The global sharing economy, e.g., AirBnB and Uber, is projected to generate roughly $335 billion by 2025. The rise of sharing economy has drawn enormous attention from academia and led to policy intervention debates. However, three questions that are essential to a better understanding of sharing economies remain unanswered: 1) can we identify, from unstructured data (product images), the key dimensions of interpretable attributes that affect consumers’ choices, and provide guidelines for sharing economy platform for optimizing images to improve the product demand, 2) can a scalable economic model be developed to disentangle factors that influence AirBnB hosts’ decisions on the type of property photos to post, and to explore photograph policies that platforms such as AirBnB can employ to improve the profitability for both the hosts and the platform, and 3) are there demand interactions/externalities that arise across sharing economies to provide policy implication. This dissertation contributes to the relevant literature by filling the gap. To achieve this objective, I apply economic theory to a large-scale demand data leveraging advanced machine learning techniques in computer vision and deep learning models.

In the first chapter, I investigate the economic impact of images and lower-level image factors that influence property demand in AirBnB. Employing Difference-in-Difference analyses on a sixteen-month AirBnB panel dataset spanning 7,423 properties, I find that units with verified photos (taken by AirBnB photographers) generate 8.9% more demand, or $3,500 more revenue per year on average. Leveraging deep learning techniques to classify aesthetic quality of more than 510,000 property photos, I show that 41% of the coefficient of verified photos is explained by the high image quality in these photos. Next, I identify 12 human-interpretable image attributes from photography and marketing literature relevant for real estate photography that capture image quality as well as consumer taste. I quantify (using computer vision algorithms) and characterize unit images to evaluate the empirical marginal effects of these interpretable attributes on demand. The results reveal that verified images not only differ significantly from low-quality photos, but also from high-quality unverified photos on most of these features. The treatment effect of verified photos becomes statistically insignificant once controlling for these 12 attributes, suggesting that AirBnB’s photographers not only improve the quality of the image but also align it with the taste of potential consumers. This implies there is significant value in optimizing images in e-commerce settings on these attributes. From an academic standpoint, this study provides one of the first large-scale empirical evidence that directly connects systematic lower-level and interpretable image attributes to product demand. This contributes to, and bridges, the photography and marketing (e.g., staging) literature, which has traditionally ignored the demand side (photography) or did not implement systematic characterization of images (marketing). Lastly, these results provide immediate insights for housing and lodging e-commerce managers (of AirBnB, hotels, realtors, etc.) to optimize product images for increased demand.

In the second chapter, I investigate how AirBnB hosts make decisions on the quality of property images to post. Prior literature has shown that the images play the role of advertisements. Particularly, compared to lower quality amateur images, high quality professional images can increase the present demand by
approximately 9% (Zhang et al. 2018). However, there exist a large number of amateur images on AirBnB, even when AirBnB was providing professional photography service for free to all the hosts. I posit that the host’s decision on what quality of images to post depends not only on the advertising impact of images on the present demand and on the cost of images, but also on the impact of images on the future demand. Thus, some hosts would be hesitant to post professional images because professional images can create unrealistically high expectations for the guests, especially if the actual property is not as good as what the images portray and if the hosts are unable to provide a high-level service to match those expectations. This would result in the satisfaction level of guests to decrease, who would then write a bad review or not write any review at all; and since the number/quality of reviews is one of the key drivers in generating new bookings, this will adversely affect the future demand. I build a structural model of demand and supply, where the demand side entails modeling of guests’ decisions on which property to stay, and the supply side entails modeling of hosts’ decisions on what quality of images to post and what level of service to provide in each period. I estimate the model on a unique one-year panel data consisting of a random sample of 958 AirBnB properties in Manhattan (New York City) where I observe hosts’ monthly choices of the quality of images posted and the level of service provided. The key findings are: 1) guests who pay more attention to images tend to care more about reviews, 2) hosts incur considerable costs for posting above-average quality of image, and 3) hosts are heterogenous in their abilities in investing service effort. In counterfactual analyses, I compare the impact of the current photography policy (offering free high-level images to hosts) and of two proposed policies (offering a menu of free medium-level images to hosts) on the property demand. I show that the proposed policies, though dominated by the current policy in the short-run, outperform the currently policy in the long-run. Noticeably, hosts who might end up using amateur images to avoid the dissatisfactory gap under the current policy, now use free medium-level images to make more revenues under the proposed policy.

In the third chapter, I examine how ride sharing services such as Uber/Lyft affect the demand for home sharing services such as AirBnB. The existing research has largely focused on the impact of sharing economy on incumbent industries while ignoring the interactions among sharing economies. In this study, I examine how ride sharing services such as Uber and Lyft affect the demand for home sharing services such as AirBnB. The identification strategy hinges on a natural experiment where Uber and Lyft exited Austin in May 2016 in response to the introduction of new regulations in Austin that targeted ride sharing services. Applying the Difference-in-Difference approach on a 9-month balanced longitudinal data spanning 7,300 AirBnB properties across 7 US cities, I find that the exit of Uber/Lyft led to a decrease of 9.6% in the AirBnB property demand, which is equivalent to a decrease of $6,482 in the annual revenue to the host of an average property. I further find that the exit of Uber/Lyft reduced the (geographic) demand dispersion of AirBnB. The demand became more concentrated in areas with access to better public transportation services. Moreover, the properties farther from downtown experienced greater decreases in their demand in the absence of Uber/Lyft. The results indicate that Uber and Lyft affect the demand for AirBnB properties primarily by reducing the transportation costs to and from AirBnB properties that otherwise have poor access to transportation services. The research effort is a first step toward understanding the positive externalities between sharing economies and provides policy implication.