Sharing Economy: Review of Current Research and Future Directions

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Abstract

The sharing economy, in which ordinary consumers also act as sellers, is attracting much interest from scholars and practitioners. . The rapid growth of this sector of the economy and the emergence of several large brands like Uber and Air BNB raise several interesting questions that need to be researched. We therefore review and summarize the extant research on this sector and suggest several additional directions for future research.

Keywords: Sharing economy, peer-to-peer trade, platforms.

Introduction

The sharing economy describes the recent phenomenon in which ordinary consumers have begun to act as sellers providing services that were once the exclusive province of professional sellers (Sundararajan 2015). As Heller (2017) describes it:

> The model goes by many names—the sharing economy; the gig economy; the on-demand, peer, or platform economy—but the companies share certain premises. They typically have ratings-based marketplaces and in-app payment systems. They give workers the chance to earn money on their own schedules, rather than through professional accession. And they find toeholds in sclerotic industries. Beyond TaskRabbit, service platforms include Thumbtack, for professional projects; Postmates, for delivery; Handy, for housework; Dogvacay, for pets; and countless others. Home-sharing services, such as Airbnb and its upmarket cousin onefinestay, supplant hotels and agencies. Ride-hailing apps—Uber, Lyft, Juno—replace taxis.

Figure 1 offers several more examples. As these examples suggest, the sharing economy has begun to permeate nearly every sector of the economy. According to PwC (PWC 2015), it was already worth $15 billion in 2013, and was projected to grow to $335 billion by 2025, equaling the retail sector.[1]

While the sharing economy is new, the idea of sharing a resource is not. Rental markets for durable goods such as hotels, cars, and tools have been around for a long time, as have markets for personal services such as accounting, automotive repair, and singing lessons. What distinguishes the new sharing economy from the old is the appearance of the platform at the very heart of the transaction. What used to be a two-way transaction has become a three-way transaction. As Figure 2 makes clear, the platform occupies pride of place right in the middle, bringing buyers and sellers together, collecting and disbursing payments, and maintaining the ratings-based reputation system that makes the sharing marketplace function. Needless to say, none of this would have been possible without the Internet and the technology it has spawned, namely mobile devices such as smartphones and tablets that allow people to connect with each other everywhere, 24/7.

[1] For more information on the sharing economy, see Botsman and Rogers (2010), Gansky (2010), Walsh (2011), Friedman (2013), Ertz et al. (2016), Hamari et al. (2016), and Telles (2016).

Our objectives in this paper are to examine the key characteristics and drivers of these markets, review existing research, and offer perspectives on future research directions. While there have been several practitioner (Botsman and Rogers 2010, Heller 2017) and scholarly (Sundararajan 2015) discussions of the sharing economy, scholarly research on this area is as quite limited as yet. There is however increasing scholarly interest and research on several issues related to the topic in ongoing. There is therefore a pressing need for academic researchers interested in the area for a scholarly overview of ongoing work, the issues that are being researched, and those that yet need to be investigated. While Sundararajan (2015) approaches the sharing economy from a scholarly perspective, the objective of his work is to give a broad rather than a scholarly audience "a deeper understanding of the ongoing transition towards crowd-based capitalism and how those shifts could be profound" (p.18) over the readers' lifetimes. The goal of our work therefore is to provide scholars with an overview of ongoing empirical, analytical, and behavioral research of the sharing economy by several scholars and provide directions for research in this growing sector of the economy. This is our contribution to the literature.

Characteristics of the sharing economy

Who participates?

From a survey of US households by PwC (PwC, 2015), it appears that 18-34 year olds, median income households, and those with small children are more likely than others to participate as buyers in the sharing economy. The sellers seem to come from all sections of society. For example, while nearly 48% of providers come from 25-44 age groups, the other age groups are represented as well. Likewise, 19% of providers are from households earning less than 25K per year while 11% come from those earning more than 200K annually. Bloomberg, in a separate report (Rossa and Moffat 2015),

found that college-educated and 18-34 year olds are over-represented as sellers (relative their share of the US workforce). Globally, according to a report by Nielsen (Nielsen 2014), more people are willing to participate in the sharing economy in Asia, Africa and Latin America than in Europe and North America.

Why participate?

The aforementioned PwC survey asked people why they participate in the sharing economy as buyers. Among the answers given were: to make life more affordable, make life more convenient, and a belief that it is better for the environment and community. Participants also said that trust and referrals by friends played a major role in their participation, and that their experience as buyers was not consistent across sellers or over time.

Growth drivers

Technology

The ability of a sharing market to form, and to function effectively, depends on the ease with which buyers and sellers of products or services can find each other, verify or trust what is being offered, and exchange money for the goods and services provided. The sharing economy is successful because it has lowered the cost of performing each of these steps.

To appreciate how it has done so, compare how the new sharing economy operates with how the old sharing economy operated. In the old sharing economy, buyers and sellers found each other through classified ads in print newspapers. Placing a classified ad was subject to the lead time requirements of the newspaper (this automatically ruled out certain types of time-sensitive sharing such as ride-sharing). For a buyer/seller, searching through a list of classified ads was difficult and time-consuming. Finally, it was difficult to evaluate the quality of offers.

In the new sharing economy, the Internet and the newer mobile technologies enable a buyer to immediately connect with tens and hundreds of service providers. Such access is provided at the time of choosing by the buyer and not at some predetermined time (such as the publication of the Sunday edition of a newspaper). Service providers use multiple types of content such as text, photos, videos, and maps to provide more information about their offerings, and computer algorithms make the matching effective and efficient. Furthermore, buyers can access the experiences of past users of a seller's product/service and similarly sellers can access the past experiences of other sellers with this buyer. Finally, the platform makes collecting and disbursing payments easy and serves as an arbiter in case of disputes. Most sharing economy platforms, thus, share some common technology-enabled features: (1) they are available as mobile apps, (2) they allow cashless transactions, (3) they allow sellers and seekers to rate each other and make those ratings available to both, (4) they use dynamic pricing to adapt to supply-demand changes.

It is this buildup in the technological capabilities available to sellers and buyers that has whittled down the barriers to the formation and functioning of sharing markets by lowering or eliminating frictions in identification, search, match, verification, and exchange. As new technologies emerge we expect more such economies to develop, expanding the scope of these exchanges.

Macroeconomic factors

Labor markets and national economies are still to recover completely from the U.S. financial crisis of 2007 and the resulting global recession. In the U.S., for example, according to the latest BLS statistics,[2] while the official unemployment rate is 4.9%, the U-6 measure which includes the underemployed, part-time employed (who seek fulltime employment), and workers who have quit looking for a job, is nearly twice as high at 9.7%; for a broad section of the population, real incomes

[2] https://www.bls.gov/news.release/pdf/empsit.pdf.

have dropped for more than a decade. This has put pressure on households to seek alternative means of supplementing their income. The sharing economy thus found a number of willing owners ready to monetize their leisure time and share their assets. Furthermore, since 2007 central banks throughout the world have sought to lower the prevailing interest rate in their economies to historical lows to spur growth and lending. This has further fueled individuals' ability to borrow money to buy or lease assets to become owners and participate in the sharing economy.

In short, macroeconomic factors have certainly played a role in the growth of these markets.

Regulation and legacy monopolies

Some service industries are highly regulated, resulting in less-competitive markets, and in some cases, outright monopolies. For instance, taxi services in most cities are heavily regulated with regulations governing who can operate a taxicab, in which areas they operate, and how much they can charge for their services. In other categories, such as hotels, city and municipal taxes comprise as much as 25% of the hotel room rates.

In such economic and political environments, less fettered entrepreneurs such as Uber and Airbnb can enter and spur demand by offering lower prices than the legacy providers. Since consumers benefit from such lower prices, they can form a powerful lobby against the legacy providers' lobbying efforts to keep away these newer entrants from operating in their neighborhoods. This scenario—of legacy operators lobbying and suing to stop the new entrants, and consumers, in turn, rising up in support of the new entrants—has played out in a number of cities worldwide.

Review of current research

Notwithstanding the attention the sharing economy has received in the popular press, there is very little published research. What little there is we have summarized in Table 1, organized along

two dimensions, methodology and outcomes investigated. The former refers to whether the research is empirical, analytical, or behavioral. We next review each investigation.

---- Table 1 about here ----

Empirical work

The five working papers that we review here are: Narasimhan, Papatla and Ravula (2016), Wu, Wang and Zhu (2016), and Zervas, Proserpio and Byers (2014), Cohen et al (2016), and Wallsten (2015). We provide a description and contribution of each of these next.

Narasimhan, Papatla and Ravula (2016)

A key feature of sharing economy providers (SEPs) is that they often charge lower prices than legacy providers (LPs) for the same service. For instance, a trip on the shared-ride service Sidecar in Chicago can cost $4.00 compared to more than $7 for an identical trip in a traditional taxi (*Wall Street Journal* 2014). The availability of lower priced substitutes could increase consumer sensitivity to legacy providers' prices. This paper examines how consumers' price sensitivity changes following the advent of shared services.

Relative preference for legacy providers via-a-vis sharing economy providers could vary by time, location, and usage occasion of the service being sold. Thus, for instance, if the demand for, and supply of, paid rides varies over different hours of the day as it does in New York City (Farber 2005, Camerer et al 1997), price sensitivity could vary with temporal variations in the supply of cabs in the city. Spatially, as well, consumers may be less sensitive to prices for rides from some locations like airports (Gupta et al 2008) than for intra-city rides. Spatial variations in price sensitivity could also result from variations in the availability of legacy providers prior to entry by shared economy

providers. For instance, riders in an area of New York City where Yellow Cabs had been readily available and widely used may continue to use them even after Uber enters the area. On the other hand, in areas of the city where it typically took longer to find a Yellow Cab, riders may begin to use Uber, get accustomed to its lower prices, and become more sensitive to the prices of Yellow Cabs.

Finally, preferences could also vary with usage-occasions. For instance, a consumer's preference for Uber over Yellow Cab may depend on whether the ride is for a job-related activity like getting to her place of work or for a leisure activity like going to the theater. When she is taking a ride to go to her place of work and cannot afford to be late, she might not be as focused on price. Even if a Yellow Cab is more expensive than Uber, therefore, she may be willing to use it if she spots one passing by and does not have to wait to get the ride. The opposite, however, may be the case when it comes to a ride to go to the theater.

The emerging literature on the sharing economy is yet to examine whether consumer sensitivity to the prices of legacy providers, relative to those of shared economy providers, exhibits such spatial, temporal, and use-occasion variations[3]. These are, however, important questions with implications for both SEP's and LP's on how they should compete. For instance, if price sensitivity exhibits spatial variations, both should compete on price in regions where consumers are more price-sensitive while, in regions where the opposite is the case, they should compete on capacity and service rather than on price.

Narasimhan et al (2016) address the gap in the literature by empirically investigating spatial, temporal and use-occasion variations in consumer sensitivity to Yellow Cab prices in New York City following Uber's entry. The specific time period that they investigate is from April 1, 2014 to

[3] Some early related work (e.g., Zervas et al 2014) only examines spatial variations in demand for LP's after the entry of SEP's.

September 30, 2014, a period during which data on every trip on Uber and on Yellow Cab taxis by residents of New York City is publicly available from the city government. The data for each trip includes the start and end point (latitude and longitude), total distance traveled, start and end time, number of passengers, total cost, the amount of tax if any, tip amount, and whether payment is by cash or credit card. Additionally, data on the temperature at the time of the ride and whether there was any precipitation (rain or snow) at the start of the ride is also available. Narasimhan et al (2016) are, therefore, also able to control for the role of weather (Farber 2014) in the demand for and, hence, sensitivity to, the prices of yellow cab rides.

To investigate whether consumer sensitivity to Yellow Cab prices in New York City varies spatially, temporally, and with use occasion, Narasimhan et al (2016) take the following approach. They identify the top one hundred (latitude, longitude) coordinates of the most frequently occurring start points of trips among all Yellow Cab rides taken in the city during the investigation period and assume that this set represents locations where Yellow Cabs have been readily available and widely used by consumers. They then obtain the mean cost $\overline{MC_{it}}$, over all trips taken from each of these locations, i, i = 1,100 on each date, t = April 1, 2014 to September 30, 2014, of the investigation period. Additionally, they obtain the mean number of passengers, $\overline{\mathrm{MP_{it}}}$, mean temperature, $\overline{\mathrm{MT_{it}}}$, and mean rainfall, $\overline{\mathrm{MR_{it}}}$, for rides from each location on each date. They also rely on data from Google Maps to classify each location into residential ($\mathrm{R_i}$), work ($\mathrm{W_i}$), leisure ($\mathrm{L_i}$), and airport ($\mathrm{A_i}$) categories. These four variables thus serve as indicators for the likely use-occasion of the typical trip from these hundred locations. Finally, they also include an indicator, $\mathrm{WKEND_{it}}$, set to 1 if the trip occurs on a weekend. They then identify all rides, $\mathrm{NU_{it}}$, taken on Uber on each date during the same period, from these locations and use this as an operational measure of the diffusion of, and awareness for, Uber's prices

in location *i* as of date *t.* The following hedonic price function that captures the willingness to pay for a Yellow Cab trip by passengers at location *i* on date *t* is estimated:

$$\overline{MC_{it}} = \gamma_i NU_{i(t-7)} + \beta_1 \overline{MP_{it}} + \beta_2 \overline{MT_{it}} + \beta_3 \overline{MR_{it}} + \beta_4 R_I + \beta_5 L_I + \beta_6 A_I + \beta_7 WKEND_{it} + \varepsilon_{it} \quad (1)$$

γ_i = spatial effect of *i* due to diffusion and awareness of Uber's prices. A negative γ_i would indicate that an increase in diffusion and awareness of Uber at location *i* reduces the amount riders spend on a Yellow cab ride from the location and *vice versa*

$NU_{i(t-7)}$ = number of rides taken on Uber from location *i* on the same weekday, as t, during the previous week;

$\varepsilon_{it} \sim N(0,1)$ assumed to be independent across *i*

The authors use W_I as the reference category and assume diffuse Normal priors on all parameters Narasimhan et al's (2016) findings indicate that consumer price sensitivity for sharing economy services can exhibit significant spatial, temporal, and usage-occasion related variations. The authors find, for instance, that the price-sensitivity of riders in regions of New York City where Yellow Cabs are heavily used and available is lower than in the other regions. Interestingly, they also find that price-sensitivity is lower for longer rides, Even if they are more expensive, riders prefer Yellow Cabs that can be readily hailed over Uber that they will have to request and wait when they are taking a long ride. Their findings thus suggest that both sharing economy and legacy providers should not focus exclusively on price for competitive advantage but should also compete on service features.

Wu, Wang, and Zhu (2016)

This paper's focus is on the implications of the demand-allocation mechanisms used by sharing economy platforms like Uber on the productivity of providers.

Sharing economy platforms can choose from various demand allocation mechanisms ranging from fully centralized to pure market-based ones. The mechanism affects how much information is revealed to the service providers (e.g., Uber drivers) and the users and how they choose each other.

Interestingly, different sharing platforms have adopted very different allocation mechanisms. For instance, in the room sharing market, Airbnb adopts a market-based matching mechanism where the traveler chooses the potential renter and the renter can decide to accept or refuse the request. In the ride sharing market, on the other hand, Uber uses a centralized allocation mechanism where neither the passengers nor the drivers make the choice but instead are assigned to each other. The market leader of the ride sharing market in China, Didi-Kuaidi, however, uses a hybrid mechanism where the drivers can choose which customers to serve while the passengers cannot choose a driver. Another major player in China, Yidao, on the other hand, adopts a mechanism similar to Airbnb where both drivers and passenger can choose whom to match with.

Different allocation mechanisms also differ in how much and what information is revealed. In the case of Uber, for instance, the driver only knows both the origin and destination of a requested ride before s/he accepts a job assigned by the platform while, for Yidao, the destination information is first revealed to potential drivers and, after one or more drivers accept a request, detailed driver information is sent back to the passenger so that s/he can choose from the list of drivers that are willing to provide the ride.

The choice of the demand allocation mechanism and the corresponding level of information revelation, affect the service provider behavior and hence the market's efficiency. This is the focus of Wu, Wang and Zhu (2016) who investigate how the demand allocation mechanism and pricing model decisions of mobile hailing applications Didi and Kuaidi in China affect the productivity of taxi drivers in Beijing, China. A key difference between these applications and those like Uber is that they can only be used by taxi drivers already licensed by the city and both platforms use a semi-decentralized demand allocation mechanism. Specifically, passengers are assigned to a set of drivers within a 3 KM radius based on their requests and the drivers can compete for passengers based on a rule where the

first driver to tap an accept button on the application gets to provide the ride. This mechanism thus reduces asymmetry of information between drivers and riders by allowing the taxi drivers to observe which customers have the most attractive pickup and drop-off locations.

Wu et al (2016)'s data includes GPS-based location data of taxi drivers for every minute of the day from January 2013 to June 2014. They rely on this data to track the taxis and operationalize driver productivity as hourly earnings and model how this measure is affected by how experienced the driver is, when the driver adopted the platform's technology and market competition. For estimation, they propose a modified change-point model with supplemented survey data on the adoption of mobile hailing technology and associated change in drivers' productivity levels. Their findings indicate that adopting mobile hailing technology increases driver productivity by 25 to 50%. As more drivers adopt the technology, however, the productivity gains decline. For instance, 18 months after the introduction of the technology, productivity increases by only 13% on average across all the drivers in the market.

Wu et al (2016) further explore the factors that contribute to productivity gains by comparing changes in the driving patterns of the drivers before and after adopting the platform. Their analysis suggests that productivity gains result mostly from drivers sorting through requests and selecting more profitable trips rather than due to reduction in unproductive time between trips. Interestingly, following their adoption of the platform, drivers undertake fewer trips and work for fewer hours without losing any of their earnings. Additionally, mobile hailing applications increase the availability of taxi cabs outside the city center with drivers spending 7% more time serving suburban areas. Taken together, therefore, Wu et al's (2016) results highlight the behavioral effects of the allocation mechanisms.

Zervas, Proserpio and Byers (2014)

A central question surrounding the sharing economy is regarding the impact of the platforms on incumbent firms. Quantifying such impact is important for several reasons such as (1) helping municipalities and regulators define appropriate laws to better regulate the sharing economy and (2) informing incumbent firms about new competitors that they should (or should not) pay attention to when developing their marketing strategies.

The sharing economy, however, affected the incumbents in different industries differently. For example, the arrival of ride sharing services like Uber and Lyft reduced the price of a taxi license to $250,000 in October 2016 from about $1.3 million in 2014[4]. On the other hand, in the case of accommodation sharing, hotel chains like Hilton and Marriott seem to not be affected much by the growth of Air BNB.

Zervas et al. (2014) address the question of whether this is indeed the case by examining data from about 14,000 Airbnb listings and monthly revenue of approximately 3,000 hotels in Texas from 2003 to the end of 2014. Their specific focus is on whether Airbnb has had a negative effect on hotel room revenue. To investigate the causality of the effect, if any, the authors exploit the significant variation in both the temporal rate and the geographical spread of Airbnb's entry into the Texas market. Specifically, they employ a difference in differences strategy that compares differences in revenue for hotels in cities affected by Airbnb before and after Airbnb's entry against a baseline of differences in revenue for hotels in cities unaffected by Airbnb over the same period of time. Zervas et al. (2014) find that the entry of Airbnb in Texas negatively affected hotel room revenue and that a 10% increase in the size of Airbnb supply resulted in about a 0.4% reduction in hotel room revenue. This translates to a loss in hotel room revenue of about 8-10% in Austin, where Airbnb supply is higher, for budget and economy hotels which are the most vulnerable. Zervas et al. (2014) also find that hotels responded

[4] http://www.businessinsider.com/nyc-yellow-cab-medallion-prices-falling-further-2016-10

to this increase in competition by lowering their prices which clearly benefits all consumers, and not just participants of the sharing economy.

Zervas et al (2014) also study Airbnb's impact on hotel room revenue during periods of peak demand, e.g., during popular events such as South by South West (SXSW). First, the authors find that, during such periods, Airbnb supply scales up almost instantaneously. They find that this ability to flexibly scale instantaneous supply in response to seasonal demand has significantly limited hotels' pricing power during periods of peak demand.

The findings reported in Zervas et al. (2014) have direct implications for hotels and policy makers. First, hotel managers should recognize that the strength of Airbnb lies in its flexible supply and the level of personalization both in terms of location and characteristics of listed properties. Although they may not be flexible in their capacity, hotels can improve service to regain consumers that strongly value such features. For policy makers, Zervas et al. (2014)'s findings show that demand is shifting away from incumbents towards peer-to-peer platforms. Thus, municipalities that count on tax receipts from well-regulated industries such as hotels and taxi cabs could be hurt in the short run. However, a well-regulated system could potentially generate extra revenue for cities with high presence of Airbnb.

Li and Srinivasan (2017)

Seasonal demand is a common feature in many markets where the sharing economy now operates, for example, hotels. Li and Srinivasan (2017) investigate the short- and long-term impact of Airbnb entry in the hotel industry, focusing on the role of market-specific seasonality and changing consumer composition in these markets.

They first develop a theoretical model to illustrate the short- and long-term impacts of Airbnb and how the impact depends on market-intrinsic seasonality and existing supply factors. They then

estimate an empirical model of consumer choices that explicitly accounts for the endogeneity of seasonal demand on hotel seasonal pricing and Airbnb supplies. They find that the estimated underlying demand is more volatile and higher than observed demand during high demand seasons. Hotels' seasonal pricing dampens the underlying demand by 14% on average. Airbnb's seasonal supply could potentially recover 77% of that loss. They further draw managerial and policy implications for hotels and the industry. Low-end hotels may benefit from abandoning seasonal pricing as Airbnb expands, and high-end hotels might benefit in the long run. They also suggest that cities with weaker seasonality of demand, more expensive high-end hotels, and higher quality low-end hotels might not need to be overly concerned about the impact of Airbnb.

Cohen et al. (2016)

This paper measures the creation of consumer surplus by the UberX service in Chicago, Los Angeles, New York, and San Francisco. The econometric analysis benefits from the platform's use of "surge" pricing and almost 50 million individual-level observations, in a regression discontinuity design, to estimate demand elasticities at several points along the demand curve. The estimates imply that the UberX service generated about $2.9 billion in 2015 in consumer surplus in the four U.S. cities included in their analysis and about $6.8 billion in the United States as a whole. To put this in context, the total revenues of the U.S. Taxi and Limousine Services industry in 2015 was $18.5 billion[5].

Wallsten (2015)

This paper examines how the conventional taxi industry responded to the rise of Uber and similar services in New York and Chicago. The paper analyzes a dataset from the New York City Taxi and Limousine Commission (over a billion NYC taxi rides, including every taxi ride from 2009

[5] Accessed in February 2017 from http://clients1.ibisworld.ca/reports/us/industry/currentperformance.aspx?entid=1951).

through 2014), taxi complaints from New York and Chicago, and information from Google Trends on the popularity of the largest ride-sharing service, Uber. Wallsten finds that "controlling for underlying trends and weather conditions that might affect taxi service, Uber's increasing popularity is associated with a decline in consumer complaints per trip about taxis in New York. In Chicago, Uber's growth is associated with a decline in particular types of complaints about taxis, including broken credit card machines, air conditioning and heating, rudeness, and talking on cell phones." (p. 1). Wallsten concludes that "The results from New York City and Chicago are consistent with the idea that taxis respond to new competition by improving quality." (p. 19).

To summarize, the findings in the extant empirical research on the sharing economy suggest that consumer preferences for legacy and sharing economy providers exhibit spatial, temporal and use-occasion variations. They also demonstrate that sharing economy platforms draw customers from legacy providers because of their ability to adjust supply rapidly to demand which legacy providers cannot do. Finally, they suggest that increased use personalized approaches to match users with providers in the sharing economy can increase productivity and availability of services to underserved markets.

Analytical work

Fraiberger and Sundararajan (2015)

Fraiberger and Sundararajan (2015) examine the welfare and distributional effects of introducing peer-to-peer Internet-enabled rental markets for durable goods in a dynamic model where transaction costs and depreciation rates may vary with usage intensity and consumers are heterogeneous in their price sensitivity and asset utilization rates. The model is tested with U.S. automobile industry data and 2 years of transaction-level data obtained from Getaround, a large peer-to-peer car rental marketplace. Counterfactual analysis shows that introduction of peer-to-peer rental

markets leads to substitution of rental for ownership, lowering of used-good prices, and increasing consumer surplus. The results also suggest that below-median income consumers will enjoy a disproportionate fraction of eventual welfare gains from this kind of sharing economy through broader inclusion, higher quality rental-based consumption, and new ownership facilitated by rental supply revenues. Overall, their conclusions demonstrate the benefits of reallocation and redistribution when a new peer-to-peer market is introduced.

Horton and Zeckhauser (2016)

This paper also models a market where consumer/owners can rent out their durable goods when not using them. The model considers the impact on the platform's pricing problem of costs such as those for labor and transactions. The authors support some of their modeling assumptions broadly with a survey of consumers. Model outcomes include ownership, rental rates, quantities, and surplus generated. The model demonstrates as an equilibrium outcome that the emergence of the sharing economy may increase access by non-owners, change ownership decisions, and affect rental rates.

Jiang and Tian (2016a)

Jiang and Tian (2016a) study the manufacturer's optimal pricing and product quality decisions when facing consumers who can share products with other consumers through sharing platforms. In their analytical framework, a manufacturer sells its product directly to consumers, who can use the product in multiple time periods. Since the utility from using the product varies over time, consumers can use it during times with high self-use values but rent it out to other consumers in the sharing market when the self-use utility is low. Consumers are forward-looking when they make their purchase decisions and anticipate the future sharing possibility. The manufacturer does not participate in the sharing market but is strategic and maximizes its profits from product sales. The question that Jiang

and Tian (2016a) investigate is: how should the manufacturer price its product and choose its quality, knowing that customers can become indirect competitors because of the sharing market?

For each sharing transaction, the renter pays a rental fee while the product owner pays the platform a percentage commission. The total transaction cost for product sharing includes a part that is proportional to the sharing price (e.g., the platform's fee) and another part that is independent of the sharing price (e.g., coordination costs for pick-up and delivery). The authors introduce a market-clearing mechanism for the sharing market to determine the equilibrium sharing price for each period. At each sharing price, there will be some product owners who want to rent out their products and some consumers (who did not buy the product) who want to rent the product. The equilibrium sharing price is the one that exactly matches the supply and the demand for sharing.

Jiang and Tian (2016a) present three interesting findings. First, transaction costs of sharing have non-monotonic effects on the firm's profits, consumer surplus, and social welfare. The product-sharing market has two opposing effects on the firm. On the one hand, the existence of the sharing market can cannibalize the firm's sales since some consumers who would buy the product in the absence of the sharing market may decide to rent rather than buy. On the other hand, the sharing market can make the consumers less price sensitive since they can rent out the product to earn some income during periods of low self-use value. The authors show that the effect that dominates depends on the range of transaction costs for sharing and the firm's marginal cost.

Second, for the firm's existing products (with exogenous quality), product sharing can be either lose-lose or win-win for the consumers and the firm depending on the firm's marginal cost. When the firm's marginal cost is low, without the sharing market, the firm will charge a low price to target many consumers; with the sharing market, the firm will raise its price significantly to respond to anticipated sharing among consumers but the loss in unit sales will lead to lower total profits. In contrast, if the

firm's marginal cost is high, product sharing is win-win for the firm and the consumers. Note that without the sharing market, the firm's strategy is to charge a high price to target the small number of high-valuation consumers since its marginal cost is high. With the sharing market, the firm will also increase its price but even more consumers may buy the product because they anticipate the relatively high potential rental income from sharing (due to the relatively low expected availability of products for sharing). The sharing market can thus increase both the firm's profits and the total consumer surplus.

Third, Jiang and Tian (2016a) show that, if the firm strategically anticipates the consumers' sharing when it designs its product, it will find it optimal to raise product quality which in turn will increase the firm's profit but reduce the total consumer surplus in a sharing market. The firm's optimal quality tends to increase in the presence of the sharing market because customers with more variable usage values across periods will be willing to pay more for product quality since higher quality will allow them to generate higher rental income during periods of low self-use values. Intuitively, the sharing market thus allows the firm to pool together consumers with high valuations for quality across periods effectively increasing the average willingness to pay for quality which, in turn, gives the firm more incentives to provide high quality.

Jiang and Tian (2016b)

In their follow-up work, Jiang and Tian (2016b) examine how consumer-to-consumer product sharing affects decisions in the distribution channel where the manufacturer needs to invest in production capacity before producing and selling its product through a retailer that markets the product to strategic consumers. They show that product sharing will increase the manufacturer's optimal capacity if the capacity cost coefficient is above some threshold. If it is below that threshold, however, product sharing will reduce the manufacturer's optimal capacity.

Interestingly, in equilibrium the sharing market tends to increase the retailer's share of the gross profit margin in the channel which implies that the retailers gain more power in the channel when consumers can share products. In their framework, the sharing market will thus reduce the demand intercept and also lower the price sensitivity of the retail demand function. With capacity costs in the channel, the sharing market therefore tends to give the retailer more leeway with strategic pricing. Furthermore, the authors show that consumer-to-consumer sharing tends to benefit both firms when capacity is relatively costly to build but is more likely to benefit the retailer than the manufacturer. When the capacity cost is in the middle range, the sharing market will make the retailer better off but the manufacturer worse off.

A third important set of issues concerns predictive and prescriptive analytics for managing new sharing economy business models. In this section we discuss work by Guda and Subramanian (2017) and Fradkin (2017). We also broaden the discussion by touching on prescriptive considerations for government regulation in work by Ranchordas (2015).

Guda and Subramanian (2017)

Peer-to-peer on-demand service platforms, such as Uber and Lyft, serve consumers by leveraging the so called "gig economy" – a variable workforce of providers who can be hired on-demand and participate to work voluntarily without committing to a fixed schedule or availability. A fundamental challenge faced by on-demand platforms is to ensure that the voluntary workforce of independent providers is available at the right market locations at the right time under fluctuating demand and supply conditions. To address this challenge, many on-demand platforms share market forecasts with providers and have adopted a form of dynamic pricing known as "surge pricing" – where the platform may increase the price at a market location depending on market conditions. While these strategies are intuitively sound, their effectiveness in managing workers is unclear. For example,

Chen et al. (2015) conducted a study of surge pricing and its effect on supply of drivers on the Uber platform across locations in New York City and San Francisco over a two-week time period. They report that surge pricing often did not attract more drivers to the surge-priced location, but in fact caused drivers already serving that location to leave to serve elsewhere. They conclude that surge pricing "is not incentivizing the drivers the way [Uber] hoped it would". Similarly, Uber and Lyft drivers often complain that the platform exaggerates the need for drivers to move to locations that they otherwise would not have moved to (Guda and Subramanian 2017). Consequently many Uber and Lyft drivers report that they ignore the platform's forecasts and advise other drivers (through social media and online forums) to do the same.

Guda and Subramanian (2017) develop a formal model-based theory of surge pricing and forecast communication explicitly accounting for providers' incentives to serve consumers in different market locations and the platform's incentive to share market information truthfully. They model the strategic interactions between an on-demand platform, independent providers, and consumers in two adjacent market zones and over two successive time periods. Each period, there are consumers in each market zone that require on-demand service. The platform matches consumers with providers available in the same market zone. Providers receive a share of the platform's revenue for serving consumers. The on-demand platform, faces uncertain supply and demand conditions. The number of providers that join the platform in each market zone is uncertain and not controlled by the platform. Further, either market zone can experience a demand surge (increase in demand), and the providers available in that zone may not be sufficient to satisfy the demand. Providers, can move between market zones by incurring some monetary and time costs and the platform can forecast market conditions and share this information with providers. The authors derive the platform's optimal forecast

communication and dynamic pricing policy under these conditions across the two market zones. Their analysis yields the following insights.

Sharing market information with providers is not sufficient to ensure that they move to locations requiring additional workers. Individual providers do not internalize the competitive externality that they impose on other providers in their market zone. Consequently, even if providers are fully informed about market conditions, too few providers may leave a market zone with an excess supply of providers to serve adjacent market zones that require additional providers. The platform, however, can induce more providers to move by using a surge price in the market zone with excess supply; a surge price lowers demand and exacerbates the extent of oversupply, thereby making it less attractive for the providers to stay in that zone. While distorting the price in this manner through surge pricing reduces the platform profit in that zone, it can increase total platform profit across zones by incentivizing more workers to move.

Moreover, in sharing market forecasts with workers, information about which market zone the providers should move to can be shared credibly. However, the platform can have an incentive to exaggerate the need for workers to move. Consequently, providers may ignore the forecasts provided by the platform even if there is truly a greater need for them to move. Therefore, to communicate the forecasts credibly, the platform can use an accompanying surge price as a credible signal of a higher need for more workers to move; interestingly, it can be more profitable for the platform to signal with a surge price in the market zone that the workers should leave.

From a theoretical perspective, Guda and Subramanian (2017) address a basic problem of how to dynamically balance supply and demand for providers to on-demand platforms that leverage the gig-economy. They show that, contrary to the conventional logic of setting a "market clearing" price at each market location, it can be optimal for the platform to raise the price and exacerbate the

imbalance in supply and demand in one location to increase the supply of providers in another location. From a managerial perspective, Guda and Subramanian (2017) shed light on the role and effectiveness of two strategies commonly employed by on-demand platforms to manage variable demand and supply conditions - namely, sharing market information with providers and surge pricing. They show, for instance, that surge pricing can be necessary to support credible sharing of market information, and identify the efficient form of surge pricing to facilitate communication. From a substantive perspective, their findings can help in understanding the counterintuitive market observations regarding surge pricing causing providers to leave that market zone. Their results also inform the debate and controversy about the "unfair" use of surge prices even when there is sufficient supply.

Some testable predictions are

1. Providers may under-respond to the forecasts provided by the platform and not enough providers move to locations requiring additional providers.
   - For example, high-demand market locations will experience a shortage of providers even though adjacent low-demand locations have an oversupply of providers.
2. Providers may also over-respond to the forecasts provided by the platform and flock a market location that is expected to surge, resulting in an excess supply of workers at that location.
3. Platform will use surge pricing (also) to force providers to leave a market location in order to improve the availability of providers at other locations.

For on-demand service platforms, surge pricing and forecast communication (under a revenue-sharing arrangement) cannot fully address the challenge of ensuring that providers are available when they are needed, where they are needed. Further research is necessary to explore the means of improving the availability of providers and improving their trust in the platform. For example, drivers could be provided directed incentives for moving between locations. In addition, the platform could "hire" workers for short durations during which time they are paid to follow all instructions from the platform.

Fradkin (2017)

Fradkin (2017) uses internal data from Airbnb to study the efficiency of the online marketplace for housing rentals and the effects of different ranking algorithms where traders are matched with each other. He shows that potential guests engage in limited search, are frequently rejected by hosts, and match at lower rates as a result. He then estimates a model of search and matching to show that, if frictions were removed, there would be substantially more matches in the marketplace. He then compares several ranking algorithms and shows the extent that a personalized algorithm would increase the matching rate.

Ranchordas (2015)

This paper considers the regulatory issues of protecting users of shared services from fraud, liability, and unskilled service providers while at the same time avoiding stifling innovation in the relevant sectors. The paper asks "should the regulation of these practices serve the same goals as the existing rules for equivalent commercial services" (p. 2) and how should regulation keep up with the evolving nature of these innovative practices? Overall, the paper recommends limited but specific regulation of sharing economy.

To summarize, the extant analytical work to date on the sharing economy suggests that the entry of sharing economy platforms could not only increase consumer surplus but also firms' profits. The findings also indicate that the growth of sharing economy platforms can affect ownership decisions and rental rates for products and services and could also reduce sales of products and consumers welfare. They also suggest that care has to be taken in the design of mechanisms like surge pricing to balance supply of providers and demand. For instance, somewhat counterintuitively, increasing the price in locations from where the providers should move may be more effective than doing so in locations that providers should move to.

Behavioral work

A third literature relevant to the sharing economy concerns the consumer behavior implications of sharing itself. A proponent of this perspective, Belk (2010, p. 715) "distinguishes between sharing in and sharing out, and suggests that sharing in dissolves interpersonal boundaries posed by materialism and possession attachment through expanding the aggregate extended self."

This work falls in the sub-discipline of consumer behavior commonly referred to as consumer culture theory focusing on the conceptual dimensions of sharing and the impact upon the self (Belk, 2010, 2013). Sharing generally, including participation in the sharing economy, is found to be driven by various motivations including an innate need to care for others, cultural orientation, prosocial behaviors, altruism, reciprocity, affiliation, self-esteem, pleasure, achievement, social congruence, and collectivism, as well as utility and attachments to objects (Belk, 2010; Schoenmueller, Fritz and Bruhn, 2014).

Concerning participation in the sharing economy, in particular, motivations include utility, trust, cost savings and familiarity, and to a lesser extent (for one of two studies) service quality and community belonging (Mohlmann, 2015). Environmental impact, internet capability, smartphone capability, and trend affinity had no effect. But there may be other effects, partly cultural. Also, traditionally, rental arrangements involving cars and housing have been viewed negatively as inferior and flawed consumption styles (Cheshire, Walters, and Rosenblatt, 2010, Ronald, 2008).

Another view is that, in contrast with traditional sharing, access-based consumption is a form of collaboration which does not entail joint ownership or transfer of owned possessions and instead is motivated by economic exchanges often taking form as rental arrangements and for-profit transactions (Bardhi and Eckhardt, 2012). The car-sharing business model considered by Bardhi and Eckhardt

(2012) differs from the sharing economy in that it is typically not consumer-to-consumer sharing of excess capacity of a durable good but rather is a form of business-to-consumer rental. For this business model, the authors conclude, "[w]e find that the types of behaviors occurring in access-based consumption in a car sharing-context divide resources among discrete economic interests—the company and the consumers—and preserve the self/other boundary" (p. 888). For the sharing economy, it is likely that similar conclusions apply, i.e., that transactions are non-personalized market activities that preserve much of the self/other boundary. The extent to which participation in different elements of the sharing economy carry attendant feelings of promoting ecology and community cooperation, however, is an open question.

Summary of findings

The research that we have reviewed has examined a variety of questions about the sharing economy, from a number of different perspectives: empirical, analytical, and behavioral. The key findings are:

1. Preference for, and consumer sensitivity to prices of, legacy providers like Yellow Cabs relative to sharing economy platforms like Uber, exhibits spatial, temporal and use-occasion variations. This means that cross-price elasticities would also exhibit similar patterns and implementations of pricing strategies in these markets have to take these into account.
2. Sharing economy platforms like Airbnb draw customers and revenue away from legacy providers like Marriott and Hilton. The key advantage of the sharing economy platforms is in their ability to adjust supply rapidly to demand unlike legacy providers.
3. Using personalized approaches to match renters with providers reduces friction in the market and increases matching. Such, demand allocation mechanisms could also lead to

increased productivity of the providers and to provision of services to heretofore neglected market segments.

4. The entry of sharing economy platforms could result in a substantial increase in consumer surplus, as well as an increase in firm profits
5. Growth of sharing economy platforms may increase access for non-owners, change ownership decisions, and affect rental rates. It could therefore reduce sales of some products (e.g., cars) and consumer welfare (e.g., by increasing rents for housing).
6. When capacity is costly to build, the sharing economy benefits both manufacturers and retailers of the shared products
7. When sharing platforms use surge pricing to balance supply of providers and demand, increasing the price in locations from where the providers should move may be more effective than in locations that providers should move to.

Research directions

The work that we have reviewed points to several areas and questions related to the sharing economy that can benefit from additional research. We organize and discuss these areas under the traditional 4 P's while also adding additional topics like regulation and public policy.

The findings that we presented suggest that the rise of the sharing economy may not only affect consumers' interest in purchasing products but also their preferences for product features and quality. For instance, some consumers may decide to rely on the sharing platforms for products like cars as needed and stop buying them altogether. There might also be some consumers who decide to become providers and buy higher quality products – for instance, luxury rather than budget brand cars – to make themselves more attractive to users of the sharing economy. More research is needed into the

dynamics of such changes in behavior as the sharing economy evolves and how best manufacturers should accordingly adapt their product mixes. Additionally, while not traditionally a question for marketing scholars, the implications of changes in consumer purchase patterns and preferences to the production capacity and inventory strategies of manufacturers and the accompanying implications for product pricing would also be important to examine.

Pricing is perhaps the most promising and important area for additional research into the sharing economy. Several characteristics of the sharing economy contribute to its importance as suggested in our review above. First, the sharing economy functions entirely via multi-sided platforms. Pricing therefore not only affects demand for the services sold in the economy but also the capacity of the platforms because of the effect of price on providers' earnings. Consequently, dynamics of demand have implications for pricing dynamics and vice versa and, in turn, both have implications for the dynamics of platforms' capacity. This area therefore holds significant promise for investigations via structural models.

By virtue of supplying their services through the platforms, providers are also effectively distributors' of the platforms' service capacity. Another promising and interesting area of research, therefore, is the investigation of platform-provider relationships drawing on the extensive research in the literature on channel relationships. The principal-agent model provides a rich framework in this regard particularly in light of the significant asymmetries in the information available to the principal that operates and has access to all the information from the platform and the agent who reacts to the information that the principal decides to provide.

The extensive information generated by the platforms on providers and users also raises several interesting questions and offers significant opportunities for research related to promotion. For instance, several platforms ask users to rate providers on the quality of the service provided and

providers to rate the users on the 'quality' of their use of the service. How this information is provided to, and used by, providers and users however varies across platforms. Uber, for example, provides summaries of ratings of each other to users and providers but users do not have a choice of providers and have to go with the provider that accepts their request for a ride. Air BNB, on the other hand, provides information to both and both have a choice of who they would transact with. There are few insights, however, into which of the two approaches leads to higher provider and user welfare.

Given the nascent state of the sharing economy, there are also several policy and regulatory questions that call for research. For instance, most sharing economy services are not yet subject to regulatory oversight or taxes. A question that needs to be addressed, therefore, is: how much regulation is optimal in the sense of increasing provider and user welfare while not being detrimental to the growth of the sharing economy? Similarly, most sharing economy services are not yet subject to taxes. The resulting losses in tax revenue for cities and states could be substantial. The absence of regulation and taxes also means that the sharing economy providers like Uber and Air BNB have a cost advantage over legacy providers like Yellow Taxis and Hotels respectively. Imposition of taxes on the sharing economy providers, however, would reduce consumer welfare when the taxes are factored into pricing by the providers. On the other hand, restoring lost tax revenues could also allow cities and states to increases services to their citizens thus increasing welfare. Investigations of taxation levels that are optimal in terms of overall consumer welfare are therefore necessary.

The directions that we provide above for are only meant to stimulate additional research into the sharing economy and are by no means comprehensive. The very early stages of this economy raise many other questions that need to be addressed. For instance, almost all of the sharing economy platforms provide services related to providers' assets such as durables such as cars or homes and time. There are as yet no platforms that have begun offering providers of intellectual assets to rent

those assets although non-commercial platforms such as Wikipedia have been operating for many years. Research into the scope and models for commercial sharing of intellectual assets would therefore be an additional promising avenue. Similarly, since sharing economy platforms allow users and providers to rate each other, another interesting direction of research would be into the role of reviews in provider selection by users and user selection by providers and how the latter affects user behavior.

In conclusion, this paper presents current research into the sharing economy and also several directions for additional research into several important questions that still need to be addressed. We hope our work stimulates such research into this rapidly growing and important sector of the global economy.

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Table 1
Literature on Sharing Economy

		Methodology				Outcomes			
	Substantive Area: Positioning and Conclusions	Conceptual	Analytical	Empirical	Algorithms	Allocation Issues	Pricing	Welfare	Consumer
Wu, Wang, and Zhu (2016)	**Pricing:** Critical role of allocation mechanism to match demand to supply and the resulting pricing impact.			**x**	**x**	**x**	**x**	**x**	
Narasimhan et al. (2016)	**Competitive Effects:** Measure consumer price sensitivity for Legacy Providers' following entry of SE Providers (spatial, temporal, usage-occasion variation).			**x**			**x**		
Zervas, Proserpio & Byers (2014)	**Competitive Effects:** Impact of Airbnb supply on hotel revenue (-.04 elasticity); hotels lower prices.			**x**			**x**		
Cohen et al. (2016)	**Consumer Surplus:** Measures consumer surplus created by Uber in four US cities.			**x**				**x**	
Wallsten (2015)	**Competitive Effects:** In New York City and Chicago, taxis respond to Uber competition by improving quality (e.g., decline in complaints).			**x**				**x**	
Fraiberger & Sundararajan (2015)	**Owning/Using/Renting:** Substituting rental for ownership; lower used-goods prices.		**x**			**x**		**x**	
Horton & Zeckhauser (2016)	**Owning/Using/Renting:** Increase access by non-owners; changes in ownership choice and rental rates.	**x**	**x**			**x**	**x**		
Jiang & Tian (2016a)	**Competitive Effects:** Impact of transaction cost of sharing and marginal cost of existing product, on pricing, product quality, and profitability.		**x**				**x**	**x**	
Jiang & Tian (2016b)	**Distribution Channel**: Impact of product sharing on distribution channel decisions (e.g., capacity).		**x**			**x**			
Guda & Subramanian (2016)	**Pricing:** Optimality of "surge pricing" even in zones where with excess supply of workers.		**x**		**x**		**x**		
Fradkin (2017)	**Friction:** If "frictions" removed from Airbnb, new algorithms attract 102% more matches.				**x**	**x**			
Ranchordas (2015)	**Regulation**: There should be limited, but specific regulation of sharing economy.	**x**						**x**	
Belk (2010, 2013)	**Sharing:** Dissolves interpersonal boundaries through expanding the aggregate extended self.	**x**							**x**
Bardhi & Eckhardt (2012)	**Access-based Consumption:** Preserves the self/other boundary in market-based, car-sharing context.			**x**					**x**
Mohlmann (2015)	**Sharing Motivations:** Include utility, trust, cost savings and familiarity. To a lesser extent, service quality and community belonging.			**x**					**x**

Table 2
Pricing Models Used by Different Platforms

		Fixed Price - Static	Fixed Price - Dynamic
Who sets the price	Platform	Lending Club	Uber Surge Pricing
	Providers	Airbnb	

Figure 1: Examples of Sharing Markets

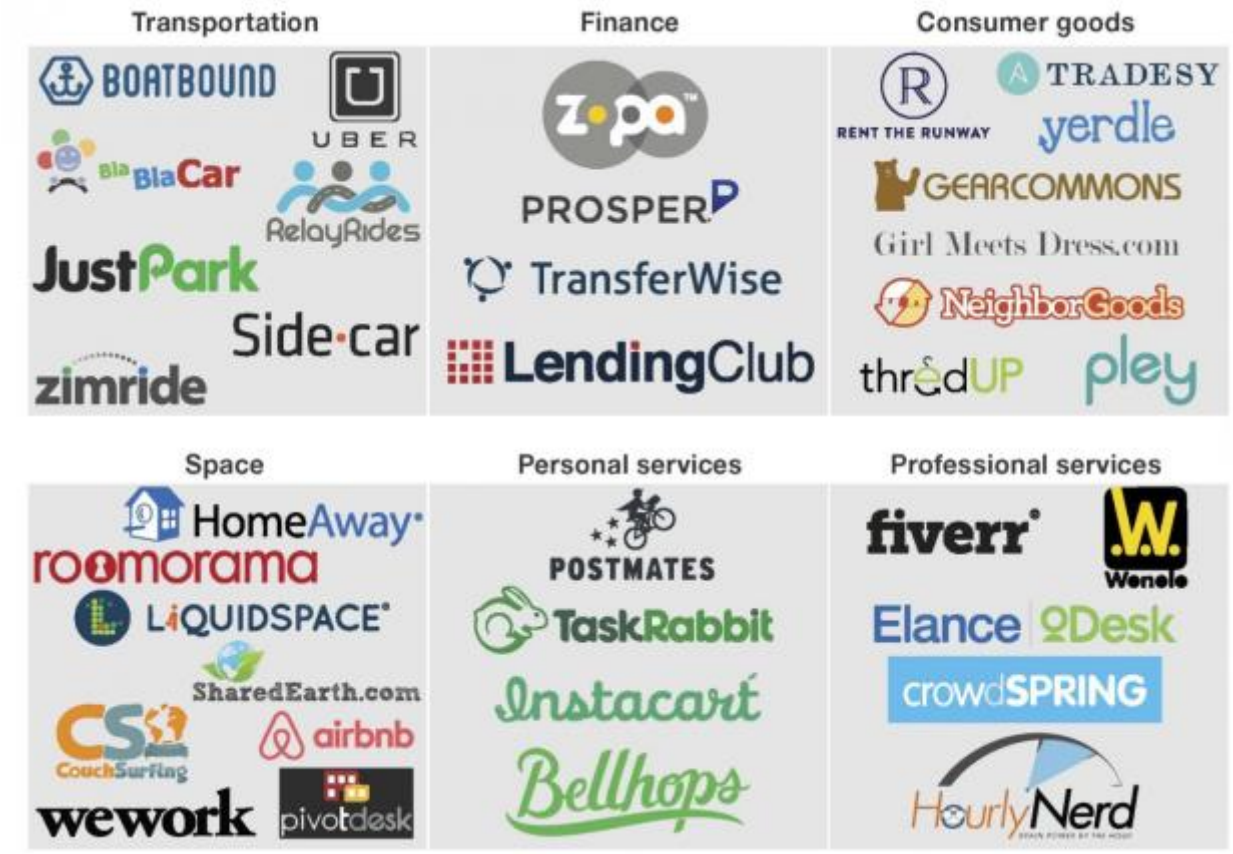
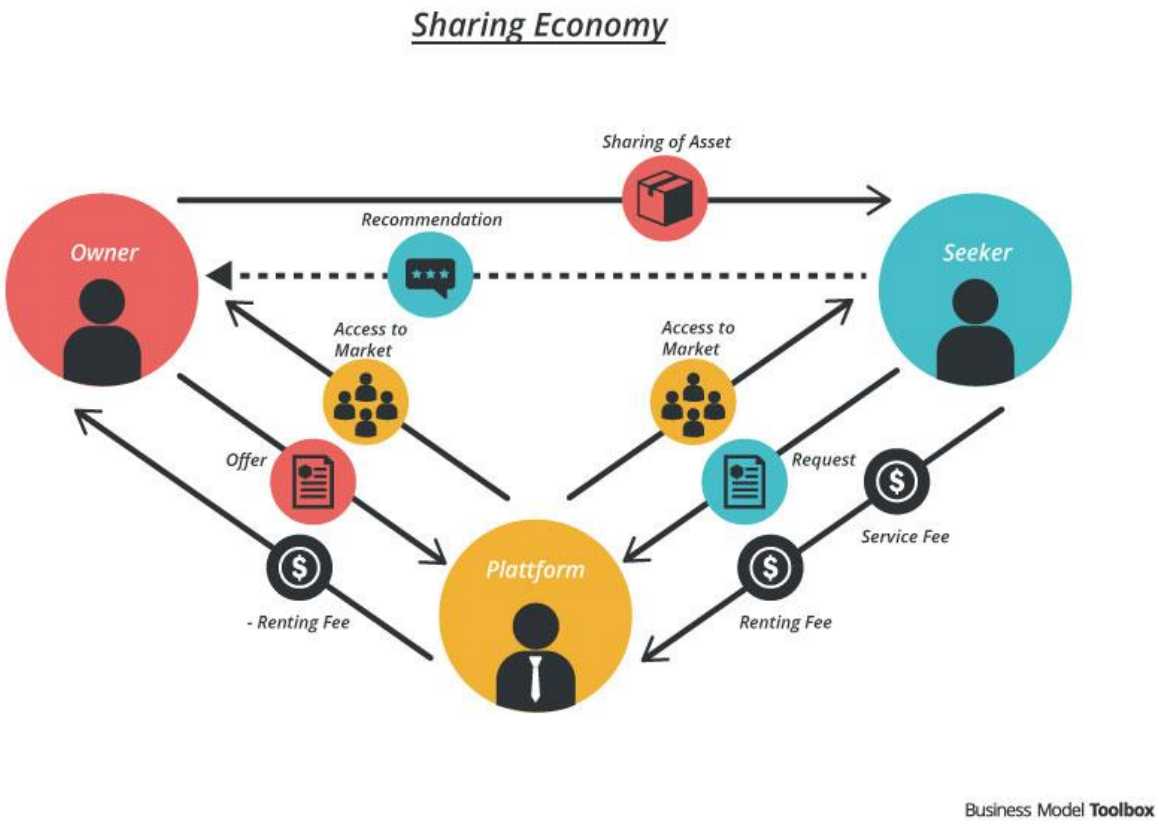


Figure 2: Overview of the Sharing Economy



Source: Business Model Toolbox: http://bmtoolbox.net/patterns/sharing-economy/