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**Master's Thesis**

**Examining the Economic and Social  
Regulations of Ride-sourcing Services in  
Asia: The Cases of Singapore,  
Philippines, China, Japan, and Taiwan**



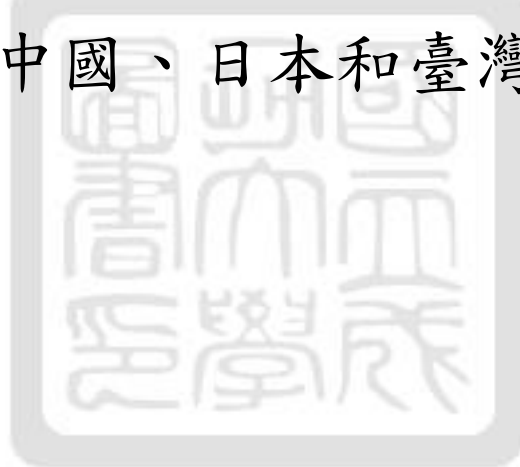
**Student: Wang, Yun-Chieh**

**Advisor: Dr. Liao, Chun-Hsiung  
Dr. Huang, Yu-Wen**

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電信管理研究所  
碩士論文

檢視亞洲國家獲利型共乘平台的經濟與社會管制：以新加坡、菲律賓、中國、日本和臺灣為例



研究生：王韻捷

指導教授：廖俊雄 博士

黃郁雯 博士

中華民國一〇七年七月

# 國立成功大學

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研究生：王韻捷

本論文業經審查及口試合格特此證明

論文考試委員：廖俊雄

林洞詔 黃郁雯

汪志堅

呂錦山

指導教授：廖俊雄 黃郁雯

系(所)主管：廖俊雄

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## ABSTRACT

With the widespread usage of the Internet and smartphones, the rise of ride-sourcing services offers new avenues for creating wealth but challenges existing incumbents and regulation structures. Ride-sourcing is an app-based on-demand ride service that matches passengers and drivers with unused vehicles and spare time to create extra income. Facing multiple legal and social hurdles in ride-sourcing, many countries, for example, Germany, France, Spain, and Taiwan have (nearly) banned such services nationwide. However, some countries and areas such as China, the Philippines, and California embrace these innovative services. This study examines the economic and social regulations of ride-sourcing services in Asia, and five analysis criteria, including supply and demand, transaction cost, externalities, safety, and privacy are adopted as the research framework. Five economies, including Asia, Singapore, Philippines, China, Japan, and Taiwan are used as case studies to investigate how ride-sourcing service influences transportation incumbents, how governments respond to this innovative service, and what legal and social issues this service has generated.

The main results are summarized as follows: When faced with ride-sourcing services, these governments made decisions on the legalization of the services mainly based on the supply and demand in the existing taxi market. In cases where taxi services were oversupplied, ride-sourcing services were made illegal. In cases where there was an excess demand for taxi services, these services were legalized to effectively resolve the shortage of taxi services. There were two methods used to legalize ride-sourcing services: revising the existing regulations to accommodate the new services and adding a new service classification in the existing regulations. On the economic regulation side, ride-sourcing services balanced the supply and demand with raises prices, responded to the real-time demand across the city, and encouraged more drivers to enter the market during rush hour. The services reduced transaction costs and made the market more efficient by reducing searching costs via an algorithm matching customers' requests with available drivers. Some positive externality effects occurred but brought other negative externality problems to both the society and taxi industry. On the social regulation side, the countries that made ride-sourcing services legal set safety standards on company and driver qualifications in order to protect customers. Two privacy invasion incidents forced all ride-sourcing companies to strengthen their private protections. Finally, this study provides feasible regulatory guidelines that governments could adopt when considering legalization of ride-sourcing services.

**Keywords:** Ride-sourcing services, Uber, Regulatory framework, Comparative research

## 摘要

隨著無線網際網路廣泛覆蓋與智慧型手機大量普及，使業者可以提供「即時」的服務，加上 2008 年金融危機嚴重影響全球經濟，消費者試圖減少支出並創造額外收入。因此，共享經濟(Sharing economy)的商業模式如雨後春筍般出現，使得閒置資源能夠更有效的利用，例如：交通產業、房屋租賃業等。其中共享經濟的概念運用在交通產業，其影響層面甚鉅。獲利型共享服務平台(Ride-sourcing services)的興起使全球交通產業出現革命性之變化，除了衝擊原有的產業結構外，更對政府和社會帶來了諸多的問題。「如何找到兼具產業發展以及消費者保護的平衡點」成為了一項管制政策的難題，面對獲利型共享平台所產生的複雜法律問題以及社會影響，許多國家抱持著不同的態度與做法，以德國、法國、西班牙與台灣為例，在全境內幾乎禁止提供此種創新服務，然而，也有某些國家和地區接受此種創新服務，例如：新加坡、中國、菲律賓和美國加州。本研究以新加坡、菲律賓、中國、日本與台灣在內的五個亞洲經濟體作為案例研究。運用質性比較研究之方法，以經濟管制和社會管制為研究架構，歸納五種要素包含「供給與需求」、「交易成本」、「外部性」、「安全」和「隱私」，並針對各個經濟體的五個要素進行比較研究，且進一步分析此五種要素如何影響各國對於獲利型共享平台的管制態度與做法。除此之外，本研究也分別探討獲利型共享平台如何影響該國之交通產業、該國政府如何應對此創新服務以及其所帶來的法律與社會議題。

在經濟管制方面，獲利型共乘服務平衡了供需，即時感應整個城市的需求，並鼓勵更多的司機在尖峰時段進入市場。這些服務通過應用程式連結乘客與司機，降低了交易成本並提高了市場效率，並給社會和計程車行業帶來了負面的外部性問題。在社會管制方面，讓獲利型共乘服務合法化的國家皆制定的相關的安全標準，以保護顧客權益；而兩起隱私相關事件迫使所有獲利型共乘服務公司加強其對顧客的隱私保護。本研究歸納出政府面對獲利型共享服務平台時，會根據現有計程車市場的供需情況決定服務是否合法化，並有三類應對方式：第一類為接受創新服務平台之經營模式，在法規內設立新的產業分類，並制定平台相關管制與安全規範；第二類為在既有的產業分類中，調整規範以適應新的服務；第三類則是依現有法規，強制要求平台停止獲利型共乘服務，並祭出高額的罰金。最終，本研究認為應該以一種不妨礙創新並保護消費者的方式，監管這類新的服務。透過競爭讓業者有動力去追求更高的品質，以便政府能夠為整個社會創造更高的效益。

**關鍵字：**獲利型共乘平台，經濟管制，社會管制

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韻捷 謹致  
成功大學電信管理研究所  
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# Chapter One

## Introduction

### *1.1 Background and Motivation*

Taxi drivers protesting competition from transportation startups who perceived them as a threat to their livelihoods attacked an Uber car near Charles-de-Gaulle Airport in Paris on January 13, 2014. This event unleashed massive protests across the nation, resulting in blocking of highways, the torching of cars, and even the taking of hostages. Taxi drivers' hostility toward ride-sourcing service drivers gave rise to road blockages in many major European cities, and two Uber executives were arrested and accused of running an "illicit" business (Cable News Network [CNN], 2014; Tech Crunch, 2014). Another incident occurred later on in July in Taiwan in which taxi drivers deliberately paralyzed road traffic in Taipei's downtown area, surrounded the Ministry of Transportation and Communications (MOTC), and burned their taxi driver licenses to demonstrate against Uber (Tech in Asia, 2014a). Similar demonstrations continued to take place to protest against the government's disregard for the legal interests of taxi drivers and Uber's engagement in illegal transportation practices on the island, putting pressure on the government to crack down on Uber (Taipei Times, 2016). In Japan, taxi drivers provide excellent services with outstanding systems, and ride-sourcing services do not have any competitive advantage. Thus, taxi disputes rarely occur (Consumer News and Business Channel [CNBC], 2018a). Further, Singapore, China, the Philippines, London, and California have ignored taxi drivers' protests and accommodated innovative ride-sourcing services. However, Korea, India, and Taiwan together with most parts of Europe simply banned ride-sourcing services nationwide and tried to placate taxi drivers. Nevertheless, the rise of innovative ride-sourcing services will force governments and academics to face their regulative and legal issues.

Horse-drawn for-hire two-wheel hackney carriage services began operating in both Paris and London in the early 17th century (Gilbey, 1903). In 1834, hansom cabs replaced hackney carriages as a vehicle for hire because the journey was cheaper than traveling in a larger four-wheel coach. Electric battery-powered taxicabs with taximeters became available in the streets of London in 1897, and gasoline-powered taxicabs began operating in Paris in 1899 and in New York in 1907. Taxi services proliferated around the world in the early 20th century. The invention of two-way radios in the late 1940s enabled taxicabs and dispatch offices to communicate and serve customers more efficiently than callbox usage. Computer-assisted dispatching in the

1980s was another major innovation for the taxi industry.

The mobile phone and the Internet are two of the most prolific and greatest inventions in human history because they connect people without any restrictions related to geography or time. Due to the technology revolution that has occurred since the 1980s, information diffusion has accelerated, and people are exposed to a great deal of information. Mobile subscriptions worldwide have become mature, reaching 7.6 billion in 2017, but mobile broadband subscriptions now are around 4.6 billion and continue to increase by 25 percent annually (Ericsson, 2017). Also, the number of smartphones users was more than 2.5 billion in 2015 and particularly, the smartphone global penetration rate in the Asia-Pacific area has soared from 34% in 2008 to 52% in 2015 (Kleiner Perkins Caufield & Byers, 2016). With the widespread internet environment and popular mobile devices, various over-the-top (OTT) applications (i.e., apps, for example, communication, entertainment, and social media) have completely changed our daily lives.

A sharing economy is a microeconomic system built around the utilization of unused resources (Bond, 2015) and involves peer-to-peer-based activities including obtaining, giving, or sharing access to goods and services, coordinated through community-based online services (Hamari, Sjöklint, & Ukkonen, 2016). Sharing involves the owner providing others with temporary access to items, not the conversion of asset ownership (The Guardian, 2015). For example, a family with a vacant bedroom for the weekend may rent out that room to a visitor who cannot find a local hotel of comparable quality. Such an idea was originally presented by Felson and Spaeth (1978) as cooperative consumption in the *Journal of American Behavioral Scientists*. However, since the 2008 financial recession and its effects on the global economy, the ensuing decrease in purchasing power changed consumer behavior in an attempt to reduce their expenditures and create extra income. Then, the idea of sharing economy sprang up because the perceived benefit of sharing is saving money. People started to share their idle assets and reutilize them. Hence, based on the idea that everyone can be a provider of goods or services, the business landscape has shifted from a “me” model to a “we” model (Botsman & Rogers, 2010). It fits the way of modern thinking in which a person uses the benefit of a product or service without purchasing its ownership via sharing directly with other individuals for free or a fee.

Sharing is generally restricted to family and friends because they are known and trusted social contacts. However, the existence of a sharing-economy platform (e.g., Airbnb, eBay, and Uber) greatly reduces transaction costs and risk (i.e., all the costs and troubles incurred in making an economic transaction) between service providers and consumers (Frenken & Schor, 2017). The platform lowers the costs related to

searching and contracting, discloses supplier information and reliability, and provides standardized contract forms. Consumers find it much easier to locate the goods and services they want, and transactions are regularized via contracts and online payment systems. Hence, the rights of both parties are protected, making lending goods to strangers possible. Overall, trust is a subjective feeling where the trustee believes that the trading partners will fulfill their promises in a certain way (Anderson & Narus, 1990; McKnight, Cummings, & Chervany, 1998). An essential reason why users on such platforms trust strangers originates from reputation systems in which users are able to evaluate the transactions experience of their counterparts, and as a result, their trustworthiness is elicited. Reputation information helps users via numerical review scores of experienced service providers who have interacted with those transaction counterparts, and it is an essential factor for transactions in online peer-to-peer (P2P) marketplaces, since two strangers are unlikely to engage in a monetary transaction without trusting one another (Bonsón Ponte, Carvajal-Trujillo, & Escobar-Rodríguez, 2015; Ert, Fleischer, & Magen, 2016; Kim, Chung, & Lee, 2011).

A sharing economy is a socioeconomic groundswell that transforms the way companies think about their value propositions and the way people fulfill their needs. It can be parsed into three different forms: product service systems, redistribution markets, and collaborative lifestyles (Botsman & Rogers, 2010). Product service systems allow consumers to engage in monetized exchanges peer-to-peer on a platform for temporary access to goods owned by a company or individual. It helps maximize the utility of the resource but disrupts traditional industries based on individual private ownership models (Piscicelli, Cooper, & Fisher, 2015). For example, car sharing service company Zipcar advertises the well-known slogan “Own the trip not the car. You drive, and we’ll take care of the rest,” and their customers reserve the service using an app and pay fees by the hour or day (Zipcar, 2017). Next, redistribution markets are a trading system comprising used or pre-owned goods being passed on from someone who does not want them to someone who needs them (Botsman & Rogers, 2010). The five “Rs” comprising redistribution: reduce, recycle, reuse, repair, and redistribute, encourage people to reuse and resell goods instead of throwing them out. eBay, for instance, provides buyers and sellers a commerce platform, where users with a bank account and an Internet connection can turn unwanted goods into cash. Everybody participates in global economy via eBay with more than 160 million users from 190 countries, and it improves lives and strengthens communities by creating more jobs and greater economic stability (eBay, 2017). Finally, collaborative lifestyles signify platforms allowing people to share and exchange less-tangible assets through peer-to-peer-based for services or access to resources such as time, skills, money, experience, or space (Ert, Lecompte & Durif, 2016). Airbnb, for instance, is an online marketplace

for people to list, discover, and book unique accommodations at any price range in more than 81,000 cities all over the world on any given night (Airbnb, 2018). It provides nearly 5 million listings in 191 countries to choose from—that's more than the top five hotel chains combined. People are connected with unique travel and vacation experiences by leasing or renting a short-term lodging of apartments, homestays, hostel beds, or hotel rooms.

Widespread internet and mobile devices lighted up the sharing economy and revolutionized the transportation landscape. The term “ride-sourcing” suggested by Rayle, Shaheen, Chan, Dai, and Cervero (2014) refers to the services provided by transportation network companies (TNCs) (e.g., Uber, Grab, and DiDi) that essentially source a ride from a driver pool. Uber, Grab, and DiDi are three of the most successful ride-sourcing companies in the world. Uber is a reference to the common word “uber” with the meaning of “topmost” or “super,” having its origins in the German word “über,” meaning “above” (The Boston Globe, 2014). A TNC furnishes ride-sourcing services with an app that connects smartphone users hunting for a ride with drivers in the locality who are prepared to provide one. They drive passengers to their destinations and charge them according to a fare structure based on the time and distance of the trip, which is set by the app provider Uber (Harding, Kandlikar, & Gulati, 2016). As of December 2016, Uber was operating in more than 600 cities worldwide. However, Uber is currently facing multiple legal hurdles. For Example, Germany, France, Japan, Korea, Hungary, Belgium, Portugal, the Netherlands, Italy, Spain, and Taiwan have banned or have nearly banned Uber nationwide. Further, by selling its business in China to rival Didi Chuxing in 2016, Uber received a stake of almost 18% in Didi and became its largest shareholder (CNN, 2016c).

Didi Chuxing, where the Didi means “beep, call a taxi” is a Chinese ride-sourcing services company that offers a full range of commuting options in China via smartphone applications. The company is the result of a merger between taxi-hailing firms Didi Dache (backed by Tencent Holding Limited) and Kuaidi Dache (backed by the Alibaba Group). As one of the world's 50 smartest companies in 2016 (MIT Technology Review, 2016), Didi had 450 million users worldwide and completed 7.43 billion rides in 2017. Didi provides transportation services for more than 400 million users across over 400 cities in China (Didi, 2018). Finally, Grab, founded in 2012, is the biggest ride-sourcing company in Southeast Asia, provided its services in most Southeast Asian nations such as Singapore, Malaysia, Indonesia, Philippines, Vietnam, Thailand, Myanmar, and Cambodia. It had over 36 million users worldwide across 8 countries and 142 cities throughout Southeast Asia and boasted a 72% share in private vehicle hailing in 2017 (The Edge Market, 2017). Jointly ventured by Didi and Softbank, the one billion-ride

milestone was hit in 2017, with 66 concurrent rides in one second (Grab, 2017; Tech Crunch, 2017). To use these ride-sourcing services, passengers simply have to download a smartphone app, tap the screen to set their pickup locations, and request a ride. The ride request is then sent to available drivers nearby and, when a driver accepts, he/she will be on his/her way to pick up the rider.

Despite the fact that the innovation offers a great number of benefits, it simultaneously has resulted in many social problems, such as safety problems and privacy issues. Unlike taxi drivers, ride-sourcing drivers do not own professional driver licenses, taxi medallions, or even commercial insurance, so numerous practical problems have occurred. For example, a 26-year old guy who faked his father's Didi driving account and passed the app's facial recognition detection in night mode recently picked up, raped, and killed a young female flight attendant in Zhengzhou Airport, Henan Province, China via a Didi ride-sourcing platform (ABC News, 2018; CNBC, 2018b). Another rape and murder case involves a 20-year-old woman raped and murdered by a driver registered with Didi with no previous criminal record (British Broadcasting Corporation [BBC], 2018; Sixth Tone, 2018). Two DiDi senior executives were fired after the second killing of a female passenger in three months, and ride-sourcing services were temporarily stopped (The New York Times, 2018). An Uber driver who had passed a background check went on a randomly weekend killing spree in the U.S. state of Michigan while picking up and dropping off passengers, and he has been charged with six counts of murder (ABC News, 2016; CNN, 2016b).

Next, any commercial driver should have a required level of liability insurance to cover the harm they may cause, both related to injuring others and damaging property. However, these ride-sourcing drivers may not have commercial insurance and thus, when a traffic accident occurs, consumers are not fully protected. For example, an Uber driver hit a six-year-old girl and her family at a green light on New Year's Eve, 2013, killing the girl and seriously injuring her mother and younger brother because of looking down at his cell phone. While acknowledging that the driver was logged into the app, the company's insurance policy did not cover any damages for the family's medical or burial bills because there was no passenger in the car at the time of the crash (ABC News, 2014; The Guardian, 2014; Time, 2014). Also, ride-sourcing service drivers need passengers' addresses in order to pick them up, and the app gives drivers the power to track passengers' locations if they allow it to, so long as it remains running in the background (Columbia Broadcasting System, 2016). It has been reported that Uber staffs used the company's internal "God View" tool to check up on customer movements, spying on the movements of high-profile politicians, celebrities, and even personal acquaintances of Uber employees and that Beyoncé was one of the celebrities

whose movements were being monitored (BBC, 2016; The Guardian, 2016). Even though the company eventually decided to remove this controversial feature of the ride-sourcing app that allows drivers to track down the location of app users even when the app is not in use, the damage to the company's reputation is done. Another privacy breach on Uber was one in which hackers stole a great deal of personal data from the company's network in 2016, including the names and license information of 600,000 drivers, and worse, the names, email addresses, and phone numbers of 57 million Uber users (The New York Times, 2017). The incident affected about 380,000 users in Singapore and 171,000 users in the Philippines, making it the largest breach in these two countries (Straits Times, 2017e; The Washington Times, 2017).

These innovative ride-sourcing services are a controversial topic. Some supporters view ride-sourcing as a part of a suite of transport options that provide fast, flexible, and convenient mobility in urban areas. By providing an attractive alternative to driving and filling gaps in the public transit network, these services significantly reduce the number of cars needed to satisfy the mobility needs of participants and thus reduce congestion and other externalities related to heavy traffic when people rely on individual transportation to satisfy their mobility needs (Stiglic, Agatz, Savelsbergh, & Gradisa, 2015). Collaboration with local municipalities will lead to achieving benefits for both enterprising individuals and communities as a whole (Bond, 2015). However, critics charge that ride-sourcing services are unfairly competing with taxi drivers; their cars or drivers are unsafe or underinsured; they endanger public safety, and they may lead to invasions of customer privacy (Rogers, 2015). To summarize, regulations may be needed to counteract negative externalities and other market failures inherent in this transportation sector.

Existing studies of ride-sourcing services have focused on the efficiency and equity issues related to such services (Edelman & Geradin, 2015; Frenken & Schor, 2017; Ge, Knittel, MacKenzie, & Zoep, 2016), pricing strategies of the platform (Chen & Sheldon, 2016; Banerjee, Johari, & Riquelme, 2016; Bimpikis, Candogan, & Daniela, 2016; Taylor, 2017; Cachon, Daniels, & Lobel, 2017; Zha, Yin, & Du, 2017), the demographics of ride-sourcing riders and drivers (Hall & Krueger, 2015; Rayle, Dai, Chan, Cervero, & Shaheen, 2016; Hughes & MacKenzie, 2016), impacts on the traditional taxi market (Wallsten, 2015; Cramer & Krueger, 2016; Rayle et al., 2016; Nie, 2017), as well as policies and regulations (Bond, 2015; Koopman, Mitchell, & Thierer, 2015; Harding et al., 2016; Zha, Yin, & Yang, 2016; Zha et al., 2017). In particular, the impact of ride-sourcing services on local taxi markets has been the most widely analyzed. Most studies have analyzed the issue in a single city or state, such as California, New York, Washington, D.C., Shenzhen, and Shanghai, and a few studies

have compared ride-sourcing service impacts across different cities (Bond, 2015). The methodologies adopted in this literature are both qualitatively and quantitatively oriented, including descriptive inductive methods, case studies, and economic models (e.g., the QQE [quantity, quality and economic controls on operators] framework, equilibrium models, aggregate model, and social costs). To fill the gap in the literature, this study examines and compares the regulations related to ride-sourcing services in five Asian economies using the research supply and demand framework, transaction costs, externalities, safety, and privacy.

## *1.2 Research Objectives*

With the popularity of the Internet and the widespread use of smartphones, the rise of ride-sourcing service has revolutionized the transportation industry worldwide but has also brought a great number of problems to governments, society, and incumbents (Elliott, 2016). Facing multiple legal and social hurdles in ride-sourcing, a number of countries have (nearly) banned these services nationwide, including Korea, Germany, France, Spain, and Taiwan. However, some countries and areas such as China, the Philippines, and California, in the USA embrace these innovative service companies. This study examines the economic and social regulations of ride-sourcing services in Asia using five analysis criteria: supply and demand, transaction cost, externalities, safety, and privacy, which are adopted as the research framework. Further, the five economies of Asia, Singapore, the Philippines, China, Japan, and Taiwan are used as case studies to investigate how ride-sourcing services influence transportation incumbents, how governments respond to the innovative service, and what legal and social issues this service has generated. Comparative research is adopted to compare two or more economies via the analysis criteria to derive their similarities and dissimilarities. Based on these case studies, the conditions under which ride-sourcing service are legalized in the local market are illustrated. Finally, this study provides suggestions for regulatory guidelines governments may wish to adopt related to these new ride-sourcing services.

# Chapter Two

## Literature Review

As a part of the sharing economy, ride-sourcing is a transportation service that connects drivers with passengers via mobile devices and applications. This chapter explains what ride-sourcing services are and reviews related studies.

### *2.1 What are Ride-sourcing Services?*

The sharing economy and smart devices fired up the transportation revolution. Ride-sourcing services, also known as TNCs, allow passengers to request a ride real-time linking their location to a nearby driver through a smartphone app. After that driver accepts a ride request, the passengers can view the vehicle's real-time location and estimated arrival time. At the same time, the app provides GPS-enabled navigation helping non-professional drivers find destinations and reducing their chances of taking a circuitous route. These new services fully utilize the potential capacity of drivers via a smartphone app, and these drivers earn more than those in traditional taxi services. In contrast to ridesharing services, ride-sourcing drivers operate for profit and typically provide rides that are not incidental to their own trips (Rayle et al., 2016). Overall, ride-sourcing services are an app-based on-demand ride service that matches passengers and drivers with unused vehicles and spare time using a dynamic matching algorithm to create extra income (Forbes, 2017; Dias, Lavieri, Garikapati, Astroza, Pendyala, & Bhat, 2017; Rayle et al., 2014). Further, payment is automatically charged to a passenger's credit card using surge pricing, a dynamic pricing mechanism, in which fares increase when demand is high to efficiently meet the fluctuating transportation demand that occurs throughout the day (Edelman & Geradin, 2015; Jin, Kong, Wu, & Sui, 2018).

Ride-sourcing services have been rapidly expanding since 2009 globally since destructive innovations have provided significantly declining transaction costs that have bothered the taxi industry for a long time. A number of successful TNCs are, for example, Uber in the U.S., Grab in Singapore, and Didi Chuxing in China. In traditional taxi services, passengers sometimes find it difficult to locate empty cabs when they are needed. However, some high-demand facilities such as hotels and airports may assemble adequate numbers of taxis in a long line outside their facilities. Passengers can hail a ride-sourcing car indoors rather than calling a dispatcher and waiting or standing outside in hot, cold, or inclement weather (Rogers, 2015). With high mobile internet penetration and advanced telecommunications devices, part-time drivers can be advised when to enter ride-sourcing services, for instance, a Friday night. With a

simple tap on a smartphone app, ride-sourcing services are available for customers to summon a ride, be transported door-to-door, and pay with a credit card without having to engage in physical monetary transactions. These less regulated ride-sourcing services have rapidly expanded and have been adopted in many countries and regions.

## *2.2 Previously Related Studies of Ride-sourcing Services*

There have been numerous studies of ride-sourcing services that have mainly focused on the impacts on the taxi market (e.g., unfair competition, income, source of drivers, and flexible pricing) (Amirkiaee & Evangelopoulos, 2018; Cetin & Deakin, 2017; Nei, 2017; Zha et al., 2016, Zha, Yin, & Xu, 2018) and on society (e.g., safety, privacy, efficiency, convenience, and public interest) (Bond, 2015; Edelman & Geradin, 2015; Elliott, 2016; Harding et al., 2016; Jin et al., 2018; Kim, Baek, & Lee, 2018; Rayle et al., 2016; Xu, Yin, & Zha, 2017). Kim et al. (2018) examined how Uber has transformed the traditional taxi industry in New York. Despite the fact that no direct evidence was found suggesting that the number of taxi trips, revenue per driver, or occupancy rates had decreased since Uber entered the market by employing a time-series regression model, taxi drivers have been forced to change their way (e.g., the degree of dispersed pick-up and drop-off locations) of conducting business in order to retain their market position. Rayle et al. (2016) compared ride-sourcing service users and regular taxi users in San Francisco and found that ride-sourcing users were generally younger males who were highly educated and resided in zero-car households, and while ride-sourcing is used in lieu of taxi in some situations, at least one-half of ride-sourcing usage replaced trips by modes other than taxi (e.g., public transit). Nie (2017) indicated that ride-sourcing imposed a relatively mild impact on the traffic congestion in Shenzhen, China by using taxi GPS trajectory data from 2013 to 2015. The results suggested that more research with updated data is needed to examine the impact of ride-sourcing on congestion in central urban areas given that ride-sourcing is growing at an exponential speed and that the modal shift from public transit to ride-sourcing (i.e., worsening congestion) should be taken into consideration.

Zha et al. (2018) developed a discrete time geometric matching framework that matches customers with drivers nearby when investigating the effects of spatial pricing on ride-sourcing markets. It was found that a customer may be matched to a distant vehicle particularly when demand surges, yielding an inefficient situation, and the platform may resort to relatively higher prices to avoid an inefficient supply state if spatial price differentiation is not allowed. Amirkiaee and Evangelopoulos (2018) proposed and examined a causal model of personal attributes (e.g., altruism, reciprocity, commitment to community, enjoyment related to being social, sustainability concerns), contextual attributes (e.g., economic benefits, time benefits, transportation anxiety, and

trust), attitude, and ridesharing participation intention using a scenario-based survey of 300 participants in the U.S. The results of the partial least squares-structural equation revealed that transportation anxiety, economic benefits, time benefits, and trust in ridesharing service providers and participants positively influenced intention to participate in ridesharing. Xu et al. (2017) focused on the congestion effect of ride-sourcing services. The cruising of vacant ride-sourcing vehicles was found to generate additional traffic demand that may worsen traffic conditions. They investigated the allocation of a certain portion of road space to on-street parking for vacant ride-sourcing vehicles and applied a framework in which to study the interactions between the ride-sourcing system and parking provisions under various market structures. The results showed that a time-varying optimal parking provision can lead to a balance between reductions in cruising for ride-sourcing vehicles and a capacity drop on the road system.

The rise of ride-sourcing services has revolutionized the transportation industry globally and has also generated serious impacts on the taxi industry and society. Regulation of these services has become an important issue for academia to tackle. Using three case studies of major American cities: San Francisco (the birthplace of Uber), New York City (the American birthplace of taxis and the medallion system), and the District of Columbia (America's capital and regulatory hub), Bond (2015) discussed Uber's impact on the taxi industry and how municipal governments have responded to the rapid advances in technology and the new sharing economy. Collaboration rather than regulation was suggested for local governments to respond to Uber and the sharing economy in general, so municipalities can best achieve benefits for both enterprising individuals and communities as a whole. Cetin and Deakin (2017) examined experiences with economic regulation of traditional taxicab markets and the effects of newly emerging dynamic rideshare services on the taxicab industry by providing a brief history of the regulation of taxicabs and the development of ridesharing services in cities world-wide. The pros and cons of taxicab regulation were discussed and why ridesharing services have gained a strong foothold in many markets was explained. Harding et al. (2016) discussed how ride-sourcing services have changed the market for taxi journeys and the resulting implications for regulating the taxi market through the "quantity, quality, and economic controls on operators (QQE)" framework and suggested that the focus of regulatory interventions should be on the possibility of a future monopoly and collusion in a market led by smartphone apps. Edelman and Geradin (2015) examined notable benefits of reducing transaction costs, improving allocation of resources, and pricing efficiencies provided by platform services for Uber and Airbnb and raised questions as to how regulation should adapt to these kinds of new forms of services and capabilities and how to correct market failures that may arise. The results suggested an updated regulatory framework that is sufficiently flexible to

allow platforms to operate and deliver their benefits, while ensuring that service providers, users, and third parties are adequately protected from the harms that may arise. Elliott (2016) explored the impact of the sharing economy model on the business landscape and regulatory environment and suggested that app-based companies should be identified according to the service that they administer; a new uniform framework should be established to balance technology innovation with the public interest, and app-based companies should cooperate with regulators in developing a new regulatory framework. The above studies on ride-sourcing service are summarized and compiled in Table 1.

### *Summary*

Ride-sourcing services link drivers and passengers with apps and provide services that can efficiently match a requesting passenger with an affiliated private car driver nearby, and the purpose of the driver of ride-sourcing services is to create extra income (Rayle et al., 2016). Since ride-sourcing services popped up in 2009, these companies have enjoyed huge success, but have also created many controversies related to regulation. Previously, ride-sourcing services studies have discussed issues related to regulation, efficiency, the economy, social impacts, the impacts on the taxi market, the labor supply, surge pricing, and customer behavior. In this study, ride-sourcing service regulations and policies are discussed through five criteria related to economic and social regulation. The related studies on ride-sourcing service are compiled in Table 1.

**Table 1** Relating studies on ride-sourcing service

Paper	Issue/Method	Area	Main conclusions
Edelman and Geradin (2015)	regulation, efficiencies/ qualitative research		<ul style="list-style-type: none"> <li>An updated regulatory framework that is sufficiently flexible to allow platforms to operate and deliver their benefits, while ensuring that service providers, users and third parties are adequately protected from the harms that may arise.</li> </ul>
Bond (2015)	regulation/qualitative research, literature review	San Francisco, New York, D.C., U.S.	<ul style="list-style-type: none"> <li>Collaboration rather than regulation was suggested for local government to respond the new sharing economy Uber so that municipalities can best achieve benefits for both enterprising individuals and communities as a whole.</li> </ul>
Harding et al. (2016)	regulation, economy, impact on the taxi market impact/qualitative research (QQE framework)	New York, U.S.	<ul style="list-style-type: none"> <li>Regulators should allow the apps (Uber) to thicken the market.</li> <li>The focus of regulatory interventions should be on the possibility of future monopoly and collusion in a market led by smartphone apps.</li> </ul>
Elliott (2016)	regulation, social impacts/ qualitative research, literature review	U.S.	<ul style="list-style-type: none"> <li>App-based companies should be identified according to the service they administer, a new, uniform framework should be established to balance technology innovation with the public interest, and app-based companies should cooperate with regulators in developing the new regulatory framework.</li> </ul>
Cetin and Deakin (2017)	regulation, taxi market's impact/qualitative research, case study	New York, U.S., Istanbul, Turkey	<ul style="list-style-type: none"> <li>Allowing increased competition will remove market distortions and lead to better services overall.</li> <li>There is an inequity that stems from the regulatory asymmetry between taxicabs and ridesharing. The solution is not to remove ridesharing from the market, nor is it to pretend that the services are fundamentally different in terms of regulatory needs, but instead to regulate ridesharing and taxis similarly.</li> </ul>
Rayle et al. (2016)	social impacts, public interest/qualitative research, comparative method	U.S.	<ul style="list-style-type: none"> <li>The taxi market and the ride-sourcing market have overlapping but different markets.</li> </ul>
Jin et al. (2018)	social impacts, economy/ qualitative research, literature review	U.S.	<ul style="list-style-type: none"> <li>The impact of ride-sourcing on urban efficiency is more straightforward than the impact on equity and sustainability.</li> </ul>
Xu et al. (2017)	social impacts/macrosopic modeling framework		<ul style="list-style-type: none"> <li>For a given road system, provision of time-varying optimal parking can lead to a balance between a reduction in cruising for ride-sourcing vehicles (RVs) and the capacity drop on the road system.</li> <li>For non-peak hours, the optimal number of parking spaces is inversely proportional to the instantaneous customer demand. No space is needed for peak hours with a demand surge.</li> <li>Even though there are fewer RVs in service under the monopoly scenario, a larger supply of parking spaces should be provided as compared to the system optimum case.</li> </ul>

Kim, et al. (2018)	impacts on the taxi market/time-series regression model	New York, U.S.	<ul style="list-style-type: none"> <li>Incumbent taxi drivers actively responded to the disruptive threat of Uber's entry and have consequently provided substantial benefits to consumers since taxis can now be hailed from a wider area of New York.</li> <li>The sharing economy has transformed the existing market in a positive and welfare-enhancing way.</li> </ul>
Nie (2017)	impacts on the taxi market/ qualitative research, case study	Shenzhen, China	<ul style="list-style-type: none"> <li>In Shenzhen, as in NYC, the taxi industry has experienced a significant loss in its ridership that can be indisputably credited to competition from ride-sourcing.</li> <li>Taxis were found to compete more effectively with ride-sourcing in peak period and in areas with higher population density.</li> <li>Ride-sourcing did seem to impose some extra traffic congestion.</li> </ul>
Zha et al. (2016)	economy/aggregate model		<ul style="list-style-type: none"> <li>A monopoly ride-sourcing platform will maximize the joint profit with its drivers.</li> <li>Competition does not necessarily lower prices or improve social welfare.</li> </ul>
Zha et al. (2017)	economy, labor supply, surge pricing/equilibrium models		<ul style="list-style-type: none"> <li>Compared to static pricing, platforms and drivers under surge prices are found to generally enjoy higher revenues while customers may be made worse off during high surge periods.</li> </ul>
Zha et al. (2018)	economy, spatial pricing/ geometric matching model	China	<ul style="list-style-type: none"> <li>A customer may be matched to a distant vehicle when demand surges, yielding an inefficient supply situation.</li> <li>Platforms may resort to relatively higher prices to avoid the inefficient supply situation if spatial price differentiation is not allowed.</li> </ul>
Amirkiaee and Evangelopoulos (2018)	economy, customer behavior/ partial least squares-structural equation modeling (PLS-SEM)	U.S.	<ul style="list-style-type: none"> <li>Transportation anxiety, economic benefits, time benefits, and trust in ridesharing service providers and participants positively influences intention to participate in ridesharing.</li> </ul>

## Chapter Three

### Regulatory Theoretical Background

Regulations are usually designed to safeguard the public against the undesirable impacts of certain activities from the perspectives of maintaining public health and safety, protecting consumer interests, or safeguarding industry reputation, among others. There are other forms of government intervention in markets, such as social regulation of the environment, health and safety practices, antitrust policies, and tax and tariff policies (Joskow & Rose, 1989). This chapter reviews the theories of economic regulations and social regulations. The following two sections introduce the analytical elements used in this study.

#### *3.1 Economic Regulation*

Market-based economies are omnipresent throughout the world in which high-quality, efficient economic infrastructures play an important role in supporting competitive and growing economies by providing goods and services that all businesses and citizens depend on. In the economic sphere, an invisible hand allocates a product or a service to those who value it the most and balance the allocation governed by the laws of supply and demand. However, market failure sometimes occurs under circumstances including externalities, monopoly privileges, information asymmetries, principal-agent problems, or imbalances in supply and demand, and the allocation of goods and services by a free market will be not efficient, often leading to a net social welfare loss. In such cases, governmental intervention is necessary. Economic regulation refers to when a government directly intervenes in market decisions for the purpose of protecting the interests of end users of infrastructure services, especially in specific public utility sectors (Kahn, 1988; Department for Business, Innovation and Skills [BIS], 2011). The types of implemented economic regulations include direct legislation and administrative regulation upon market entry or exit, pricing, prescription of quality and conditions of service, fair competition, and universal service obligation, etc. Numerous examples can be observed in reality. The prices of electric/water utility monopolies are regulated from going beyond a level that will ensure them reasonable profits only. The quality of cosmetic products is ensured by government regulations. Also, the number of 4G mobile service operators is planned in advance by the telecommunications authority for proper competition in a specific market size and the licenses are issued through auctions. The goal of economic regulation is to ensure the delivery of safe and appropriate goods and services while not discouraging the effective

functioning and development of businesses. In other cases, industries will seek out governmental regulation for their own benefit (i.e., lobbying Congress). Normally, these benefits (e.g., granting a monopoly position or raising custom taxes for importing goods) protect businesses from emerging competition (Stigler, 1971). The following subsections introduce three characteristics of economic regulations: supply and demand, transaction cost, and externalities.

### *3.1.1 Supply and Demand*

Supply and demand, the backbone of a market economy, is one of the most fundamental concepts of economics. The law of supply and demand is considered one of the fundamental principles governing an economy. A primary focus of economics is to solve the problem of fulfilling the unlimited desires of humankind with limited or scarce resources by allocating the resources in such a way that everything ends up where it ought to. Supply is a fundamental economic concept that describes the total amount of a specific good or service firms are willing to provide to the marketplace. It is determined by many factors, including production capacity, production costs for labor and materials, and the number of competitor, all of which directly affect how much supply can be created. The law of supply states that the quantity provided by producers will rise if the price rises because all firms look to maximize profits. A change in supply is due to changes in the price of production factors (e.g., gas price for taxis), the price of related goods (e.g., prices of Uber and public transportation), expected future prices, number of sellers (i.e., number of taxi drivers), and technology (e.g., cab-calling app) (Parkin, 2014). Demand is an economic principle referring to a consumer's desire and willingness to pay a price for a specific good or service, and it is the quantity of a good or service that people are willing and able to buy at various prices over a given period of time. Demand is affected by the quality and cost of the good or service, the number of available substitutes, the amount of advertising, and shifts in the price of complementary good or service. The law of demand states that an increase in the price of a good or service will decrease the quantity demanded by consumers. A change in demand is due to changes in the price of related goods (e.g., prices of Uber and public transportation), expected future prices, income, expected future income, population, and preferences (e.g., safety concerns decrease passengers' willingness to take a taxi) (Parkin, 2014). In a perfect competitive market, an excess of demand will prompt sellers to increase prices until the quantity demanded at that price matches the available quantity supplied, establishing market equilibrium (Camerer, Babcock, Loewenstein, & Thaler, 1997; Sullivan & Sheffrin, 2003).

In terms of price controls, airlines, telecommunications, and railways companies are told what prices they can charge or at least not exceed. An excess demand sometimes

occurs under the government regulated price, but the price does not rise to reach equilibrium. For example, during the oil shocks of the 1970s and 1980s, the U.S. government attempted to cap gas prices, which caused producers to only be willing to sell a limited supply of gas for the price set by the government, resulting in extreme shortages of gas in the 1970s (The Washington Times, 2006). In terms of entry barriers, taxi drivers and many professionals such as doctors, lawyers, accountants, and financial advisers must have licenses in order to do business, and the supply of the services provider is controlled by the government. When firms are protected from competition, consumers and would-be competitors lose social welfare more than protected firms gain, and hence, total welfare decreases (Hines, 1999). The taxi industry in large cities is highly regulated in many countries and is subject to various types of regulation, such as entry restrictions and price control (Beesley & Glaister, 1983; Yang, Wong, & Wong, 2002). These regulations were mainly instituted and implemented in the early decades of the twentieth century, and the entry into the market, rates charged, vehicles used, and the quality of service were intensively regulated (Cetin & Deakin, 2017; Dempsey, 1996; Farber, 2015). These price regulations were justified as preventing “destructive competition” that would lead to a race to the bottom, with deteriorating, under-maintained vehicles and poor service (Snead, 2015). The restrictions on market entry also required taxi drivers to hold a special license or medallion (limited in number) with a clear driving record going back a number of years, passing a background check, and being in good health. Since the taxi supply is regulated, and a closed market is formed through licenses, taxis became an economic commodity.

### *3.1.2 Transaction Cost*

Prohibitively high transaction costs may impede the development of a market and the efficient use of goods and services and may in turn result in market failure. Neo-classical economics assumes that there is full information for all economic agents in all markets and that the only costs to be considered are the costs of production and transportation. However, Coase (1973) argued that economic agents have only limited information and that there are many costs (e.g., marketing, contracting, and searching costs) associated with transacting in markets. In a real-world view explaining why firms have existed, many individuals join together and create smaller or larger economic entities in the production and marketing processes to lower transaction costs where there is not a vast array of individual economic agents transacting with one another. Later on, Williamson (1979, 1981) developed a framework for understanding transaction costs that included the concepts of bounded rationality, uncertainty, opportunism, asset specificity, and transaction frequency, which create transaction costs in the economy. In particular, information and enforcement costs were shown to be the

primary systematic differences between the transaction costs of markets and sharing economies (North, 1992; Benkler, 2004). Markets use price systems and a managerial hierarchy to manage information flow related to the universe of potential actions on resources, while an excess capacity of shareable goods may better be harnessed through sharing relationships (e.g., sharing platform). Platforms are used to rent, sell, or share things with others since the Internet has made it much easier for people to connect with one another and to coordinate their activities. The development of digital technologies facilitated the emergence of the sharing economy in terms of overcoming transaction costs, trust issues, and reputational barriers that once restricted sharing activities (Benkler, 2004; Schor & Fitzmaurice, 2015). The processes of searching, contacting, and contracting was previously much more difficult for private transportation and accommodation than for taxis and hotels. This is exactly where the new digital platforms come in and change the basic conditions for substitution. When it becomes easy to search for the right means of transportation or the right place to contact and to contract for gaining access to such services, the degree of substitution will increase. The potential substitutability between services becomes a real possibility for substitution (Henten & Windekilde, 2016).

Deregulation has become the norm for many industries and markets in countries over the last thirty years mainly due to the belief that free market economics will win out over government control. Innovation technologies (e.g., telephone, the Internet) gradually but significantly reduced the transaction costs for commodities and services. As the level of transaction cost changes, the efficient organizational environment in which transactions take place will also change (MacLeod, 1999). Further, the existence of transaction costs means there exists a profit opportunity for anyone who can discover ways to reduce these costs, and a reduction in transaction costs could lead to a service being moved into the marketplace or a change in its form of transaction (Gallick & Sisk, 1987; Seibert, 2006). In taxi markets, service providers are imposed regulated fares by a government authority, where the negotiation of fare rates between customers and taxi drivers are illegal and lead to substantial penalties for taxi drivers. Transaction costs related to the time and effort to search for a taxi were significantly reduced since the wide adoption of GPS/app in taxi fleets in the 2010s. Hence, there was a chance for ride-sourcing services such as Uber to emerge in the taxi market and a scenario in which a customer stands on a street corner hailing taxis for a fare he is satisfied with won't occur.

### *3.1.3 Externality*

Externalities are spillover gains and costs not captured by the direct participants in economic exchanges arising either during the production or the consumption of a

good or service (Buchanan & Stubblebine, 1962; Goodstein & Polasky, 2005; Varian, 2014). On one hand, a negative externality is an economic activity that imposes a negative effect on an unrelated third party. For example, pollution is termed an externality because it imposes costs on people who are external to the producer and consumer of the polluting product. The producer may choose to produce more of the product that should not be produced whenever such external costs exist if the producer were “not required” to pay all associated environmental costs. It is the responsibility or consequence of self-directed actions lying partly outside the self that creates an element of externalization. On the other hand, a positive externality is a positive effect an activity imposes on an unrelated third party. For instance, an externality associated with the activity of a beekeeper who keeps bees for their honey is the pollination of surrounding crops by the bees, where the value generated by the pollination may be more important than the value of the harvested honey. Less of the good may be produced than would be the case whenever such external benefits (e.g., public safety) exist, if the producer were “not to receive” payment for the external benefits to others. For the purpose of these statements, overall costs and benefits to society are defined as the sum of the imputed monetary value of benefits and costs to all parties involved in market exchanges (Arrow, 1969; Durlauf & Blume, 2008). In sum, unregulated markets in goods or services with significant externalities generate prices that do not reflect the full social cost or benefit of their transactions, and such markets are therefore inefficient.

For an externality to occur, there must be an unpriced resource, and each additional user of that resource increases the cost of usage for all other users. An example concerns the discharge of polluting waste material by a factory such that downstream companies must incur costs of water purification. According to the Coase theorem (Coase, 1960), an efficient allocation of resources can nonetheless result from a process of negotiation in the case of clearly defined property rights and in the absence of transaction costs. In particular, information cost, bargaining cost, or enforcement cost may prevent such efficient solutions. Bargaining costs can be prohibitively high and can heighten transaction costs if several parties are involved in the bargaining process or if elements of strategic behavior are present (Veljanovski, 1982). Information cost may arise in situations where (1) the aggregated damage is significant, while the damage per person may be too small to organize and participate in any action; (2) it may not even be known who or what caused the damage as in the case of, for example, secret oil dumping at sea or acid rain; (3) the damage may manifest itself years after exposure as in the case of, for example, cancer from asbestos, or future generations may be the main victims. In those cases, it will be difficult to prove causality between the negligent act and damages. Also, enforcement costs may be an obstacle to an efficient outcome since the firms may not be able to financially compensate for the damages even if held liable.

Hence, market failure is accompanied by a private law failure, and regulation may be the more efficient solution if the costs of regulatory intervention are lower than the benefits in terms of welfare loss control (Gruenspecht & Lave, 1989). Such internalization of social costs is, for example, the safety regulations for automobiles and food, noise levels for aircraft, obligation to use catalytic converters in automobiles, and limits to the emission of hazardous substances in permits.

Congestion and air quality deterioration are two commonly cited negative externalities related to taxis (Kang, 1998). In large cities, taxis make considerable demands on limited road resources and contribute significantly to unacceptable traffic congestion on the streets and degraded air quality. Each additional increase in taxi numbers may contribute to externalities including congestion, poor air, noise, and threats to the city image, and these costs are borne by everyone (Shreiber, 1981). Another negative externality is where an increase in the number of taxis may impose waiting and time costs for all other taxis in the locations outside of stations, hotels, or airports. Further, visitors, the common users of a city's taxi services, may be vulnerable to and offended by unpleasant taxi experiences (Dempsey, 1996). A positive externality is that customers do not need to bargain for the fare with taxi drivers under regulated fare structures, and they won't be in a weak bargaining position even in periods of high demand for taxi services (e.g., when it is raining or during rush hour) with no bargaining costs (Barrett, 2010). Hence, a number of taxi regulations were intended to improve safety, deal with externalities (e.g., congestion), and assure access to all potential customers. Restrictions on price regulation and market entry have been imposed in many cities worldwide, and they can be justified as preventing "destructive competition," which can lead to deteriorating, under-maintained vehicles and poor service quality (Snead, 2015). Nevertheless, numerical restrictions on taxis risk the creation of "waiting time externalities" for passengers and lead to underproduction in the market, which has a side effect of higher private car use (Cairns & Liston-Heyes, 1996).

### *3.2 Social Regulations*

Economic regulation of price, profit, and market entry in the industries of transportation, communications, energy, and finance have been gradually deregulated since the 1970s. The focus then switched to social regulation, for example, the Clean Air Acts of 1970 in the U.S. (Henning, 1994). Regulation efficiency emphasizes the measurement of economic and social costs and benefits brought about by regulation when determining the need for regulation and how to choose the optimal regulatory tools. Social regulation concerns the issues of safety, privacy, quality, health and sanitation, disaster prevention, social justice, and sustainable development of the

economy accompanied with the production of these goods and services (Bardach & Kagan, 1955; Liu, 2014). Regulations include the standard requirements applied upon all industries but not specific industries and protect public interests despite the fact that these costs may not be visible or monetized. Overall, safety and privacy are the two social regulation factors related to taxi and ride-sourcing services.

### *3.2.1 Safety*

Safety is the condition that could be described as a “steady state” of being protected against physical, social, spiritual, financial, political, emotional, occupational, psychological, educational, or other types of failure, damage, error, accidents, or harm that could be considered non-desirable and can also be interpreted as having a real and significant impact that can include risk of death, injury, or damage to property. For any service or good, intangible or tangible, safety is a normative concept in which recognized hazards can be controlled to achieve an acceptable level of risk. Insurance, probably the most common response when individuals perceive risks, compensates for or provides restitution in the case of damage or loss (Ceko, 2013; Wilpert, 2008). Public safety is measured by activities and precautions taken to reduce the risk of harm due to intentional criminal acts such as assault, burglary, or vandalism (Doumi, Dolan, Tatesh, Casati, Tsirtsis, Anchan, & Flore, 2013; Hubbard & Meunier, 2013). In response to perceived risks, interventions brought about by regulations proposed by governments are often a choice. For example, the Occupational Safety and Health Administration requires that employers inform workers about risks and mandates firms to reduce risks, and the National Highway and Traffic Safety Administration monitors risks and sets standards for automobiles and highways. The Federal Aviation Administration (FAA) sets standards for airline safety and makes any necessary changes in safety requirements if they can reduce risk and thereby save lives. Then, airlines defer to the FAA’s authority and comply with these protocols. Similarly, it would be costly for each consumer to check the accuracy of all advertising claims or to test the efficacy of a new drug. By giving the U.S. Food and Drug Administration (FDA) authority to test new drugs, the public saves considerably in terms of time and effort.

Automobile safety is the study and practice of design, construction, equipment, and regulation of vehicles to minimize the occurrence and consequences of traffic collisions. It reduces the chances of a driver making an error and the severity of crashes that do occur (e.g., parking sensors). Comprehensive requirements and specifications for safety-related vehicle devices, systems, and design demand that vehicles be equipped with passenger restraints (e.g., seat belts and airbags), crash avoidance equipment (e.g., lights and reflectors), and driver assistance systems (e.g., Electronic Stability Control) (Mackay, 1985; Heslop, 2010). Taxi regulations specify a warranted

minimum level of safety for customers and cover vehicles, drivers, and taxi proprietors. Regulations on vehicles require passenger space, minimum engine power, age limits, emissions and safety tests, vehicle identification, and metering (Seibert, 2006). Regulations on taxi drivers require a commercial license which requires a criminal background check, a rigorous medical examination, a minimum age or level of driving experience, and adequate geographical knowledge of the area in which they intend to operate. They are also required to take additional training (e.g., local traffic laws, customer service, and communication), to be covered by compulsory insurance (e.g., third party liability insurance), and to comply with restrictions on certain speed limits, use of mobile phones, and driving after consuming alcohol or various drugs. Taxi proprietors are required to have a clean criminal record and carry appropriate comprehensive insurance for their taxi operations (e.g., general commercial liability insurance) (Harding et al., 2016).

### *3.2.2 Privacy*

Privacy has been defined as the claim of individuals, groups, or institutions to determine for themselves when, how, and to what extent their personal information, including information about their body, home, finance, property, thoughts, feelings, and secrets can be disclosed (Westin, 1968). Information privacy occurs in the collection and dissemination of data in a computer system; in particular, wherever personally identifiable information or other sensitive information is collected, stored, used, and finally destroyed or deleted in digital form (Michael, 2013). New technologies can alter methods for data dissemination, and personal data can be easily and quickly acquired on the Internet (Warren & Brandeis, 1890; Westin, 1968). Many location-based devices or services such as advanced smartphones with location tracking capabilities are related to user privacy problems since users' daily movement patterns are predictable because they carry smartphones everywhere they go. When using a navigating service, ride-sourcing services, Pokémon GO game or even surfing the Internet, uniquely personal information such as trace route, address, and habits can be collected. Privacy issues may arise because of personal beliefs, the social and cultural environment, and other general private causes (Al Ameen, Liu, & Kwak, 2012). However, personal privacy may be voluntarily sacrificed, normally in exchange for perceived benefits (Oulasvirta, Suomalainen, Hamari, Lampinen, & Karvonen, 2014). For example, personal data including name, address, and even credit card numbers are needed before using the services of eBay, Airbnb, Uber, and taxi apps, etc. and name, gender, habits, and photos may be revealed on social networking sites in order to promote trust among peers and build meaningful social relations (Gaudeul & Giannetti, 2017).

According to the Universal Declaration of Human Rights (Assembly, 1948), no

one shall be subjected to arbitrary interference related to privacy, family, home, or correspondence, nor to attacks upon one's honor and reputation. Everyone has the right to the protection of the law against such interference or attacks. The right to privacy gives people the ability to choose which parts of this domain can be accessed by others and to control the extent, manner, and timing of the use of the information they choose to disclose. It should be seen as an independent right that deserves legal protection in and of itself (Onn et al., 2005). The right not to be subjected to the unsanctioned invasion of privacy by the government, corporations, or individuals is part of many countries' privacy laws, and in some cases, constitutions. Almost all countries have laws that in some way limit the use of private data, and these privacy regulations protect persons with regard to the processing of personal data and the free movement of data (e.g., Article 8 of the European Convention on Human Rights in Europe and the Constitution under the 4th Amendment in the U.S.) The General Data Protection Regulation in the European Union (EU) is primarily aimed at protecting the personal data of citizens and residents by unifying the privacy-related regulations within the EU.

### *Summary*

This chapter focuses on economic and social regulation with five analysis criteria, including supply and demand, transaction cost, externality, safety, and privacy. Most taxi regulations were first instituted in the early decades of the twentieth century (Dempsey, 1996). The taxi industry has at various times suffered from numerous market failures, providing the rationale for regulation. Information asymmetry is a main problem in street-hail and cab-stand markets because customers cannot compare service quality before choosing a taxi, often resulting in poor service quality. Because the taxi market is usually regulated in terms of price, entry, supply (i.e., medallion systems), and service quality while comparatively fewer regulatory requirements have been imposed on ride-sourcing companies, unfair competition is argued particularly by taxi drivers and their employers, who have gone on strikes and filed lawsuits around the world (Cairns & Liston-Heyes, 1996). As a competitor to the taxi industries, ride-sourcing brought a great number of problems to regulators. Some have decided to ban them or treat these services as illegal; others embrace them as a new type of service provider or have passed ride-sourcing laws and regulations. Although these laws and regulations have some differences, they all essentially involve safety standards, insurance coverage, driver background checks, and regular car inspections. This study examines the economic and social regulations of ride-sourcing services in five economies: Asia, Singapore, the Philippines, China, Japan, and Taiwan, with five analysis criteria, including supply and demand, transaction cost, externality, safety, and privacy.

# Chapter Four

## Case Studies

In this chapter, Asian countries including Singapore (the first Asian country Uber entered), the Philippines (the first country to let ride-sourcing services legal at the national level), China (the largest economy in Asia), Japan (the best taxi services in Asia), and Taiwan (the largest fines against Uber in the world) are selected as case studies to illustrate their transportation background, the impact of ride-sourcing services, and how local governments have responded to ride-sourcing services.

### *4.1 Singapore*

#### *4.1.1 Transportation Background*

Singapore has one of the most cost-efficient public transport networks in the world (Siemens, 2014). The transportation, which is mainly land-based, covers a variety of transport modes such as bus, rail, and taxi. With limited land resources and increasing demands for vehicle ownership, their vehicle growth rates are regulated by the Vehicle Quota System (VQS) so as to not spiral out of control leading to gridlocks on their roads.<sup>1</sup> The number of new vehicles is controlled for registration, while the market determines the price of owning a vehicle. Prior to 2009, the growth rate of the vehicle population was 3% per annum. But after that, the growth rate of vehicles was reduced to 0.25% per annum (from February 2015 to January 2018) (Land Transport Authority of Singapore [LTA], 2018a). Convenient bus and rail ridership had risen by 4.3 percent in 2016 to hit a record high daily average of 7.2 million (LTA, 2017). Light Rail Transit led the growth with an 18.4 percent increase in ridership to 180,000 a day. Mass Rapid Transit followed with a 7.8 percent rise to 3.1 million rides a day, and buses posted a 1.2 percent increase to 3.9 million rides a day (Straits Times, 2017a). Nevertheless, even with the good public transport network, “last-mile” access was still needed to provide individuals who work late or live in sparsely populated areas ill-served by public transit with a means of transportation.

Singapore has one of the highest cab densities in the world, with 5,225 taxis per 1 million inhabitants, compared to 1,522 in New York and 3,285 in London (Today Online, 2016). Five large companies predominantly operate in the taxi industry and hold a Taxi Operator License (TOL) issued by the LTA and comply with the Quality of

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<sup>1</sup> The VQS was implemented in May 1990 when rising affluence in the country showed that simply increasing ownership taxes were not effective in controlling the growth of vehicle numbers.

Service standards, codes of practice, and audit directions. Failure to do so may result in revoking of the license by the LTA. All taxi drivers are required to hold a valid Taxi Driver's Vocational License (TDVL) issued by the LTA, after having met basic prerequisites, successfully completing a training course in the Singapore Taxi Academy, and passing a theory test. They must abide by a framework of rules and regulations under the Vocational License Points System (VLPS), in which the penalty for a scheduled offense is a fine in addition to demerit points. Overall, taxi companies play a great role in the discipline of their drivers to educate and encourage them to provide good customer service. The license holders may then approach any of the taxi companies to hire a taxi on a daily rental basis, and the rental rate and associated benefits may vary among the companies. As of December 2016, there were a total of 100,411 TDVL holders in Singapore. The normal taxi fares in Singapore are metered at \$0.22 for every 400 meters thereafter or less, which is less than 10 kilometers and again every 350 meters thereafter or less, which is more than 10 kilometers, and it is an offense for taxi drivers to disable, tamper with, or fail to use their metering devices (LTA, 2018b). Overall, Singaporean taxi drivers are badly paid and only earn an annual salary of S\$34,701 (i.e., \$26,402) on average, which is 49% of the gross domestic product per capita \$53,880 (Pay Scale, 2018a).

#### *4.1.2 Ride-sourcing's Impact on Singapore*

Taxis in Singapore are controlled in terms of both quantity and tariffs. Hence, it is hard to hail a taxi on the roadside, sometimes even at a taxi waiting station, and taxi drivers may reject picking passengers simply with the excuse of "shift change" (where instead, it is because of a short route or not on their way). Uber and Grab entered Singapore's transportation market in 2013, rapidly hitting the taxi market with their low prices and user friendly app system. Grab is the biggest ride-sourcing company in Southeast Asia jointly ventured by Didi and Softbank. It hit the 1 billion-ride milestone in 2017 with 66 concurrent rides in one second (Grab, 2017; Tech Crunch, 2017). Their business model is operated in the gray area and avoids compliance with taxi-related regulations. Taxi drivers complained that these ride-sourcing drivers evade all the requirements related to safety measures, health examinations, and insurance coverage. Unlike taxi passengers, who are protected by the Transport Act, Uber and Grab do not have enough safety measures for passengers (e.g., driver's background check or insurance coverage). For example, the government requires all taxi drivers to have a routine physical examination, but Uber and Grab drivers are mostly part-timers and do not have any health requirements. Specifically, taxi drivers must be at least 30 year-old Singapore citizens who hold a pink National Registration Identity Card and have held a valid Class 3 or 3A auto driving license for a continuous period of at least one year at

the point of application. Upon approval of the vocational license, the drivers are required to undergo a medical check-up and chest X-ray and complete a training course at the Singapore Taxi Academy or Comfort Delgro Taxi (LTA, 2018c). As for the insurance, taxi companies are covered by commercial insurance (e.g., medical payment, comprehensive coverage, uninsured motorist coverage) in addition to the third-party liability insurance required for all drivers.

Overall, ride-sourcing services negatively affect the taxi market but positively boost the car rental market. On one hand, increased competition from ride-sourcing services significantly reduced taxi drivers' revenue, where for example, the third quarter taxi revenue in 2017 fell by 11% to \$219.5 million dollars. These decrease in revenues drove taxi drivers out of the market. In September 2017, more than 2,000 drivers for ComfortDelGro, the biggest taxi company in Singapore, had signed up for a driver account during recruitment by Grab. As a result, the number of taxis hit an eight-year low of 23,140 in 2017, representing a 20 percent drop from its peak of 28,736 in 2014 - a year after Uber and Grab set up (LTA, 2018d; Nikkei Asian Review, 2017; Straits Times, 2017b). On the other hand, ride-sourcing services provided new business opportunities for car rental companies. Due to almost zero-growth vehicle regulation, the prices of new cars are skyrocketing. For example, a 2,000 cc Toyota Camry costs \$150,722 (vehicle price plus Certificate price of Entitlement) in Singapore, about 6.4 times the price of the same model in the U.S. A feasible solution is to lease a vehicle for personal use or for private chauffeuring purposes, so an increasing number of rental cars are now on the road (Straits Times, 2015). When signing up as the drivers of ride-sourcing services with Uber and Grab, either using their own vehicle or renting one is fine as long as the vehicle is commercially insured and registered. Nevertheless, car rental is more popular since it is quite expensive to own a car. Also, rental firms charge as little as \$ 45 a day for a basic saloon model, including the maintenance and servicing of the car. Hence, the number of rental cars sharply increased from 14,862 in 2012 to 68,083 at the end of 2017, a grown rate of 458 percent (LTA, 2018d).

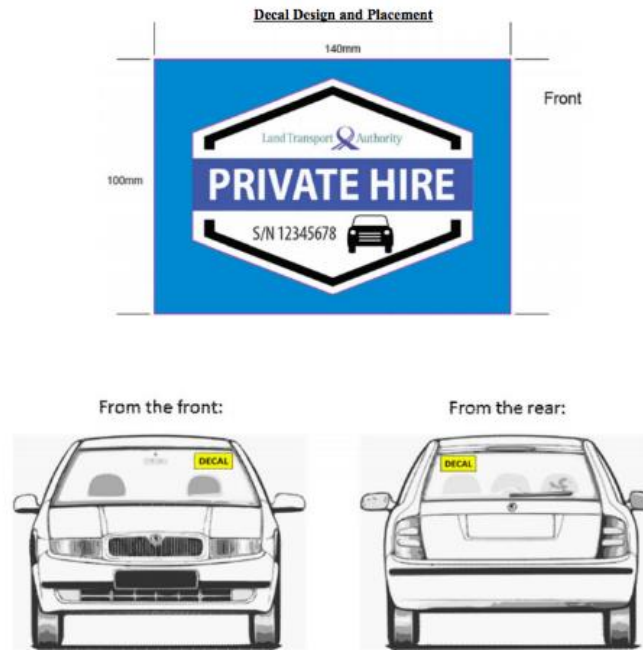
#### *4.1.3 How the Government Responded to Ride-sourcing*

In the early stage of the ride-sourcing services when Uber and Grab entered the local market (i.e., from 2013 to 2015), the government of Singapore adopted an unregulated position towards the services in which they were ignored until 2017 in an attempt to reduce the number of vehicles on the road. The only requirement then was that ride-sourcing service drivers could not pick up passengers at taxi stands. Unlike privately-owned cars being idle in parking lots most of the time, fully utilized rise-sourcing services imply more efficient road usage and fewer vehicles on the road (Tech in Asia, 2016). The government is willing to embrace innovation and build Singapore

as a smart nation that harnesses technologies, networks, and big data to create tech-enabled solutions (Straits Times, 2014). The author of an article posted by the Transport Minister in Singapore on Moving News, the Ministry of Transport's blog, went out of his way to talk about how the state will regulate transportation apps (Khaw, 2015). Overall, ride-sourcing services are viewed as a new industry in Singapore. Technology and the Internet combined together to make it possible for people to share their surplus resources by linking up ride-sourcing service supply with demand, leading to better resource utilization and improved consumer welfare.

Nevertheless, embracing innovation does not mean fewer or no government regulations. The fact that ride-sourcing service drivers were not bound by taxi-related regulations seemed unfair to taxi drivers. The new regulations imposed on these drivers in terms of eligibility and license requirements enforced in 2017 were intended to better protect commuter interests. The new rules might give ride-sourcing services the boost it needs and stop all confusion on the issue of licensing and boycotting of one service over the other. Overall, it makes the competition fair for not only both entities but also for passengers (Vulcan Post, 2016). These new updated regulations require all chauffeured service drivers to obtain a Private Hire Car Driver's Vocational License (PDVL) registered with the LTA and to prominently display their PDVLs and a tamper-resistant decal, as shown in Figure 1.

Registered owners of a chauffeured service company (applicable only to Singapore citizens – similar to the policy for self-employed taxi drivers) or an employee of a limousine company (applicable to all) are eligible for the PDVL, and they must have held a Class 3/3A driving license for at least 2 years prior to application for the PDVL. Relevant training course (about 10 hours long), requisite tests on roads, passenger safety, and the regulations for chauffeured services are required plus a background screening. To encourage safe driving, a 3-hour refresher course every 6 years and insurance against third-party liability risks (including death and bodily injury to passengers) have been implemented. In cases whether no demerit points are recorded or the companies' training programs to meet the LTA's requirements, PDVL holders can be exempted from the refresher course (LTA, 2016a).



**Figure 1** Placement of decal on private hire car in Singapore

Source: Firstlane (2017)

## 4.2 The Philippines

### 4.2.1 Transportation Background

The Philippines, the second most populous country in Southeast Asia, had a relatively underdeveloped transportation and faced serious traffic problems due to the country's mountainous areas and scattered islands and the government's persistent underinvestment in the nation's transportation infrastructure. About 85.4% (i.e., 88 million) of its population live in urban areas. Jeepneys, a ubiquitous symbol of the Philippine culture, comprise the most popular mode of public transportation in the Islands, and motorized tricycles are commonly seen in rural areas (Rappler, 2016). Manila, one of most dense metropolitan areas with a population of 15 million, is a car-centric urban environment where motorized vehicles dominate the roads, and the public transport system is neither efficient nor organized. Public transport accounts for 69% of the total number of trips taken in Manila every day, and buses and jeepneys occupy 71% of public transportation modes (Rappler, 2014). Filipinos in Manila spend an hour and six minutes each day (i.e., 16 days a year) stuck in traffic, costing them about 100,000 pesos (\$1,886) a year in lost income opportunities, not including another 24 minutes a day that they spend looking for parking (Straits Times, 2017c). According to the Japan International Cooperation Agency (2014), traffic congestion in Manila resulted in estimated 2.4 billion pesos (\$57 million) worth of productivity losses daily. Waze, the world's largest community-based traffic and navigation app, found that

drivers in the Philippines are among the least satisfied in the world according to its annual global driver satisfaction index<sup>2</sup> in 2017 (Interaksyon, 2017; Waze, 2017). Their driving dissatisfaction is because of unhappiness with traffic jams and commuting time, and Manila was ranked as the city with “the worst traffic on Earth” in 2015 based on their report (CNN, 2016a).

Taxis in the Philippines are highly regulated by the Department of Transportation (DOT), the Land Transportation Office (LTO), and the Land Transportation Franchising and Regulatory Board (LTFRB). There are 36,000 taxi drivers in the Philippines, and their annual salary in Manila is 148,360 pesos (i.e., \$2,803) on average, which is about 93% of the gross domestic product per capita of \$2,989 (Salary Expert, 2018a; The World Bank, 2018). White taxis with yellow colored license plates and taxi signs are mandatory, as well as LTFRB registration, taximeters, and operation at regulated tariff fares. Taxi drivers must secure a franchise from the LTFRB and pay the necessary fees. However, this controlled environment with a limited number of the licenses has essentially given the drivers little or no incentive to improve their quality of services. In fact, taxi services in Manila are well-known to be notorious and out of control, and the drivers show complete disdain for the rules. The taxis are known for being old and dirty. Further, the Manila Bulletin (2018) reported that taxi drivers did not want to turn their meters on, trying to charge passengers above the metered price. Some drivers and their accomplices have robbed and harmed passengers with weapons and drugged passengers with poisonous perfume, taking their money and valuables (CNN, 2016a; SET News, 2016; The Philippine Star, 2018). Nevertheless, the regulators have ignored passenger complaints about tampered meters, overcharging, hostile drivers, and even the prevalence of crimes perpetrated in taxis.

#### *4.2.2 Ride-sourcing's Impact on the Philippines*

Ride-sourcing services provide a safe, comfortable, reliable, and cashless payment commuting alternative, especially in a place where public transportation has a reputation for being dangerous (Paronda, Regidor, & Gaabucayan-Napalang, 2017; Tech in Asia, 2014b). The convenience of online booking is more efficient and safer, particularly for women, than hailing a taxi on the roadside or waiting in line at a taxi stand. Detailed information about the vehicle, the plate number, and the driver's photo appear on the app before the ride arrives. Grab and Uber were the two main ride-sourcing companies in the Philippines starting in 2013 (Paronda et al., 2017; Quartz,

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<sup>2</sup> The Waze's report (2017) ranks their user's experience in metros and countries based on a scale of 10 (satisfying) to 1 (unhappy) across six key factors of traffic, quality, road safety, driver services, socioeconomic, and wazeyness (happiness with and helpfulness of the Waze Community). The Philippines got an average score of 3.02, putting it in the last place.

2015). Uber maps out drivers' routes using the navigation app Waze to provide a fast, properly oriented route, and the entire trip is tracked and stored, making users feel safer about taking the ride-sourcing service. However, in 2018, Uber sold its ride-sourcing and UberEats food delivery services in Southeast Asia to Grab in exchange a 27.5% stake in Grab, and its CEO joined Grab's board. This was approved by the Philippine Competition Commission (Nikkei Asia Review, 2018; Quartz, 2018). Currently, the ride-sourcing services in Southeast Asia are nearly monopolized by Grab, and its registered drivers number more than two million.

The rise of ride-sourcing services has been highly correlated to the sharp rise in car sales, with a 27.8 percent rise in Q1 of 2017 for the passenger car segment (Carmudi, 2015; Manila Times, 2016). Banking services have also seen growth due to the need for financing the purchase of vehicles. Lower interest rates and higher loan amounts have made it more feasible for consumers to acquire loans for vehicle purchases, with a 26 percent growth annually. Ride-sourcing services have created more employment opportunities and incomes. The average annual income of an Uber driver in Manila was \$14,632 in 2017 as compared to the average salary in Manila of \$6,980 (Pay Scale, 2018b; Uber, 2017). The healthy competition between ride-sourcing services and taxis services has eliminated taxi operators' monopoly in the transport market and has created a benchmark that challenges taxi operators to improve the quality of their services (Paronda et al., 2017).

#### *4.2.3 How the Government Responded to Ride-sourcing*

In the early stage when ride-sourcing services entered the local market, the Philippine government was under pressure from taxi operators calling for a crackdown on services that were considered illegal as well as unlicensed services that could lower profit margins in the taxi industry. In 2014, the LTFRB regulators launched a sting operation against Uber by arranging an agent to book a short ride from Uber, who then fined the driver \$4,400 for operating an unlicensed commercial transport vehicle (Tech in Asia, 2014a). This incident not only sparked public outrage but also created dissatisfaction in the Metropolitan Manila Development Authority (MMDA). The MMDA's chairman issued a press statement condemning the LTFRB's actions urging it to accommodate the ride-sourcing services (The Philippine Star, 2014). Since then, the regulators have acknowledged that ride-sourcing services are attractive alternatives for commuters who have relentlessly complained about the worsening state of the taxi industry in the country and took a soft stance on these innovative transport services. In 2015, the DOT enacted an order to create a new category of transport known as "Transport Network Vehicles (TNVs)," which provide app-based services connecting private vehicle owners or drivers with members of the public looking for a ride (Tech

in Asia, 2015). It made the Philippines the first country in the world to enforce specific rules for ride-sourcing services, and Grab became the first accredited TNV in the same year. At the same time, another category called “premium taxis” created by the DOT was aimed at allowing taxi operators to compete with the ride-sourcing services. Premium taxis equipped with GPS and with a seven-year age limit can be booked through the Web or smartphones, and payments are handled through credit or debit cards.

Certain standards for equipment, vehicle type/ year, certificates, and driver qualifications for ride-sourcing services were imposed by the DOT (Department of Transportation of the Philippines, 2015). Ride-sourcing vehicles must have GPS tracking and navigation devices, and drivers must be accredited by the TNV and registered with the LTFRB to ensure convenient, safe services. Only vehicle types including sedans, Asian utility and sports utility vehicles, and vans were allowed to provide the services, and a vehicle’s maximum age limit of seven years was enforced. Ride-sourcing companies were required to obtain a Certificate of Public Convenience for every vehicle to ensure accountability, and the accreditation certificate cannot be sold, assigned, leased, or otherwise transferred. In 2017, some further regulations governing the operations of ride-sourcing services were issued by the LTFRB. A criminal background check and screening of all applicant-drivers were required before the ride-sourcing companies endorsed them to the LTFRB (Malaya, 2017). The permit of the companies was restricted to be valid for only two years, and a reapplication for the permit is required. The fare calculation method and the applicable rates to be charged were required to be disclosed, and an electronic receipt had to be transmitted to passenger’s electronic mail address or mobile application. Further, drivers were required to strictly comply with the “no smoking policy” inside the vehicle, to wear identification cards, and to put stickers on their windshields (shown in Figure 2; Extra, 2018), which allowed users and law enforcers to easily recognize ride-sourcing vehicles on the road.



**Figure 2** The TNV vehicle stickers in the Philippines

Source: Extra (2018)

### 4.3 China

#### 4.3.1 Transportation Background

The physical state of China's transport infrastructure tends to vary widely based on its geography. The transport system comprises a vast network of transport nodes across its huge territory, and the nodes tend to concentrate in economically developed coastal areas and inland cities along major rivers (Zhang, 2009). Much of contemporary China's transport systems have been built since 1949. Airlines and railways are the primary modes of long-distance transportation in China. The national rail network is one of the biggest in the world, and the country has the longest and busiest high-speed railway network in the world. The total mileage of railways opens to traffic amounted to 127,000 kilometers, and 25,000 kilometers of them belonged to high-speed railways by the end of 2017 (National Railway Administration of the People's Republic of China, 2018; Xin Hua News, 2018). These railways cover almost every place in the country, even remote mountainous areas, plateaus, and the seaside. In 2017, a total of 3.04 billion passenger trips were made on railways, up 9.6 percent annually, and more than 56 percent of those trips were made on high-speed railways. The country's operating high-speed rail tracks accounted for 66.3 percent of the world's total by the end of 2017. Its airlines offer safe and comfortable service, with about 1,279 air routes, and among them, 1,035 are domestic, including the routes to Hong Kong and Macau, and 244 are international (China Travel, 2018). China has the seventh largest number of air passengers in the world, with 1.1478 billion passenger trips made in 2017m up 12.9 percent annually (Civil Aviation Administration of China, 2018). Further, numerous,

complex highways connect almost all cities, towns, and rural areas in China. Highway and road systems have gone through rapid expansion, resulting in a rapid increase in motor vehicle use throughout the country. The “National Trunk Highway System” started in the 90s with a government-led effort has expanded the network to about 102,300 kilometers, giving China the longest expressway network in the world (China Highway, 2018). Beijing currently has the highest annual rate of private car growth in China, leading to major congestion (Beijing Municipal Bureau of Statistics, 2013).

There are three broad categories in the taxi services in China: standing, cruising, and telephone-booking. Standing taxis wait for passengers at designated places, where drivers and customers usually form queues at specific fixed stops, and customers walk to the nearest taxi stop to take a taxi. Cruising taxis cruise on the street looking for customers, but their waiting time and the quality of service customers receive are uncertain. For telephone-booking taxis, consumers call a dispatch center from one of the different taxi companies asking for an immediate taxi service or reserving a taxi service for later on. Taxis are painted in different colors, including red, yellow and green, or yellow and black. An entry regulation keeping the number of officially licensed taxis steady creates an artificial cap by limiting the number of taxis and leads to a shortage in the taxi supply, which cannot meet the increasing demand. For example, the population of permanent residents in Beijing increased from 14.92 million to 21.15 million from 2004 to 2015, but the number of taxis only increased from 65,000 to 66,000 from 2003 to 2012, and the number has been kept at 66,000 since 2012 due to the limited road resources and requirements for energy conservation (Beijing Municipal Bureau of Statistics, 2013). A license in Shanghai may cost as much as RMB¥500,000 (\$80,745) (Li & Chen, 2016; CNN, 2015). The fare controls in different cities are set to regulate the fare schedules charged to taxis customers in terms of both time and distance.

Since licensed taxi services are an oligopolistic structure, taxi companies essentially control the market. The general perception in that market is that their service quality is relatively uncertain, and it has frequently been reported that drivers may refuse passengers for going to less profitable destinations and charge them an exorbitant rate during rush hour (China Times, 2015; TVBS, 2018). In China’s taxi system, drivers have to pay vehicle rental and management fees (e.g., RMB¥8,000 per month in Shanghai) to their companies, irrespective of daily passenger fare incomes. Such high costs actually deplete the drivers’ net income and discourage any improvement in service quality. Hence, the average annual incomes of drivers in Beijing and Shanghai were found to be, respectively, RMB¥45,671 (\$6,647) and RMB¥45,463 (\$6,616) which was about 82% of the gross domestic product per capita RMB¥55,817 (\$8,123)

(Salary Expert, 2018b, 2018c; The World Bank, 2018).

#### *4.3.2 Ride-sourcing's Impact on China*

In terms of China's transport infrastructure, rapid urban migration caused hundreds of millions of people to pour into cities over the past two decades, and its transport options have not been able to keep up. Taxis have failed to keep pace with the economic growth, making it difficult for the public to find a taxi in major cities (Financial Times, 2016a). Didi became the largest transportation network company in China after its merge with ride-sourcing services of Kuaidi Dache and Uber China in 2015 and 2016, respectively. Didi was founded in 2012 and was providing transportation services for more than 400 million users across over 400 cities in China in 2017 (Didi, 2018). It had 450 million users worldwide and had reached 7.43 billion rides. Uber entered the Chinese market in 2013, but it lost approximately \$2 billion dollars trying to compete with Didi, which was estimated to control close to 80% of the market (Fortune, 2016a).

These ride-sourcing companies promoted services by a free first ride for new customers or customers inviting friends to use the service and used subsidies to attract users (e.g., RMB¥6-20 coupon per trip) and drivers (e.g., RMB¥200 per day), which was practically unfair to taxi drivers (Financial Times, 2016b). Ride-sourcing drivers usually own their vehicles, and Didi's drivers could earn up to RMB¥30,000 (\$4,386) a month in 2015 with the companies' subsidies (South China Morning Post, 2018a). When ride-sourcing services made inroads into the local market, it was no doubt to observe customers turning to the mobile app from taxi or public transit services. Hence, the number of private cars in Beijing had increased from 4.075 million in 2013 to 4.403 million in 2015, but the public transit passenger volume (of bus and subway) had decreased from 7,615 million in 2013 to 7,383 in 2015 along with the rise of ride-sourcing services (Beijing Municipal Bureau of Statistics, 2016). Such a decrease in public transit volume was another result of the promotion and subsidy offered by ride-sourcing services since lower prices and quality services attracted passengers, and drivers bought private cars to earn extra income. To summarize, the taxi industry was severely hit by the competition triggered by ride-sourcing companies. The average passenger-delivery trip number per day per taxi dropped by 18.08%, and the average daily profit per taxi dropped by 19.29% from 2012 to 2015 (Jiang & Zhang, 2018).

#### *4.3.3 How the Government Responded to Ride-sourcing*

Overall, the Chinese government embraces the innovative sharing economies and its inherent contradictions, moving with the times and seeking common ground while maintaining differences and attempting to create harmony and tolerance (China Policy

Institute, 2017). Ride-sourcing services are believed to create benefits for the society as a whole based on the four pillars since they fill the gaps in the insufficiency of public transport in metropolitan areas and because the service quality of taxis has been long criticized by the public. In the early stage of ride-sourcing services when Uber entered the local market, the government basically ignored this booming innovative industry. Domestic ride-sourcing companies Didi and Kuadi Dache were intentionally cultivated by the government during the competition with Uber by restricting foreign-investments outside of China and because they revealed their data (e.g., customer lists and GPS routes and algorithms for price surges) to the government. Ride-sourcing services were legalized in 2016 with the setup of certain guidelines on drivers, vehicles, and equipment, including no criminal records, at least three years of professional driving experience, license by a local (i.e., province, city) regulator, and a specified level of vehicle condition (Business Insider, 2016).

The “Interim Measures for the Administration of Online Taxi Booking Business Operations and Services” and the “Administrative Provisions on Cruising Taxi Operations and Services” issued and enforced in 2016 positioned taxis and app-based ride-sourcing services into different market segments (Lee Kuan Yew Centre for Innovative Cities, 2016), where ride-sourcing services offered higher-quality, more expensive peer-to-peer transport services, and traditional taxis had an obvious taxi appearance and cruised around roads or waited at train stations and airports to pick up passengers. The measures only applied to online ride-sourcing companies and services provided by non-cruising taxis and specified the norms and standards of ride-sourcing companies and measures to be taken to safeguard passengers as well as the supervision and inspection powers of the government and the legal liability limits of the companies, including specified amounts of fines (CMS, 2016). In addition, all regions of China have now published their own rules in accordance with the measures and have specified that drivers must have a local residency permit and that the vehicle is locally registered (Ministry of Transport of the People’s Republic of China, 2016). The ride-sourcing services company must meet a series of qualification requirements and obtain a license from a local government to operate the online services online with qualified drivers and vehicles. In Beijing, ride-sourcing vehicles have to seat 5-7 passengers and be a maximum of 8 years-old. In addition, the age of drivers is regulated (i.e., males under 60, females under 55), and commercial insurance is required.

#### *4.4 Japan*

##### *4.4.1 Transportation Background*

The well-developed and sophisticated public transport in Japan is highly efficient

and punctual in its territories. Energy efficiency per person in the transport sector is due to the high penetration of rail transport, which is also very expensive (Lipsy & Schipper, 2013; Lipsy, 2012). Railways are a major means of passenger transport for mass transport, high-speed transport between major cities, and commuting transport in metropolitan areas. Dozens of Japanese railway companies compete in the regional and local transport markets (e.g., seven JR Group companies, Kintetsu Railway, Seibu Railway, Keio Corporation). High-speed Shinkansen trains connect major cities, and they are known to be very safe with no accident-related deaths of passengers in the 50-plus year history of the system. In Tokyo, Osaka, and some other large cities, buses serve a complementary role in their train and subway networks (Japan Guide, 2018a). In cities with less dense train networks, smaller towns, and in the countryside, buses commonly serve as the primary mode of public transportation.

Taxi drivers in Japan are known to be generally highly polite and trustworthy, with a culture of no tipping and never trying to take advantage of their customers. When boarding a taxi, the vehicle's left rear door will be opened and closed remotely by the driver, and the driver will help load passengers' luggage (Japan Guide, 2018b). Taxi vehicles are widely praised for being spotless and installed with a GPS. There is no regulatory rule on the exterior taxi design, and they can be recognized by green license plates. Taxi companies adopt their own designs and colors. Taxis can be operated by taxi companies and individuals, and as of December 2016, there were 234,486 taxis in total in Japan, with 16,221 taxi companies and 35,150 private taxis (Ministry of Land, Infrastructure, Transport and Tourism, 2018a, 2018b). Taxi companies cover all the expenses related to vehicle purchases, fuel costs, insurance, and parking, and drivers receive a salary with a constant number of duties and consistent work time, and they enjoy normal fringe benefits (China Times News, 2016). About 40% of taxi drivers in Japan participated in unions in 2016 much higher than that in other countries (Organization for Economic Co-operation and Development, 2018). Its taxi services have the most expensive fares in the world and are positioned toward high-end customers but not the general public, who rarely take taxis as a daily transport mode but instead use the highly developed railway systems. The taxi market in Tokyo with 50,494 taxis provides the best services in Asia and has the world's biggest market value of \$17 billion (CNBC, 2018a). In 2017, the starting fare of \$3.95 covered the first 1.059 kilometers, and the fare increased \$0.73 for every 237 meters traveled (Japan Visitor, 2018). In a 10-kilometer route, it would cost \$34.75 which is 5.35 times of the price for a taxi in New York City during daytime hours. The average annual income of Japanese taxi drivers in 2017 was ¥4,515,403 (i.e., \$39,795), which is about 103% of the gross domestic product per capita of \$38,428 (Salary Expert, 2018d; The World Bank, 2018).

#### *4.4.2 Ride-sourcing's Impact on Japan*

The low-cost, fast, and convenient characteristics of ride-sourcing services have seriously threatened and looted taxi businesses worldwide (China Times, 2016). One of the key points is that passengers are unsatisfied with taxi and public transport services and switch to these new, innovative services. However, this is not the case in Japan since risk-averse passengers are anxious about the risk and uncertainty of ride-sourcing services and stick to high-quality traditional taxi services (Liberty Time News, 2016). The Japanese are strict about the quality of goods and services (Straits Times, 2017d). For decades, Japan's taxi unions have endeavored to build up the lauded management systems in the taxi industry, and the taxis are renowned for their quality and safety. The only drawback of Japan's taxi services is the high prices. In 2015, Uber entered Japan's market to provide ride-sourcing services (Japan Times, 2015). However, private cars are not allowed to operate as taxis in Japan, and Uber was considered to be illegal. The company shut down its services itself, and the service was only provided for a month. In 2018, Uber cooperated with dozens of local taxi companies (e.g., Daiichi Koutsu Sangyo Company) and taxi drivers and began its expansion in Japan as a taxi dispatcher (Fortune, 2018a). It also provided a professional car-dispatch service of luxury UberBlack or UberBlack vans at a booking fee of ¥1,080 (US\$9.70) (South China Morning Post, 2018b). Nevertheless, Uber only accounts for less than 1 percent of monthly rides in Tokyo (CNBC, 2018a).

The conservative Japanese public is simply ignorant of the existence of sharing apps or suspect that they may be illegal, thus impeding the development of the sharing economy (The Economist, 2018). Overall, there were two advantages for Japan's taxis in the fight against the entry of ride-sourcing services. Timing was a key advantage. As early as 2013 when Uber entered local taxi markets around the world and posed a serious threat to them, taxi unions in Japan had time to observe the impacts and came out with some quality strategies to improve the situation. Recognizing ride-sourcing companies as a business competitor, in 2015, Nihon Kotsu, the country's largest taxi company, launched a partnership with the social media company, Line, where passengers could call a taxi and pay the fare with Line Taxi (Huff Post, 2015; Watanabe, Naveed, Neittaanmäki, & Fox, 2017). Another key point was safety. The safety issue was why ride-sourcing services had not enjoyed the same success in Japan as such services had, elsewhere. Numerous reported incidents of ride-sourcing drivers committing crimes around the world shocked Japanese passengers, and criticisms had been made of companies for not thoroughly vetting their drivers (Motion Digest, 2017). In particular, the ride-sourcing services failed to take responsibility by saying they are just a platform provider. Such responses infuriated the public, and the safety issue

became an important matter. To prepare for the coming of the 2020 Olympics in Tokyo, Japanese companies jointly ventured with their partners (e.g., Softbank and Didi, Sony and Kokusai Motorcars Company, Nissan Motor and DeNA, and Toyota Motor and JapanTaxi) aiming to gain shares of the giant taxi market via developing a vehicle-dispatch support system/platform using artificial intelligence or using driverless taxis (CNBC, 2018a; Japan Times, 2018).

#### *4.4.3 How the Government Responded to Ride-sourcing*

Despite the fact that Prime Minister Abe Shinzo attempted in 2015 to accelerate regulatory reforms and promote the sharing economy, his regulating authorities continuously responded to these innovative services in their characteristically conservative manner (Public Affairs Asia, 2016). As compared to other major economies (e.g., \$229 billion in China), the sharing economy in Japan is still in its infancy with a value of only \$11 billion, accounting for only 1.9% of the global sharing economy (Circulate news, 2016; The Economist, 2018). Overall, Japan takes a cautious approach to the sharing economy (Japan Times, 2017). The “Road Transportation Act” regulates services conveying passengers or goods for a fee, by requiring such companies to apply for a professional business license, and drivers must have a professional license. Uber was forbidden to operate services without a license. It ran up against the regulation, and after one month of service provision in Tokyo and Fukuoka, Uber’s ride-sourcing services were shut down except in Tangocho, a remote coastal town of about 5,900 residents (Asia Time, 2016). The services effectively operated as a social service for the elderly who needed a way to get around after buses stopped operating, and the town’s only taxi company went bust. Because most of its customers did not own smartphones, they usually had to call someone who in turn arranged rides via the app (Bloomberg, 2017). To deal with this situation, Japan’s government allowed the use of private vehicles as a commercial transport service for local residents in areas with few available public transportation services under a 2006 revision to the Act (Kyodo News, 2018).

### *4.5 Taiwan*

#### *4.5.1 Transportation Background*

Public transport in Taiwan is highly competitive and effective. It has railway, high speed rail, freeway bus, subway, and bus options. It is known that public transport has a high benefit cost ratio since its service quality is high at a low cost. The usage rate of public transport in Taiwan was 18.1% in 2016 (MOTC, 2017a). The market shares of intercity transportation in terms of passenger-kilometer for railway, freeway bus, and high speed rail in 2017 were 53.4%, 32.6%, and 13.9%, respectively. The Taiwan

Railways Administration (TRA), with 1,065 kilometers of networks carrying over 232 million passengers in 2017 (TRA, 2018a, 2018b) and Taiwan High Speed Rail (THSR), with 349.5 kilometers along the west coast of the island carrying 60.6 million passengers in 2017 (THSR, 2018). Freeway buses operating 24 hours a day and 7 days a week provide passenger transportation across cities using freeways at relatively cheap prices. As for intra-city transport, clean, safe, convenient and reliable mass rapid transit metro systems have been installed in Taipei, New Taipei City, Kaohsiung, and Taoyuan, and comprehensive bus systems are also offered in cities. In particular, Taiwan is famous for its high scooter density, which is the most economic but polluting transport mode. There are 378 scooters per squared kilometer, the highest in Asia, and riders ride scooters 53.8 minutes per day (MOTC, 2017b).

Taxis in Taiwan are oversupplied and very competitive (National Policy Foundation, 2008). Recognized as yellow vehicles with a red license number on white plates, taxis require a taxi registration certificate, and drivers must have a commercial driving license. The tariffs are set according to distance and time, but they vary in different cities due to differences in occupancy rates. Taxis in Taipei charge N.T.\$70 for the first 1.25 kilometers, an extra N.T.\$5 per 0.25 kilometer, N.T.\$5 per 80 seconds at speeds slower than 5km/hour (Taipei City Transportation Public Office, 2015). Of course, taxis are more expensive than mass transit (e.g., N.T.\$15 and N.T.\$20 per trip for bus and subway, respectively) but cheaper than their counterparts in developed countries. There were totally 86,000 taxis running on the roads of Taiwan in 2015, and Taipei had a total of 29,344 taxis. There are three types of taxi organizations in Taiwan: taxi companies, taxi credit unions, and individual taxis. Drivers usually join taxi companies or taxi credit unions, but the qualifications for individual taxis for a driver are strict and require no traffic violation while holding a commercial driving license for more than six years consecutively (MOTC, 2017c). There are two categories of taxi services in Taiwan: cruising and dispatching. Cruising taxis cruise on the street or wait in a line near hotels, train stations, and airports looking for customers, but the quality of service customers receive is uncertain. As for satellite/radio dispatching taxis, customers may use dispatch apps or call a taxi dispatch center to request a taxi ride, a taxi reservation number and estimated arrival time will be given, and the fares can be paid with credit cards, electronic ticket cards, or cash. In general, dispatched taxis are efficient and safe, and their driving routes are monitored and recorded via their GPS by dispatching centers at the company headquarters. Although taxi drivers in Taiwan tend to be friendly and more honest than those in many other countries, not all of them are trustworthy. Another unusual sight is that few drivers chew betel nuts and spew liquid “blood” from their mouths. Despite the fact that taxi drivers are granted an exemption from a license tax, they are paid very little for their worked. It has been reported that

taxi drivers in Taipei work 26-27 days a month for 10.46 hours per day (MOTC, 2016). However, their annual income on average was only NT\$493,986 (i.e., \$16,088) in 2017 which was 66% of the gross domestic product per capita of \$24,318 (Salary Expert, 2018e; Directorate General of Budget, Accounting and Statistics, Executive Yuan, 2018).

#### *4.5.2 Ride-sourcing's Impact on Taiwan*

Two ride-sourcing companies, Uber and DiDi, entered the taxi market in Taiwan. Uber was established in 2013 and was registered in Taiwan as a digital service provider that offers data processing services, electronic information supply services, and third-party payment services. DiDi, partnering with a local technology firm, entered Taiwan in 2018 to provide two services, Didi Taxi (i.e., offering legal taxi services via a taxi-hailing platform) and Didi Hitch (i.e., recruiting unlicensed drivers to offer ride-sourcing services) via its app. What these innovative services charge is based on a surging pricing structure in which the fares range between a fixed price floor and a price ceiling and closely depend on demand and supply conditions. More than 10,000 drivers registered with Uber provided ride-sourcing services using their leisure time, or while working part-time or full-time (Time, 2017). Like the promotions provided in other countries, a free first ride and subsidies to customers (e.g., N.T.\$20-120 coupon per trip) and drivers (e.g., N.T.\$100-1,000 per trip) were implemented. This practically unfair competition seriously hurt taxi services, and their business went down by 20% to 30% (Chang, 2017; Focus Taiwan, 2016). Further, the revenues of taxi drivers decreased by 12% in 2013 and by 18% in 2015 after deducting for gas, maintenance, and other overhead, respectively. In contrast, ride-sourcing drivers earned higher incomes than regular taxi drivers.

The entry of ride-sourcing services has given rise to countless protests from taxi drivers. Uber ceased its ride-sourcing services in February 2017 after being fined with the penalty of N.T.\$2.5 billion for offering illegal passenger transportation services. However, after two months, Uber's X services were relaunched by partnering with licensed car-rental operators (Taipei Times, 2018b). Likewise, Didi suspended its ride-sourcing services in 2018 after only operating for three months after being determined to be illegal by the MOTC. Nevertheless, a lack of regulation on such services and the aggressive promotions and subsidies carried out by the providers deteriorated the market of already competitive taxi services. In particular, four taxi drivers committed suicide within 10 days during August 2018 due to their mounting financial pressure (ETtoday news, 2018).

#### *4.5.3 How the Government Responded to Ride-sourcing*

Despite the success of sharing economies worldwide, the oversupply in the taxi market along with countless protests on the part of taxi drivers forced Taiwan's government take a negative attitude toward these new business models and innovative ride-sourcing services. Overall, there was a sluggish government reaction to the entry of the services and reluctance to revise laws to accommodate them (Taipei Times, 2016). Starting in 2013, Uber carried customers using non-professional drivers via its ride-sourcing services platform and seriously undermined the interests of incumbent taxis. These actions were against the existing laws and gave rise to the concerns related to consumer disputes, safety, privacy, and paying taxes. Uber got its first fine in Taiwan in September 2014, but the local government increased the fine for illegal passenger transportation services up to NT\$25 million (\$780,000) a ticket by amending the Highway Act in 2016 (Fortune, 2016b). Up to the present time, Uber has gotten more than 500 tickets, and the total fines have risen to NT\$2.5 billion (\$81.35 million), the largest amount of fines against Uber in the world (Taipei Times, 2018b; Taiwan Executive Yuan, 2016). Uber was advised several times by the authorities to stop illegal business operations, and it eventually stopped providing ride-sourcing services in Taiwan in February 2017. Likewise, DiDi, who entered Taiwan's market in February 2018 was also considered to be illegal. After 9 fines in the amount of NT\$181 million (\$6.18 million), DiDi suspended its local ride-sourcing services in April (Taipei Times, 2018a). To summarize, the attitude of the Taiwanese government toward ride-sourcing services was based on protecting the interest of the incumbents, which hindered the development of sharing economies. At the same time, to promote service quality in taxi services, regulatory guidelines for diversified taxis was announced and launched in 2017 (Taiwan Executive Yuan, 2016). Diversified taxis using non-yellow 5-person/7-person vehicles provide services via an advance booking app (similar to the Uber model) at a rate set by themselves and approved by local authorities (Formosa News, 2016). Currently, there are about 1,000 diversified taxis in Taiwan (China Times, 2018).

### *Summary*

Ride-sourcing services have disrupted the market for taxis and transportation industries. These influences have prompted governments to respond to these disruptive innovations. Policy development will be influenced by the economic, social, and political culture. Culture, customer habits, and market structure are different in these five countries. The only commonality is that ride-sourcing services solve the existing transportation problems in these countries. Taxi industries are a highly regulated industry, and the existing laws were clearly made to protect taxis from competition. However, most regulations are invalid and counterproductive. The main concerns in these five countries are different, where some countries are focused on promoting the

competition, and others are emphasize protecting customers. The decisions of the government depend on the country's transportation background and the government's attitude towards innovation.



**Table 2** Summary of the ride-sourcing in the case studies

Country	Singapore	The Philippines	China	Japan	Taiwan
Transportation background	<ul style="list-style-type: none"> <li>Difficult to hail a taxi on the roadside</li> </ul>	<ul style="list-style-type: none"> <li>Worst traffic on Earth</li> <li>The taxi system is out of control.</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to hail a taxi on the roadside</li> <li>Congestion in Beijing</li> </ul>	<ul style="list-style-type: none"> <li>Highly developed transportation system</li> <li>Best taxi services in Asia</li> </ul>	<ul style="list-style-type: none"> <li>Well-developed transportation system</li> <li>The quality of taxis is uncertain.</li> </ul>
Taxi supply	<ul style="list-style-type: none"> <li>Supply shortage</li> </ul>	<ul style="list-style-type: none"> <li>Supply shortage</li> </ul>	<ul style="list-style-type: none"> <li>Supply shortage</li> </ul>	<ul style="list-style-type: none"> <li>Oversupplied</li> </ul>	<ul style="list-style-type: none"> <li>Oversupplied</li> </ul>
Externality of ride-sourcing	<ul style="list-style-type: none"> <li>Taxi driver's income reduced.</li> <li>The number of taxis decreased.</li> <li>The number of rental cars increased.</li> </ul>	<ul style="list-style-type: none"> <li>created more employment opportunities and income</li> </ul>	<ul style="list-style-type: none"> <li>Public transit volume decreased.</li> <li>The average passenger-delivery trip number decreased.</li> </ul>	<ul style="list-style-type: none"> <li>Taxis improve their services (e.g., APP)</li> </ul>	<ul style="list-style-type: none"> <li>Taxi driver's income reduced.</li> </ul>
Legal or illegal	Legal (private hire car)	Legal (transport network vehicles)	Legal (online taxi booking business)	Illegal	Illegal
Safety standards for ride-sourcing	<ul style="list-style-type: none"> <li>Driver training course required.</li> <li>Driver background screening required.</li> </ul>	<ul style="list-style-type: none"> <li>GPS tracking and navigation devices</li> <li>Driver background screening required</li> <li>Standards for vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Driver background screening required</li> <li>Standards for vehicles</li> </ul>	x	x

# Chapter Five

## Theoretical Analysis

In this chapter, the impact of ride-sourcing services on the five regulatory theoretical criteria, supply and demand, transaction cost, externalities, safety, and privacy are discussed and analyzed.

### *5.1 Balancing Supply and Demand*

The entry of ride-sourcing companies into taxi services increased both supply and demand and dynamically balanced the supply and demand situation in the market. Taxi services are not a market in which winners take all, and customers have their own preferences and selections. In a graph of supply and demand, an increase in supply will shift the equilibrium to the right and increase the quantity supplied. The entry of ride-sourcing services means more drivers join taxi services. When ride-sourcing services entered a local market, it definitely increased the supply of door-to-door services, and such an increase in the competition in taxi services in turn decreased the revenues of taxi drivers and gave rise to their consistent protests. However, ride-sourcing services also increased market demand and met a latent demand that had been underserved by taxi services through their superior service quality and aggressive marketing and promotion strategies. The use of coupons and free rides offered to first-time customers attracted those who did not usually make use of taxi services. Urban mobility was enhanced since such rides were usually cheaper and more convenient than taxis due to the provision of automatic and postpaid payment methods. Overall, the market scale was expanded with more customers and revenue. Surging pricing mechanisms adopted in ride-sourcing services allowed setting the fares based on a predetermined pricing structure that is closely linked with the supply and demand in the local market. It is a commercial opportunity that comes from a better understanding of what customers are willing to pay at any given moment, which might be driven by weather, holidays, or by what a competitor is charging. Under the fixed and regulated fares set in taxi services, excess demand occurs in peak hours, and excess supply occurs in off-peak hours, and no pricing mechanism can work to adjust equilibrium. In surge pricing, high demand drives up the prices and incentivizes drivers to join the market, but low demand lowers the prices such that drivers leave the market. Frequent pricing adjustments rapidly adjust and balance the supply and demand in the market. To summarize, surge pricing senses in real-time the supply and demand across the city and encourages drivers to enter the market during peak hours to benefit from the temporary spike in fares on

Friday nights or holidays. Also, the influx of drivers makes it possible for customers to have a higher chance of finding a ride.

The market ride-sourcing services enter is taxi services in which operations are strictly controlled through official operating licenses, fare structures, and so forth (Kamga, Yazici, & Singhal, 2015). Such regulated and closed taxi markets can be observed under conditions of short supply in Singapore, the Philippines, and China. For example, although Singapore has one of the highest taxi densities in the world, with 5,225 taxis per 1 million inhabitants, taxis are difficult to acquire, especially during peak hours and when cabbies change shifts (Today Online, 2016). This supply-demand imbalance or the market failure has not been resolved for decades under government-backed monopolies and entry and price regulations. The entry of ride-sourcing services would effectively increase supply and solve the problem of supply-demand imbalance. This might be a reason why in some countries, ride-sourcing services have been legalized to increase the supply (or competition) of taxi services.

### *5.2 Reducing Transaction Costs*

One advantage of sharing economies is the ability to significantly reduce transaction costs and to make the information available to the transacting parties symmetrical. Thanks to widespread smartphone ownership and mobile payment systems, requesting ride-sourcing services and making payments can be done by simply clicking an app, and the matching of customers and drivers will be effectively conducted. This is like allowing individual drivers and tiny businesses to outsource functions involving finding customers, setting market prices, and making payments to ride-sourcing companies. Overall, ride-sourcing services make the taxi service market more efficient than what it was previously, and indeed, they greatly reduce transaction costs for both drivers and customers. The digital platforms reduce driver search and contact costs via an algorithm matching customer requests with nearby available drivers. The usage of fuel and time is more efficient since drivers have no need to cruise on the streets and wait in lines looking for customers. Further, ride-sourcing customers are required to download the app and register on the platform along with their credit card information prior to requesting ride-sourcing services, and thus, the vehicles do not need to install built-in radios and credit card processors. A considerable amount of the costs related to traditional telephone-based dispatch systems and staffing at dispatching centers can thus be saved.

Likewise, ride-sourcing services reduce search and contact costs and the uncertainty of risk to customers. By simply clicking the app, a vehicle can be requested indoors rather than calling the dispatching center or waiting on the streets outside. The

driver's name, face, reputation, vehicle type, license plate, and arrival time are displayed on the platform, so customers can easily recognize the drivers. In a case in which vehicles are delayed at the pickup point and fail to meet the expected arrival time, customers can check on the platforms for continuous updates of GPS-based vehicle locations, reducing the uncertainty and anxiety associated with waiting for a ride. There is no need to call the dispatching center for possibly inaccurate information about vehicle locations and arrival time. Also, the fares of ride-sourcing services are processed by built-in pricing and payment functions, eliminating the chaos caused by bargaining. In the end, such innovative business models encourage taxis service companies in every city to promote their own service quality by creating apps and partnering with social media.

### *5.3 Bringing in Externalities*

The emergence of ride-sourcing services has brought personal door-to-door transportation services some externalities in terms of production as follows: improving city image and service quality, lowering taxi drivers' revenues, and increasing private vehicle ownership. First of all, the image of a city may be influenced by landmark buildings and roads (for pedestrians and vehicles, respectively). In many cases, taxi services could be threats to the city image due to visitors experiencing poor quality, highly priced, or unpleasant taxi experiences since they are the most frequent users of a city's taxi services (Dempsey, 1996). Many news stories about drivers' refusing to pick up customers, not turning the meter on, charging above the metered price, or robbing and harming customers have been reported in the Philippines, China, and even in Singapore (CNN, 2016a; SET News, 2016; The Philippine Star, 2018). Such notorious taxi services surely damage the image of the city or country. In particular, taxis may be foreigners, and may present one of the key impressions of the city to visitors. Because of competing with ride-sourcing services, the service quality of taxi services will be improved, and all drivers will turn their meters on, charge prices by the meter, and not engage in misconduct. Ubiquitous, reasonably priced, and efficient on-demand taxi services will result in satisfactory services. As a result, visitors' impression of the city will be enhanced.

In the contrast, ride-sourcing services reduce taxi drivers' revenue and increase private vehicle ownership. It was inevitable that taxi drivers' revenue and the number of passenger-delivery trips would drop due to the competition from ride-sourcing services (e.g., driver revenues dropped by approximately 19.29% in China and by 12% in Taiwan in 2015). Lastly, an advantage of sharing economies is that full utilization of resources will result in less ownership of those resources. In the case of ride-sourcing services, these innovative services will satisfy the need for personal door-to-door

transportation; private cars will not be needed, and less car ownership implies less consumed gasoline and fewer emissions, thus helping ease road congestion (American Public Transportation Association [APTA], 2018). In the U.S., passengers who use ride-sourcing services own 1.05 cars per household on average, which is 0.45 cars less than those who never use ride-sourcing services (Foley, 2018). Also, almost a quarter million Lyft ride-sourcing customers sold their personal car or abandoned replacing their current car in 2017 due to the availability of ride-sourcing services. However, this decreased car ownership situation did not occur in developing Asian countries. With a low-level GDP per capita, the public wants to join the ride-sourcing services industry to get extra income by buying a car. The car market in the Philippines rose with a 27.8 percent in Q1 of 2017 (Carmudi, 2015; Manila Times, 2016). Likewise, the number of private cars in Beijing increased by 8% from 2013 to 2015.

#### *5.4 Raising Safety Issues*

One of the key concerns for the public related to ride-sourcing services is safety issues. Whenever ride-sourcing services drivers engage in criminal behavior (e.g., sexual assaults or murder), media reports in that country will make the public feel that such services are unsafe. For example, perceptions of the danger of flying on airplanes would be exaggerated by a case of plane crash despite the fact that airplane travel is statistically safer than all other transportation modes. Since all enrolled ride-sourcing drivers are registered; the services are booked and paid by the app, and the GPS tracking routes are monitored and stored at the headquarters, any criminal case can be discovered quickly and easily. Further, the services are cashless transactions charged directly to customers' credit cards, which makes the chance of being robbed significantly less. In an in-depth review of police reports, federal court records, and county court databases for 20 major U.S. cities, there were 103 Uber drivers accused of sexual assault or abuse in 2014 and 2017, but 18 of these criminal cases did not move forward either because the charges were dropped, the cases were dismissed, or the drivers were found not guilty (CNN, 2018). However, 1,948 taxi drivers in the city of London alone were charged with criminal offences in 2011 and 2015 and 521 of them were charged with violent or sexual offenses, including grievous bodily harm or rape (Standard, 2016). Up to the present, there have been no empirical reports stating that ride-sourcing services may be more dangerous than taxi services. In some countries or areas (e.g., the Philippines, China, New York), it is considered safer to take ride-sourcing services than to take taxis.

Initially, ride-sourcing companies only required their drivers to have driver licenses (but not professional licenses). However, background checks, commercial insurance, training courses, and periodical vehicle maintenance were not required. These drawbacks may result in possible safety concerns especially after criminal

incidents occur. There is no doubt that high regulatory requirements with extra precautions will expose ride-sourcing drivers and customers to less potential risk of harm. Of course, training courses offered to the drivers would alert them to pay attention to any risk they may be unaware of, and periodic inspections would uncover any possible problem with the vehicles they may be ignoring or unaware of. Another safety concern is that ride-sourcing services are insured only with a basic level of liability insurance but not commercial insurance. This type of coverage would not be able to cover a driver's legal liability for property damage, death of a passenger, or bodily injury to passengers and other third parties in an accident, and ride-sourcing companies will not be responsible for these losses either. These safety issues were a topic of criticism by the public for a long time until ride-sourcing services became legal in some countries (e.g., the Philippines in 2015, China in 2016, and Singapore in 2017), and the outlined standards for equipment, vehicle type/year, certificate, and driver's qualifications were set. These ride-sourcing companies were asked to follow similar requirements to those of taxi services, including background checks, commercial insurance, and periodic training courses and vehicle maintenance. For customer safety, the drivers are required to be accredited by ride-sourcing companies and registered with the regulatory agency of the country. Further, there is a maximum age limit of the vehicles (e.g., 7 years in the Philippines, 8 years in Beijing, 15 years in Singapore), and the vehicles must be equipped with GPS tracking and navigation devices.

### *5.5 Raising Privacy Issues*

While registering with ride-sourcing services, customers have to provide their name, gender, phone, address, and credit card/ third party mobile payment method voluntarily. One major difference between ride-sourcing services and taxi services is that the former can be used only through advanced reservations and cashless payment. The GPS location tracking data (e.g., origin-destination [O-D] point, time, route) of customers when traveling is collected, crunched, and analyzed using a surge-pricing algorithm (Neil Patel, 2017). A high density of O-D points in a given area (e.g., a concert) of cities may lead to a hike in price. In the future, a data-driven mapping system for Uber's autonomous cars can be built using these location data (Computer Business Review, 2017). This roadmap gathers, analyzes, and redistributes information from real-time crowdsourced updates, ensuring the car navigates the roads safely and allowing customers arrive at their destinations in the most efficient way possible. The location data that may be related to personal safety is one of the types of personal sensitive data being collected. Ride-sourcing companies own, maintain, and utilize this personal information, leading to customers' privacy concerns. Further, the fact that customers cannot have full protection in when there are privacy breaches forced

Taiwan's government to ban ride-sourcing services (Taipei Times, 2016).

Uber's God View incident and data breach incident in 2016 and 2017, respectively, were two major privacy invasion incidents in ride-sourcing services. After the first incident, Uber promised to be transparent and secure anyone in the company with the authority to access the location tracing routes of customers despite the fact that the passenger had agreed to share the data with the company, and Uber also agreed to remedy necessary privacy protections required to safeguard customer data (Inverse, 2017; Tech Crunch, 2018). The second incident was a multinational data breach that gave rise to the administrative and investigative responses of the local governments involved. Since a successful overseas cyber-attack has disrupted essential services and affected the lives of citizens, no organization is allowed to take a laissez-faire approach in data protection. The Personal Data Protection Commission in Singapore amended the Personal Data Protection Act, demanding that organizations have the responsibility to inform customers as soon as a breach is discovered (Insurance Business, 2017). Likewise, the concealment of data breaches is a criminal offense under the Philippine's Data Privacy Act. The National Privacy Commission requested Uber officials to report the incident, including the types of breached data, the leak that led to the data breach, and the response of the company to remedy the data protection process for its drivers and customers (The Philippine Star, 2017). The incident is still under the investigation, and no criminal charge against Uber has been filed. These two privacy invasion incidents forced all ride-sourcing companies to take further steps in implementing and strengthening security measures and privacy protections. Access to the cloud-based data storage accounts was restricted, and Uber's first chief privacy officer was hired (Fortune, 2018b).

### *Summary*

On the economic regulation side, ride-sourcing services balance the supply and demand through the use of price surging strategies, responding the real-time demand across the city, which also encourages more drivers to enter the market during peak hours. The services reduce transaction costs including searching costs and dispatching costs, which makes the market more efficient. Ride-sourcing services solve a part of the externality problems (e.g., improving the city image and service quality). However, they also bring another externality problem to society (e.g., increased private vehicle ownership) and the taxi industry (e.g., reduced average passenger-delivery trip number and lowering taxi drivers' revenues). On the social regulation side, every country making ride-sourcing services legal has set safety standards in order to protect customers (e.g., vehicle type/year, certificate, and driver's qualifications). After the two privacy invasion incidents referenced above, regulatory authorities have seen how

successful overseas cyber-attacks disrupt essential services and affect the lives of citizens, so they cannot take a laissez-faire approach to data protection, and all ride-sourcing companies have now begun work on strengthening their privacy protection mechanisms.



# Chapter Six

## Conclusion

### *6.1 Summary of the Results*

With the widespread use of the Internet and smartphones, ride-sourcing services offer new avenues for creating wealth but challenge existing incumbents and regulatory structures. This study reviews the transportation background, the impact of ride-sourcing, and how governments respond to these impacts in five economies: Singapore, the Philippines, China, Japan, and Taiwan. It also examines the economic and social regulations related to ride-sourcing services. The main results are summarized as follows. When faced with incoming ride-sourcing services, the governments of these countries made decisions about the legalization of the services mainly based on the supply and demand of the existing taxi market using three methods. The parties with entrenched interests (i.e., taxi drivers and companies) attempted to influence the regulatory agencies in the name of customer protection to protect themselves from the forces of market competition. Such a decision creates a tradeoff between the welfare of customers in taxi services and that of taxi drivers. In the case of oversupplying of taxi services, ride-sourcing services were made illegal regardless of whether or not the quality of the taxi services was good. For example, Taiwan's government wanted to protect taxi drivers who were threatened by the competition introduced by ride-sourcing services and used regulations to shut down Uber's new services and fined it a total of \$81.35 million dollars.

However, in the case of excess demand for taxi services, ride-sourcing services were legalized and effectively resolved shortages of taxi services. Ride-sourcing services were made legalized in Singapore, the Philippines, and China for the sake of the public interest. To ensure the maximum welfare and safety of customers, a series of standards and qualifications were imposed on the drivers and companies of ride-sourcing services before operating these services (e.g., equipment, vehicle type/year, certificate, driver's qualifications background check, commercial insurance, and periodical training courses and vehicle maintenance.) There were two methods used to legalize ride-sourcing services: revising the existing regulations to accommodate the new services and adding a new service classification in the existing regulations. For example, Singapore revised its taxi regulations allowing the entry of ride-sourcing services as private hire car services and requiring these drivers to have a vocational license. By adding a new service classification in the existing regulations, Grab served

as a transportation network vehicle service in the Philippines, and Didi operated as an online taxi booking business in China.

On the economic regulation side, ride-sourcing services balance the supply and demand through surge pricing, respond to the demand in real-time across a city, and encourage more drivers to enter the market during rush hour. The services reduce transaction costs and make the market more efficient by reducing searching costs via an algorithm matching customer requests with available drivers. Some positive externality effects (e.g., improving city image and service quality) occur but result in other negative externality problems to the society (e.g., increasing private vehicle ownership) and the taxi industry (e.g., lowering taxi drivers' revenues). On the social regulation side, the countries making ride-sourcing services legal set safety standards on the companies and established driver's qualifications in order to protect customers. Finally, the two privacy invasion incidents forced all ride-sourcing companies to strengthen their private protections.

This study offers several contributions to the existing literature. The related studies analyzed ride-sourcing services in a single city or state, and few studies have compared their impacts across different geographical areas. This study compared ride-sourcing services across five Asian economies to gain an understanding of their impacts and how local governments responded to them. The similarities and dissimilarities in policy responses across economies and the possible reasons why ride-sourcing services were legalized or not in local markets were summarized. Economic regulations and social regulations using the criteria of supply and demand, transaction cost, externalities, safety, and privacy were applied to further analyze the impact of ride-sourcing services on the society, the incumbents, and government policy making. Finally, cases where sharing economies fully utilize resources resulted in less ownership of those resources in high-level GDP per capita countries but did not occur in developing Asian countries. Instead, the public with a low-level GDP per capita tended to purchase new vehicles in order to join ride-sourcing services and obtain extra income.

## *6.2 Regulatory Implications*

Several regulatory suggestions drawn from the results are provided for the government with respect to ride-sourcing services. Innovations play a critical role in the evolution and progress of society. Governments should be open minded toward innovative ride-sourcing services and accommodate them into personal door-to-door transportation of the local market base. Overall, these services bring positive benefits to society by balancing the imbalance of supply and demand in taxi services, reducing transaction costs, and giving rise to some positive externality effects. The rise of ride-

sourcing services creates job opportunities for the unemployed and many others who wish to make extra income by using existing resources (i.e., a car and their free time.) Particularly, in ride-sourcing services, drivers' ride routes and reputation systems can be observed, and customer protections are secured as is evident with fewer incidents of physical harm. The adopted mobile payments provide convenience to customers with a high level of security in terms of service charges both for customers and drivers. Ride-sourcing services do have a great number of impacts on the taxi industry. The arrival of such disruptive technologies vastly improved their quality and efficiency. In many cities, taxi services were badly operated in the form of unmaintained vehicles and rude drivers. These industries were highly regulated, and taxi companies and drivers had no incentive to innovate and improve their mediocre service quality. Fierce competition driven by the entry of ride-sourcing services forces taxi companies and drivers to improve service quality and efficiency (e.g., adopting calling apps, GPS navigation, mobile/credit card payment, and partnering with social media) in the long run. However, in the short-run the incumbent taxi companies and drivers suffer from a drop in their revenues and incomes, respectively.

The embracing of innovative services never implies a lack of governmental regulations, and the regulations are never intended to impede the development of innovations. The existing regulations may not properly fit these new innovative ride-sourcing services, but certain amendments would help balance regulating innovations and would preserve their contributions to the society. The provision of ride-sourcing services gives customers new choices for quality door-to-door transportation services. However, two important issues, safety concern and privacy concern, should be properly addressed in order to safeguard customers. As for customer safety, it should be the responsibility of ride-sourcing companies, and it should be required by law that they hire qualified drivers (e.g., background check, registered at the regulatory agency, training courses) and vehicles (e.g., type/year, periodic maintenance) with sufficient insurance coverage. As for customer privacy, ride-sourcing companies should be subject to the proper use of customer data (e.g., allowing certain and limited staffs the authority to access customers' data), endeavor to heighten the protection of customer data (e.g., hiring a chief privacy officer, strengthening the protections of cloud-based data storage), and they should take full responsibility in the case of data breach (e.g., informing customers as soon as possible.) In sum, accommodating the entry of ride-sourcing services would allow regulators, customers, and companies to evolve in an ever-changing innovative society.

### *6.3 Limitations and Future Research*

This study provides qualitative perspectives of ride-sourcing services via case

studies based on information from secondary sources such as related journal studies, government/organization reports, and news. The implications of economic regulation and social regulation of the services are fully discussed and analyzed. There were still difficulties encountered in collecting updated regulation and market status in this cross-country comparative study. A direction for future research could be an examination of labor relations within the provision of ride-sourcing services. Labor relations are the rights and obligations between employers and employees and include the type of work, working hours, and the degree of autonomy associated with the work (Budd, 2014). Taxi companies charge various commission fees to their drivers, including equipment fees (e.g., taxi top light, taximeter, GPS navigation), booking fees, and passenger service fees during the customer exchange process, renewing driving licenses and vehicle registration, processing insurance, and fleet management, etc. (Houston Chronicle, 2017). Such commission fees vary depending on the area where the companies are located. For example, taxi companies charge 10%-15% commissions on all drivers' revenues or \$900-\$1,530 per month including vehicle rental, \$1 passenger service per trip, and \$0.5 booking fee per trip. Good labor relations between taxi companies and drivers would provide good taxi services, and unfair labor practices and exploitation would thus never occur. Similar issues can arise between companies and drivers of ride-sourcing services. Ride-sourcing companies provide a technology platform for drivers and customers. Drivers have flexible control over when and where to work, and companies exert little control over the drivers' activities. In the business of ride-sourcing transportation services, both companies and drivers are dispensable. A cross-country comparative study on the labor relations of ride-sourcing services can be conducted using survey questionnaires to analyze the opinions of how companies surcharge (e.g., commission fees) and manage (e.g., education and training, suspension of rights) and what kinds of fringe benefits companies provide from the perspective of drivers.

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