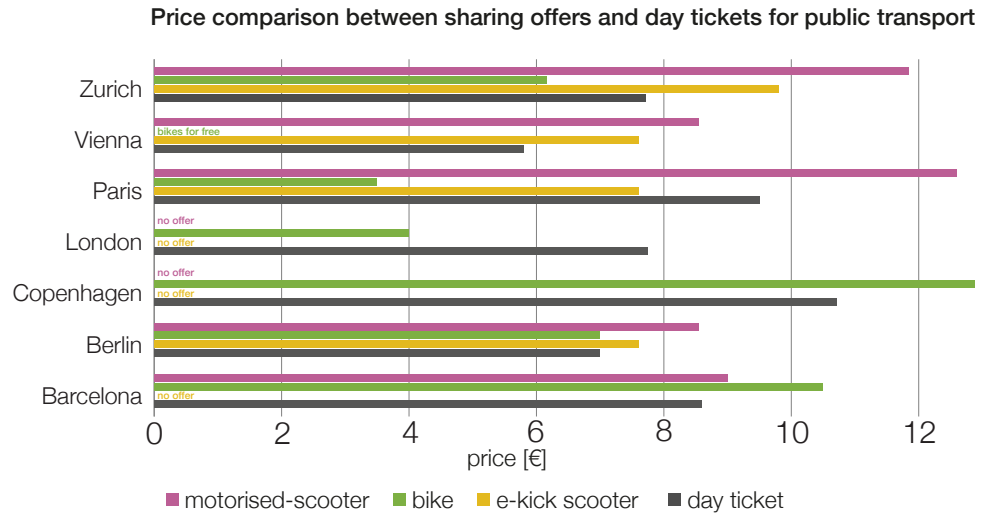


The e-kick scooter has recently reached Europe. Correspondingly, only little data was able to be gathered and the diversity of providers remains low. It remains to be seen how the cities will handle e-kick scooters after the experiences with bike sharing (vandalism/indiscriminate parking) and the legal bases. Expansion is assumed in 2019 with more vehicles being provided and more cities being involved.

5.6 Comparison with public transport



To tour a foreign city, a tourist has various options. Apart from the public transport, sharing offers are becoming increasingly attractive to use. To calculate the expense differences, the price of motorised scooter sharing, bike sharing and e-kick scooter sharing was compared with a day ticket for public transport use. It was assumed that the motorised scooter would be used five times, the bike seven times or the e-kick scooter four times.



Generally, bike sharing is the cheapest way to get around a city given that no single ride lasts more than 20-30 minutes. If a ride lasts longer, most providers charge additional fees. On Compared with public transport, one is not sheltered from wind and rain on a bike.

Nowhere is the motorised scooter cheaper than public transport, unless it is used together with a second person. In which case it is required that the provider provides two helmets.

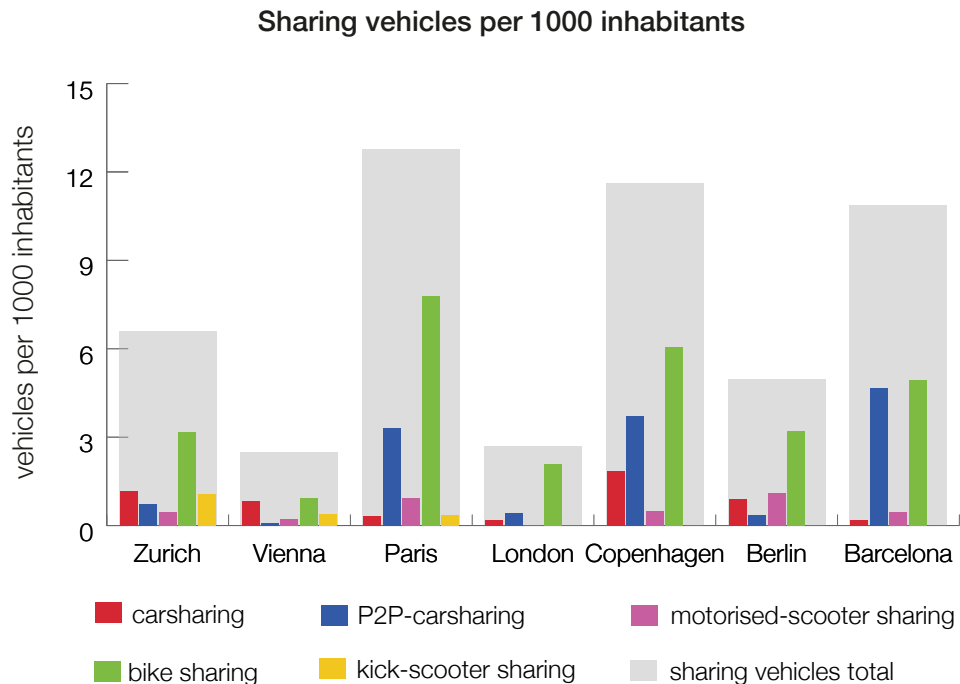
In Paris the most recently introduced sharing type, the e-kick scooter, is cheaper than a day ticket but the covered distance is considerably smaller. Momentarily, the e-kick scooter serves more as a complement to public transport to reach places or sights that are not well accessible by tram, subway or bus.

In summary, depending on the city, a sharing vehicle option can be a considered alternative to public transport. For an extensive city tour, a day ticket is more suitable, making travel more comfortable and allowing multiple long-distance trips without having to cope with local traffic. On the other hand, combining public transport and sharing vehicles can definitely diversify a city trip and even optimise it.

6 How many is many?



Looking at the absolute numbers of vehicles, Paris and London are the two cities with the most sharing vehicles. Zurich, on the other hand, has much fewer vehicles to offer and hence does not seem very sharing oriented. Qualifying the numbers with the size of the population shows a more realistic image.



Even when put into perspective, Paris has the largest sharing offer. Per 1000 inhabitants almost 13 sharing vehicles are available. (E-)bikes alone account for eight of the 13 vehicles. Considering the planned increase to 20 000 (e-)bikes by “Vélib’ Métropole” by the end of March 2019, there will be more than 12 (e-)bikes per 1000 inhabitants. This will raise the total number of sharing vehicles in Paris to 17 per 1000 inhabitants. The local government support is showing success.

The same can be said for Barcelona. The high number of P2P-carsharing and bike sharing vehicles lift Barcelona to third position in this comparison.

Apart from Paris, only Copenhagen beats Barcelona. The “city of bikes” has the second largest number of bike sharing and P2P-carsharing vehicles per 1000 inhabitants in this comparison. In total it offers one sharing vehicle per 1000 inhabitants more than Barcelona.

Zurich marks the centre of the span. Six and a half sharing vehicles per 1000 inhabitants are ready to be used. Zurich offers the second most carsharing vehicles and the most e-kick scooters per 1000 inhabitants.

Berlin’s sharing offers are nowhere found at the top of the rankings. Nevertheless, Berlin has five sharing vehicles per 1000 inhabitants and is found on the fifth place.

In London and Vienna, less than three sharing vehicles per 1000 inhabitants are provided, even though London has 18 000 (e-)bikes in total. In Vienna no single sharing type offers more than one vehicle per 1000 inhabitants.

In summary, Barcelona, Copenhagen and Paris have expanded their sharing to the point where every 100th inhabitant is covered with a sharing vehicle. Due to its comparatively smaller population Zurich stands better than the absolute numbers would imply. Sharing in London and Vienna, on the other hand, is low in comparison. Care must be taken in calling Barcelona, Copenhagen and Paris sharing cities. A high number of vehicles does not always directly correlate with the degree of capacity utilisation and use. To label a city a sharing city these points have to be considered additionally.

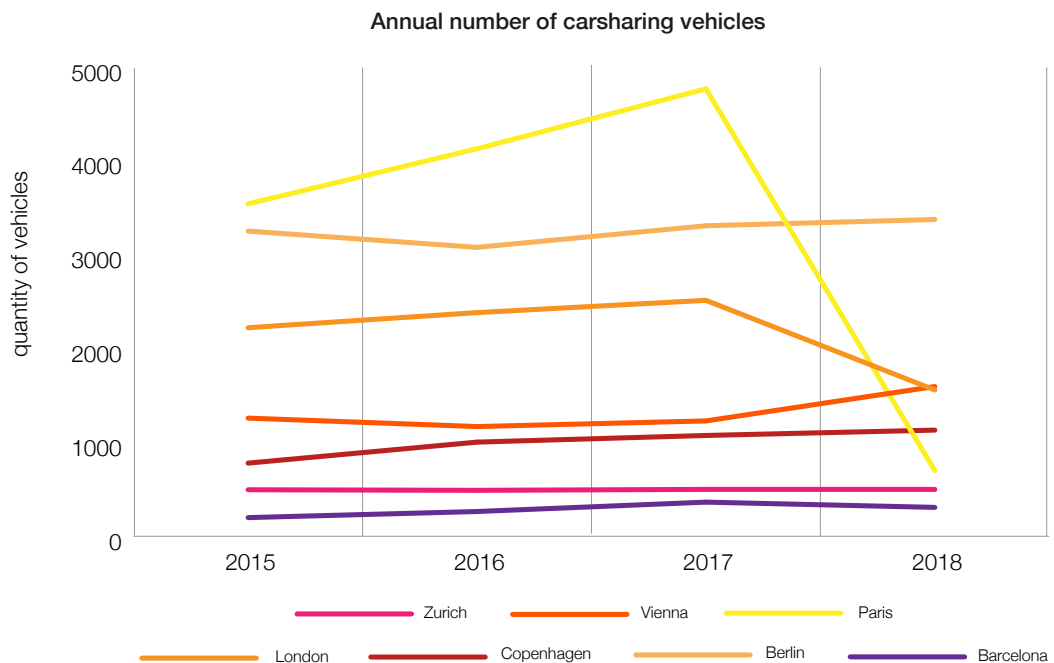
7 Sharing – just a hype?

For a few years now, newspaper articles often address the topic of sharing. Which provider is launching a new sharing offer, which one has disappeared - a constant coming and going. Occasionally the terms “boom” and “hype” are used. But does this describe the reality? Are the vehicle numbers increasing exponentially? In the following chapter, the development of the numbers of carsharing and bike sharing vehicles over the past studies are compared.

7.1 Carsharing



Looking at the last three years, in four of the seven cities vehicle numbers have increased. In Zurich they remained the same and in London, as well as Paris, they have decreased.



The most conspicuous line of the graph is that representing Paris. The background of the plummeting number of vehicles has to do with the withdrawal of “Autolib’s” concession by the local government. In 2011, the billionaire Vincent Bolloré initiated the carsharing provider “Autolib” and started off with 4000 electric cars. Following a debt of several hundred million euros, mutual accusations and deteriorating customer service, the city of Paris withdrew the concession. It remains to be seen how other carsharing providers will react. Bolloré, however, is still active in the city’s sharing economy, running the biggest bike sharing provider in Paris, “Vélib’ Métropole”.^[15]

The decrease in carsharing cars in London is to be judged with caution. Compared to the year 2017, “Zipcar” lost 625 vehicles but this is based on metadata. Nevertheless, there are also conflicts between the provider and the city council. “Zipcar” is complaining about lacking charging stations for the cars.^[16] However, “Zipcar” wants to increase their fleet in London by 325 electric cars by the end of 2018. They are hoping for an incremental growth of electric cars and an orientation away from cars with combustion engines.^[17]

The consistent numbers of vehicles in Zurich is due to the limited amount of parking spaces that can be provided to the providers. So far, only round-trips were possible. In the future “Mobility” will adjust their system and start offering one-way rentals. The further the distance between the origin and destination, the higher the extra cost. Furthermore, “Mobility” is starting a test stage during which second-hand and replacement vehicles will be made available by participating garages.^[18] Therefore, it is expected that the number of carsharing vehicles in Zurich will increase in 2019.

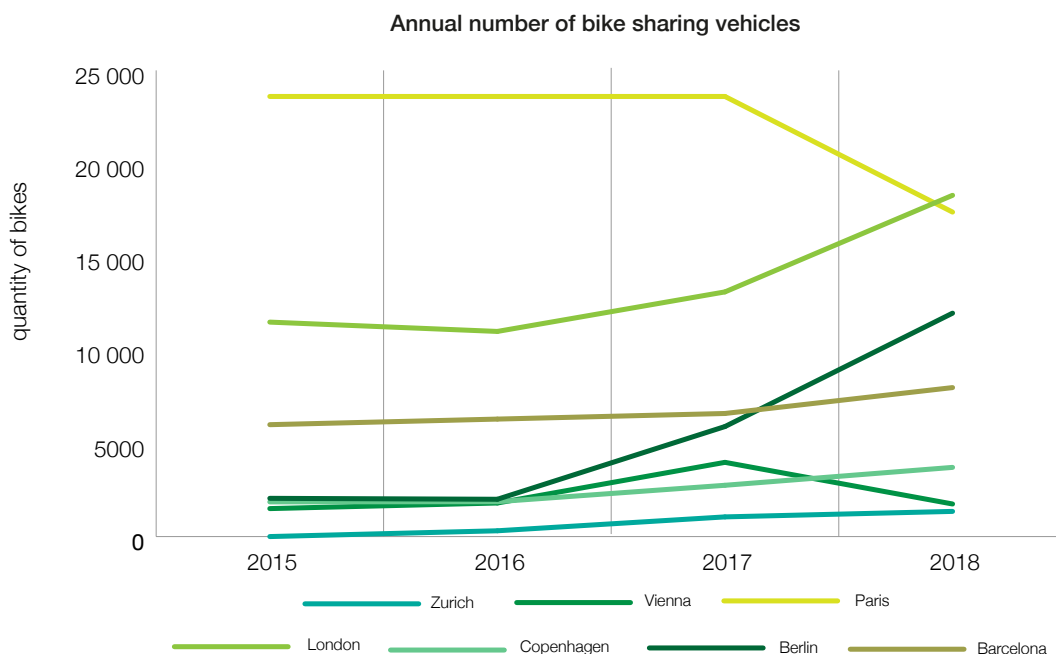
Less than 400 vehicles in Barcelona – that is surprising. Reasons for this can be found in the city’s mobility plan of 2011. By the end of 2018, car traffic should be reduced by 21 %. Using a push-pull strategy the government wants to encourage the people to ride a bike or catch public transport. A second part of the plan is to support carsharing initiatives, which should replace certain in the future prohibited cars. However the mobility plan is polarising, the reduction of car traffic will not be met and the expansion of carsharing fleets has not happened (yet). Instead P2P-carsharing has grown. In view of the complexity of the mobility plan, the future development in Barcelona is open.^[19]

In Berlin, Copenhagen and Vienna the carsharing market is developing moderately. A limiting factor is, as in the other cities, the availability of parking spaces. The introduction of carsharing vehicles does not mean that everyone will immediately sell their personal car. This is a process which will take time. Nevertheless, the increasing member and vehicle numbers are hinting that a responsive chord has been struck and more inhabitants will consider using carsharing instead of buying a new or second car.

7.2 Bike sharing



Bike sharing is experiencing a perceptible growth. This statement fits especially for the cities of Berlin and London, rather less for Paris and Vienna.



Particularly in Vienna, the invasion and disappearance of “oBike” is visible. In 2017, the Singaporean bike sharing provider flooded European cities with their bikes before going bankrupt a year later. Vienna was supplied with 2000 bikes, which now have to be disposed of by the city. Apart from that interlude, bike sharing has increased slowly and steadily since 2015. The slow expansion can be a sign of a saturated market. On the other hand, it can also be due to the popular and free bike sharing provider “Citybike Wien” which has been in existence for 15 years - a difficult offer to top by new, fee-based provider.

Zurich was flooded likewise by “oBike”. The disappearance of “oBike” was compensated by 700 new “PubliBike” (e-)bikes and 400 bikes by “Lime”.

In Paris the decrease observed has another reason. The provider of the successfully operating bike sharing service “Vélib’ Métropole” changed and the delivery of the new bikes and docking stations are delayed. Consequently, by the end of August 2018, only 10 000 instead of 20 000 vehicles were ready for use. By the end of 2018, 16 000 should be available and by the end of March 2019, 20 000. In the meantime, “Ofo”, “Mobike” and “Donkey Republic” have entered the market in Paris.

The Chinese providers “Ofo” and “Mobike” are also active in the bike sharing market in London. Through the growth of their fleets, they have increased the number of available bikes by over 50 %.

Over the last three years the number of sharing (e-)bikes in Berlin has increased by 550 %. In 2016 two providers were active in Berlin. In 2017, "Donkey Republic" entered the market, while "LIDL-Bike" (formerly "Call-a-Bike") and "Deezer nextbike" increased their number of (e-)bikes. In 2018 six providers are sharing the market. Additionally "Deezer nextbike" and "Donkey Republic" have increased their number of vehicles. It is assumed that the expansion will slow and the number of providers will decrease.

Unsurprisingly Copenhagen has a large bike sharing fleet, compared to the number of inhabitants and other cities. Whereas typically bikes are introduced before e-bikes, Copenhagen did it the other way around. "Bycyklen" started off in 2014, providing 1800 e-bikes with an integrated GPS-system before "Donkey Republic" entered the market in 2017, providing classic bikes and doubling their fleet last year.

A special case is found in Barcelona. To register with "Bicing" it is required to live in Barcelona. This led to the issue that up to 2017 only the inhabitants of Barcelona could use bike sharing. During 2017 "Donkey Republic" entered the market, providing bikes for anyone. 2018 "Scoot" entered the market, providing e-bikes and "Donkey Republic" doubled its fleet.

7.3 Conclusion

Looking at the graphs of bike sharing it is possible to speak of a "boom" or "hype". Bike sharing providers know how to benefit from the situation and by providing free-floating or well distributed one-way offers they maximise their user catchment area. The comparatively low prices increase the attractiveness even more. Furthermore, the bikes, compared to carsharing, are cheaper in production and acquisition, take up less space and are rentable without a driving license. This leads to a dynamic market, but also a heightened risk.

It is possible that the expression "hype" fits literally. Being one of THE solutions for mobility problems, according to politicians, the media and researchers, the possibility of a crash cannot be excluded. After "oBike's", failure two new Asian providers have entered the European market. It is questionable if they can be successful using a similar approach. Furthermore, it is debateable if there is room for more than three providers in a city. In 2017 five and four providers respectively shared the market in London and Vienna. A year later they were down to three and two providers.

Speaking of a "boom" in carsharing would not be fitting. On one hand, none of the cities show a huge growth in vehicles, on the other hand, on average every 420th car is a carsharing vehicle. Barcelona has not been included in the average calculation as only every 2545th car is a carsharing vehicle.



“ Despite all resistance, sharing has potential. For a successful realisation, a boom or hype is not always necessary. Engaging in dialogue with the city and a close collaboration between sharing services and the public transport networks can optimise the benefits to the user. Perhaps, one day, to the extent that sharing vehicles become part of the daily business for a large part of the population. ”

Sources

- [1] Cambridge Dictionary (2018). sharing economy.
Website: <https://dictionary.cambridge.org/dictionary/english/sharing-economy>
- [2] The Economist (2018). The Big Mac index.
Website: <https://www.economist.com/news/2018/07/11/the-big-mac-index>
- [3] Stadt Wien (2018). Wiener Radverkehrsnetz.
Website: <https://www.wien.gv.at/verkehr/radfahren/radnetz/>
- [4] Fahrrad Wien (2018). Radverkehr bleibt 2017 konstant. Juni absoluter Rekordmonat.
Website: <https://www.fahrradwien.at/radfahren-in-zahlen/radzahlen-2017/>
- [5] Paris (2016). Paris respire.
Website: <https://www.paris.fr/parisrespire>
- [6] Schweizer Radio und Fernsehen (2018). Autofreier Sonntag löst auch Widerstände aus.
Website: <https://www.srf.ch/news/international/aktion-paris-respire-autofreier-sonntag-loest-auch-widerstaende-aus>
- [7] Statista (2018). Ranking der 20 meistbesuchten Städte der Welt in den Jahren 2017 und 2018 nach Anzahl internationaler Gästeankünfte.
Website: <https://de.statista.com/statistik/daten/studie/382777/umfrage/meistbesuchte-staedte-weltweit/>
- [8] Berliner Zeitung (2015). Berliner Leben in Zahlen 1.165.215 Autos sind in Berlin zugelassen - viel oder wenig?
Website: <https://www.berliner-zeitung.de/wirtschaft/berliner-leben-in-zahlen-1-165-215-autos-sind-in-berlin-zugelassen---viel-oder-wenig--22361400>
- [9] Deutschlandfunknova (2016). Superblocks in Barcelona.
Website: <https://www.deutschlandfunknova.de/beitrag/superblocks-in-barcelona>
- [10] Neue Zürcher Zeitung (2018). Es fährt kein Carsharing-Auto mehr in Paris.
Website: <https://www.nzz.ch/wirtschaft/es-faehrt-kein-carsharing-auto-mehr-in-paris-ld.1414045>
- [11] Neue Zürcher Zeitung (2018). Ärger um Mietvelos in Paris – Chinesen wollen davon profitieren.
Website: <https://www.nzz.ch/panorama/aerger-um-mietvelos-in-paris-chinesen-wollen-davon-profitieren-ld.1347562>
- [12] France Bleu (2018). Vélib' franchit le cap des 1000 stations.
Website: <https://www.francebleu.fr/infos/transports/velib-1000-stations-sont-ouvertes-1542298532>
- [13] wired (2018). The electric scooter craze isn't coming to London anytime soon.
Website: <https://www.wired.co.uk/article/electric-scooters-london-san-francisco-lime-bird-spin>
- [14] Berliner Zeitung (2018). Neuer Fortbewegungstrend Elektro-Tretroller sollen auch bald in Berlin unterwegs sein.
Website: <https://www.berliner-zeitung.de/berlin/verkehr/neuer-fortbewegungstrend-elektro-tretroller-sollen-auch-bald-in-berlin-unterwegs-sein-31138864>
- [15] Handelsblatt (2018). Wie das Carsharing mit Elektroautos in Paris in einer Schlammschlacht endete.
Website: <https://www.handelsblatt.com/unternehmen/industrie/aus-fuer-autolib-wie-das-carsharing-mit-elektroautos-in-paris-in-einer-schlammschlacht-endete/22737586.html?ticket=ST-350487-oJgHmh35d7KMurfPB7g4-ap1>
- [16] Driving (2018). Zipcar boss says 'petty' arguments in London Authorities are Delaying electric car infrastructure.
Website: <https://www.driving.co.uk/news/zipcar-boss-says-petty-arguments-by-councils-are-delaying-electric-car-infrastructure/>
- [17] Clean Technica (2018). London Carsharing Goes Electric As Zipcar Adds 325 New Electric Cars To The Network.
Website: <https://cleantechnica.com/2018/05/30/london-carsharing-goes-electric-as-zipcar-adds-325-new-electric-cars-to-the-network>
- [18] Handelszeitung (2018). Wie Mobility mit Autohändlern neue Kunden gewinnen will.
Website: <https://www.handelszeitung.ch/unternehmen/wie-mobility-mit-autohaendlern-neue-kunden-gewinnen-will>
- [19] Zeit Online (2018). Mit Hightech und pädagogischem Druck.
Website: <https://www.zeit.de/mobilitaet/2018-04/barcelona-verkehr-problem-autofahrer-smart-data/komplettansich>

City characteristics

Population

Zurich:	https://www.stadt-zuerich.ch/prd/de/index/statistik/themen/bevoelkerung.html#ueberblick_bevoelkerungstadtzuerich (20.12.2018)
Vienna:	https://www.wien.gv.at/statistik/bevoelkerung/bevoelkerungsstand/index.html (20.12.2018)
Paris:	https://94.citoyens.com/2017/metropole-du-grand-paris-population-officielle-2017-par-ville-par-territoire,02-01-2017.html (20.12.2018)
London:	http://worldpopulationreview.com/world-cities/london-population (20.12.2018)
Copenhagen:	http://www.statistikbanken.dk/BY1 (20.12.2018)
Berlin:	https://www.statistik-berlin-brandenburg.de/publikationen/stat_berichte/2018/SB_A01-05-00_2018h01_BE.pdf (20.12.2018)
Barcelona:	http://www.ine.es/dynt3/inebase/en/index.html?padre=517&dh=1 (20.12.2018)
City area	All city areas to define the population density were taken from Wikipedia. Looked up on 20.12.2018.
Wet days	All wet days were taken from following the website: http://www.klima.org . Looked up on 17.12.2018.

Day ticket, public transport

Zurich:	https://www.stadt-zuerich.ch/vbz/de/index/tickets/tickets/tageskarten/tageskarten.html (06.12.2018)
Vienna:	https://www.wienerlinien.at/eportal3/ep/channelView.do/pageTypeld/66526/channelId/-46648 (06.12.2018)
Paris:	https://help-tourists-in-paris.com/store-2/products/mobilis-tagesticket-zone-1-2 (06.12.2018)
London:	https://tfl.gov.uk/fares/find-fares/tube-and-rail-fares/caps-and-travelcard-prices?intcmp=54720 (06.12.2018)
Copenhagen:	https://dinoffentligetransport.dk/hjaelp-til-billetter/billetter-og-kort/periodebilletter/citypass-english/prices-and-zones (06.12.2018)
Berlin:	https://www.vbb.de/tickets/day-passes-day-pass (06.12.2018)
Barcelona:	https://hallo-barcelona.com/metro-barcelona (06.12.2018)

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