Texas A&M Transportation Institute

Policy Implications of Transportation Network Companies

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Policy Implications of Transportation Network Companies

Transportation network companies (TNCs) are rapidly expanding organizations that use digital technologies to connect passengers to drivers who use their personal vehicles to provide for-hire ride services. This research was designed to help Texas policy makers navigate the evolving policy considerations presented by the rising popularity—and accompanying controversy—of TNCs. This report presents the findings of a TNC legislative and regulatory review, discussions of priority issues related to TNC policy, and future considerations related to TNC policy. These findings include:

- As of August 2017, 48 states and Washington, D.C., have passed at least one piece of legislation regulating some aspect of TNCs. The report identifies the states that passed legislation creating a statewide TNC framework, states that passed legislation that regulates insurance only, and states that do not have statewide legislation. Researchers tracked legislative activity through August 2017 to create a database of TNC legislation across the United States.
- In September 2012, the first TNC services launched in Dallas, Texas (*1*). As of August 2017, at least six TNCs were operating in Texas and providing service in dozens of Texas cities. According to the 2016 Texas Transportation Poll, about 22 percent of Texans surveyed have used a TNC (*2*).
- Between 2014 and 2016, 20 Texas cities approved regulations regarding TNCs. These local ordinances addressed issues such as operating permits and fees, background check requirements, operational standards, and protections for passengers. These regulations were nullified by the state-level regulations introduced in May 2017.

The report evaluates and discusses the following priority issues discussed in the 2017 Texas legislative session:

- HB 100 clarifies the relationship of TNCs and motor carriers under Texas law, stating in Section 2402.002 "Transportation network companies and drivers logged in to the company's digital network are not common carriers, contract carriers, or motor carriers" (*3*).
- A majority of state legislation overrules, or preempts, the local authority of cities to regulate, tax, or impose rules on TNCs. The national status of state preemption policy in TNC legislation as of August 2017 is included in the report.
- Several studies find correlations between TNC activity and impaired-driving activity but cannot conclusively conclude that TNCs are directly responsible for these trends. Additional research is needed to link TNC ridership data to impaired-driving outcomes.

- Forty-two states and Washington, D.C., require TNCs to have a name-based background check conducted for a TNC driver before, or within a specified amount of time after, that driver is allowed to operate. However, no state law currently requires fingerprint-based background checks for TNC drivers.
- Policy makers, TNCs, and the public see public safety as a primary consideration for TNC operation, and the TNC business model incorporates new technology to provide safety features, some of which may increase public safety. However, more research is needed to identify which safety features and regulatory policies contribute to increasing safety and to ensure that policies are not unnecessarily hindering market innovation.
- There are questions about whether TNC services are accessible to transportation-disadvantaged groups, such as older adults, low-income individuals, individuals with disabilities, or individuals who live in rural areas. However, the limited information available about TNC users and service areas suggests that TNCs primarily serve users who have higher incomes in urban areas.
- TNC data can provide meaningful information to understand the role of TNCs and to inform decision making about transportation policy. However, due to TNCs' concerns about privacy and competition, data-sharing agreements have not been common between TNCs and government agencies.
- Transit agencies across the country are exploring partnership opportunities with TNCs to identify the potential for mutual benefits. However, TNC and transit partnerships face challenges related to existing funding and regulatory frameworks for transit agencies; liability, insurance, and driver training concerns; and nondiscrimination and accessibility policies. Solutions for longer-term funding of TNC pilots and transit partnerships, and for clarifying how TNC services fit into transit liability and accessibility requirements, are needed to expand these types of programs.

TNCs have the potential to support many transportation programs and goals by offering new travel modes for individuals who have difficulty driving themselves or accessing public transportation, an alternative for individuals who might otherwise drive impaired, a means to increase vehicle occupancy, or a tool to incentivize ride pooling and control growth in vehicle miles traveled. As policy makers continue to seek out ways to ensure TNCs have positive benefits, they can monitor emerging considerations such as the following.

- TNC and Taxi Regulation Harmonization.
- TNCs and Automated Vehicles.
- Effects of TNC Policy on Future Market Activity.

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Executive Summary

Transportation network companies (TNCs) have expanded rapidly in cities worldwide, leading policy makers, regulators, other transportation providers, and the public to consider the policy implications of TNC services on the transportation network. TNCs are organizations that use digital technologies to connect passengers with drivers who use their personal vehicles to provide for-hire ride services.

This research is designed to help Texas policy makers navigate the evolving policy considerations presented by the rising popularity—and accompanying controversy—of TNCs. This report presents the findings of a TNC legislative and regulatory review, discussions of priority issues related to TNC policy, and future considerations related to TNC policy.

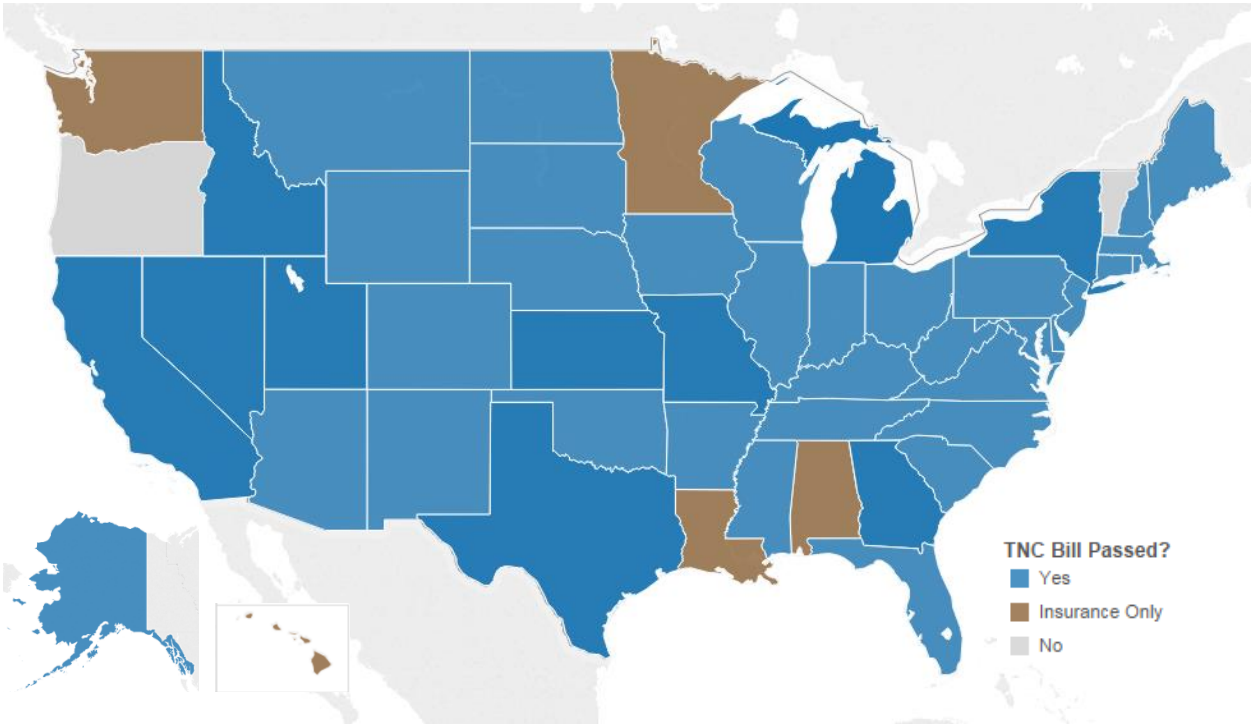
Policy makers in Texas and elsewhere are interested in the development and growth of TNCs because TNC services have potential implications for transportation regulation, public safety, economic development, transportation accessibility, equity, and the role of new technologies in transportation. At the same time, many of these issues present uncertainties because TNCs are part of a new and evolving industry.

State TNC Legislation in the United States

Since the introduction of ride sourcing, state and local policy makers and regulators have acted quickly to respond to these new and disruptive companies. As of August 2017, 48 states and Washington, D.C., have passed at least one piece of legislation regulating some aspect of TNCs. The amount and degree of regulation vary from state to state:

- 43 states and Washington, D.C., have laws that address operating permits and fees, background check requirements, operational standards, and protections for passengers.
- Five states—Alabama, Hawaii, Louisiana, Minnesota, and Washington—have laws that address only insurance requirements for TNCs and TNC drivers (*4*).
- Two states—Oregon and Vermont—have no statewide legislation, though TNCs are regulated under local city or county regulations.

Figure 1 shows the states that have passed state TNC legislation, states that passed legislation that regulates insurance only, and states that do not have statewide legislation. Researchers have tracked legislative activity through August 2017 to create a database of TNC legislation across the United States.



Last update: August 18, 2017
Source: (*4*)

Figure 1. State Legislation for Transportation Network Companies. Darker blue shading indicates multiple bills passed. Alaska and Hawaii not drawn to scale.

TNC Policy in Texas

In September 2012, the first TNC services launched in Dallas, Texas (*1*). As of August 2017, at least six TNCs operate in Texas and provide service in dozens of Texas cities. According to the 2016 Texas Transportation Poll, about 22 percent of Texans surveyed have used a TNC (*2*).

Between 2014 and 2016, 20 Texas cities approved regulations regarding TNCs. These local ordinances addressed issues such as operating permits and fees, background check requirements, operational standards, and protections for passengers. These regulations were nullified by the state-level regulations introduced in May 2017.

Texas state lawmakers have passed the following legislation regarding TNCs:

- **House Bill (HB) 1733**. In 2015, Texas lawmakers passed HB 1733, which introduced a set of insurance liability requirements for TNCs and TNC drivers. This legislation went into effect on January 1, 2016 (*5*). The law requires TNC drivers to have primary automobile insurance that allows them to operate as TNC drivers. The TNC, TNC driver, or a combination of both can maintain the automobile insurance.
- **HB 100**. In May 2017, Texas lawmakers passed HB 100, which introduced a more comprehensive statewide regulatory framework than was previously in place for TNCs.

HB 100 introduced a set of regulations that require a TNC permit, operational requirements, driver and vehicle standards, and passenger protections. In addition, HB 100 nullified all local TNC regulations and established one set of statewide regulations governing TNCs.

Priority TNC Policy Issues

In the 2017 Texas legislative session, Texas policy makers introduced and discussed legislation to authorize and regulate TNCs statewide. A set of priority issues related to TNCs based on those discussed in the legislative session and in academic and public discourse was evaluated in more detail. This report summarizes the findings.

Are TNCs Considered Motor Carriers in the Texas Transportation Code?

TNCs and TNC drivers offer commercial transportation services that have similarities to commercial motor carrier activities. Researchers evaluated whether these regulations may legally apply to a TNC or TNC driver operating in Texas. In particular, the question was whether a TNC or TNC driver is or is not considered a motor carrier under motor carrier regulations in the Texas Transportation Code. Researchers reviewed the regulatory framework and case law to find that a TNC is probably not considered a motor carrier under Texas Transportation Code Section 643.001 because TNCs are explicitly defined to not "control" TNC drivers. However, TNCs cannot be clearly excluded based on the definition of a motor carrier in the Texas Transportation Code. A TNC driver, as defined in the Texas Insurance Code (6), conforms more closely to the definition of a motor carrier in the Texas Transportation Code than a TNC due to the driver's role in operating the vehicle.

Ultimately, in Texas and other states, legislative actions were taken to amend existing motor carrier regulations and introduce TNC definitions to clarify the motor carrier status of TNCs. HB 100 clarifies the relationship of TNCs and motor carriers under Texas law. Section 2402.002 of HB 100 states, "Transportation network companies and drivers logged in to the company's digital network are not common carriers, contract carriers, or motor carriers" (*3*).

State Preemption of Local TNC Authority

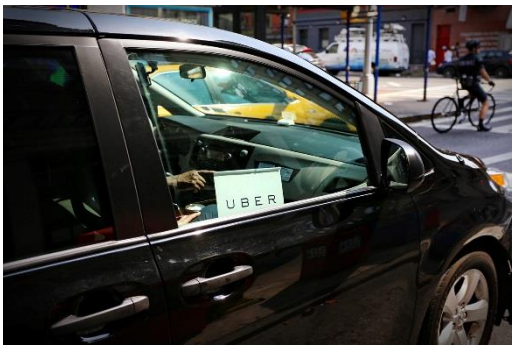
HB 100 explicitly overrules, or preempts, existing TNC ordinances and prohibits local authority from regulating TNCs. *Preemption* is a term for the use of state statutory or constitutional law to supersede or nullify a municipal ordinance or authority. Lawmakers support statewide TNC legislation that preempts local ordinances because the legislation is expected to reduce barriers to TNC operations and enable expansion to more areas of the state.

A majority of state legislation includes preemption of the local authority to regulate, tax, or impose rules on TNCs. The status of state preemption in TNC legislation as of August 2017 is as follows:

- 33 states explicitly preempt all local authority to regulate TNCs.
- 7 additional states include some form of limitation, or partial preemption, of local authority.
- The remaining 10 states do not prohibit local authority to introduce regulations. These states include the five insurance-only states and the two states with no statewide TNC legislation.

TNCs and Impaired Driving

Driving under the influence of alcohol, or impaired driving, is a major contributor to crashes and fatalities on roadways. Proponents argue that TNC services offer a safe transportation option for individuals who have been drinking. While anecdotal evidence suggests that TNCs are being used by individuals who go out drinking, formal research lacks data to attribute reductions in impaired driving and improved safety to any one factor, such as TNC services. Several studies find correlations between TNC activity and impaired-driving activity but cannot conclusively conclude that TNCs are directly responsible for these trends. Researchers have difficulty controlling for the effects of enforcement trends, population change, economic effects, and other unknown factors. The frequent use of TNCs by individuals under age 30 suggests that targeted programs could maximize impaired-driving reduction. The effect of TNC activity on reducing alcohol-related crashes may be stronger when costs are lower, which suggests that to incentivize TNC use, some sort of rider subsidy may be desirable. Additional research is needed to link TNC ridership data to impaired-driving outcomes.



Concerns with Driver Background Checks

During the 2017 Texas legislative session, and across the country, there were vigorous public debates about the nature and effectiveness of the use of different approaches to background checks to ensure public safety. The public discourse about TNC background checks has focused on the relative merits of two predominant types of checks routinely used to screen an individual's criminal background: a fingerprint-based background check (typically conducted through a government agency) and a name-based check, which is the preferred screening approach of some TNCs (notably Uber and Lyft).

Forty-two states and Washington, D.C., require TNCs to have a background check conducted for a TNC driver before, or within a specified amount of time after, that driver is allowed to operate. State TNC legislation varies in terms of who conducts the background check, what databases are reviewed, and what disqualifies a driver from work eligibility. However, no state law currently requires fingerprint-based background checks for TNC drivers. Uber and Lyft have opposed

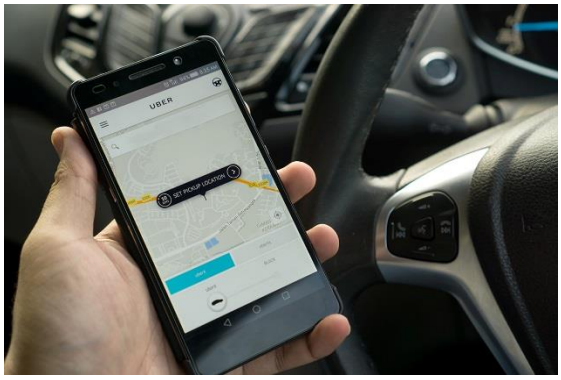
fingerprint-based background checks on the grounds that their third-party background checks are safe and reliable; both companies have suspended service in most locations where a fingerprint requirement has been imposed. Ultimately, however, no background check process can guarantee that an individual will not commit a crime in the future.

Maintaining Public Safety

Policy makers, TNCs, and the public see public safety as a primary consideration for TNC operations. The TNC business model incorporates new technology to provide safety features, some of which may increase public safety. This includes making the identification information of the driver and vehicle available prior to a ride, tracking and sharing the route, and collecting feedback and a rating for each trip. A 2016 study by Aite Group and Zendrive found that TNC drivers drive more safely than average drivers, based on attributes such as speeding, aggressive driving, phone use, and hard braking (*7*). The report concludes that the TNC rating system is likely a factor that contributes to TNC drivers' behavior.

TNC regulation can be used to ensure that TNC features that increase safety are implemented. State TNC legislation frequently includes driver age minimums, cash payments, vehicle inspections, driver training, and limitations on driver hours, which may provide safety benefits. However, the impacts on driver and user safety are not documented. Furthermore, some policies may have other costs that can be weighed against perceived safety benefits. For example, digital credit card payments may increase safety for drivers but exclude individuals who do not or cannot use credit cards. More research is needed to identify which safety features and regulatory policies contribute to increasing safety and ensure that policies are not unnecessarily hindering market innovation.

Equity and Accessibility Considerations



The TNC service model has the potential to fill gaps in transportation networks and introduces a convenient travel option. At the same time, there are questions about whether TNC services are accessible to transportation-disadvantaged groups, such as older adults, low-income individuals, individuals with disabilities, or individuals who live in rural areas. However, the limited information available about TNC users and service areas suggests that TNCs primarily serve users who have higher incomes in urban areas.

Features of TNCs that may improve equity include the following:

- Requesting a ride through the app may reduce the likelihood that an individual is rejected based on traits such as race, gender, or appearance compared to street hails.

- Drivers do not know the destination of a trip before it is accepted, so they cannot try to avoid neighborhoods they consider unappealing.

Features of TNCs that risk creating inequity include the following:

- Individuals without access to a credit card cannot use TNC services.
- Individuals without access to a smartphone are less able to request rides.

Policy makers can consider how TNC policies influence the equity implications of TNC services. Data collection efforts, such as monitoring of wheelchair-accessible TNC ride requests, which is required in some states, offer an opportunity to learn more about the demand for rides.

Data Sharing

Data-sharing agreements that provide specific and accurate data, protect the privacy of TNC passengers and drivers, and do not limit TNC competition could help inform better transportation decision making. The National Association of City Transportation Officials provides guidelines in three areas where data-sharing standards can improve policy making and transportation planning:

- Better data for transportation planning in order to manage city streets, manage curb space, and prioritize moving people.
- Equitable access to mobility options and services for all segments of the population.
- Better tools for safety in order to identify design issues (*8*).

Thirty-four states and Washington, D.C., introduced basic data retention requirements that require TNCs to retain driver and trip records for one or more years. These regulations typically do not include a more involved data-sharing agreement, but in some states, the regulation allows regulators to audit these records in the case of a crash or violation. Six states require additional data-sharing requirements.

TNC data can provide meaningful information to understand the role of TNCs and to inform decision making about transportation policy. However, due to TNCs' concerns about privacy and competition, data-sharing agreements have not been common between TNCs and government agencies.

TNC and Transit Partnerships

Transit agencies across the country are exploring partnership opportunities with TNCs to identify the potential for mutual benefits. Most agreements can be classified into five categories based on the type of service provided:

- Technology integration and data sharing.
- First-mile/last-mile service connections.

- Gap service/carpooling.
- Promotional fares/marketing services.
- Special populations/paratransit services.

However, TNC and transit partnerships face challenges related to existing funding and regulatory frameworks for transit agencies; liability, insurance, and driver training concerns; and nondiscrimination and accessibility policies. Solutions for longer-term funding of TNC pilots and transit partnerships, and for clarifying how TNCs fit into transit liability and accessibility requirements, are needed to expand these types of programs.

Future Considerations for TNC Policy

Policy makers in Texas and across the United States have introduced legislation to respond to the rapid growth of TNC services in cities across the United States. Early legislation authorized TNC services, addressed ambiguity about insurance liability, and introduced standards intended to protect the safety of the traveling public. TNCs have the potential to support many transportation programs and goals by offering new travel modes for individuals who have difficulty driving themselves or accessing public transportation, an alternative for individuals who might otherwise drive impaired, a means to increase vehicle occupancy, or a tool to incentivize ride pooling and control growth in vehicle miles traveled. As policy makers continue to seek out ways to ensure TNCs have positive benefits, they can monitor emerging considerations such as the following.

TNC and Taxi Regulation Harmonization

If the regulatory environment contributes to the disappearance of taxis, there may be negative consequences for individuals with disabilities and individuals without smartphones, credit cards, or bank accounts.

TNCs and Automated Vehicles

While TNCs and other new mobility services are evolving, the development of automated vehicles (AVs) presents another potential disruption in the transportation arena. Companies like Uber and Lyft, as well as many automobile manufacturing companies, are pursuing AV programs. AVs operated by TNCs could lead to different transportation outcomes based on the degree of sharing that occurs and whether AVs enable longer trips or generate more vehicle trips.

Effects of TNC Policy on Future Market Activity

Policy decisions can lead to unanticipated or undesirable side effects, such as efforts by incumbent companies to support regulations that create a situation where one party benefits from the decreased competition created by regulation (*9*). Monitoring the impact of legislation and considering approaches that adjust to the rapidly changing environment that disruptive technologies create will help policy makers ensure that TNCs contribute to goals including supporting economic growth, maintaining public safety, and increasing transportation options.

Chapter 1. Introduction

Transportation network company (TNC) is a term given to organizations, typically private companies, that have entered the transportation services market by offering transportation options that use digital technologies to connect passengers with drivers. TNC drivers use their personal vehicles to provide an on-demand for-hire ride service. This service is also called ride sourcing or ride hailing (*10*).

The most well-known TNCs may be Uber and Lyft, but today there are many companies operating in this arena (*11*). TNCs have expanded rapidly in cities worldwide, leading policy makers, regulators, other transportation providers, and the public to consider the policy implications of TNC services on the transportation network.

TNCs Operating in the United States in 2017

- Fare
- Fasten
- Get Me
- Liberty Mobility
- Lyft
- RideAustin
- Tride
- Uber
- Via
- Wingz

Policy makers in Texas and elsewhere are interested in the development and growth of TNCs because TNC services have potential implications for transportation regulation, public safety, economic development, transportation accessibility, equity, and the role of new technologies in transportation. At the same time, many of these issues present uncertainties because TNCs are part of a new and evolving industry.

As the private sector rapidly expands on-demand transportation services across Texas and the United States, policy makers can learn from legislation and implemented policies or programs related to TNCs in other states and cities. State and local agencies need to understand if and how these services may affect the provision of transportation to Texas travelers with different needs and in different geographic settings. These policies and programs can have implications for state and local transportation planning, design, and funding.

This research is designed to help Texas policy makers navigate the evolving policy considerations presented by the rising popularity—and accompanying controversy—of TNCs. This review analyzes existing TNC policies across the United States to investigate the implications of TNCs in the context of existing regulations and laws, as well as the potential policy implications of TNC operations in the future.

Short History of TNC Operations

Uber, the most ubiquitous of the TNCs, launched in 2010. In the earliest iteration, UberCab (as it was then named) offered a smartphone app to allow travelers to request rides from licensed luxury car and limousine drivers in San Francisco (*12*). This business model addressed two issues:

- Connecting passengers to professional drivers while they were between scheduled rides.
- Reducing long wait times and uncertainty for individuals looking to hail a cab.

Uber launched this service in New York City and Paris, France, in 2011. Especially in the early stages, Uber faced criticism and accusations that the service was illegally operating outside of highly regulated taxi and limousine markets.

In 2012, Lyft and Uber launched respective services in which the TNC connects passengers to non-professional drivers driving their own personal vehicles who provide rides for a fee, through a digital application or website. Since 2012, ride-sourcing services have been provided by numerous companies and are available in hundreds of cities across the United States.

The emergence of TNCs has generated uncertainty about the legality of the service they provide, criticism from the taxicab industry, and public safety concerns. TNCs have negotiated and clashed with policy makers as both parties navigate this new industry. Regulators and members of the public have made allegations that TNCs are illegally operating as unlicensed taxicabs, vehicles for hire, or other regulated transportation services across the country. Faced with this rapid expansion of a service that does not fit within the conventional approaches to transportation regulation, policy makers and regulators have now at least considered or passed legislation in every state.

Research Overview

This report presents the findings of a TNC legislative and regulatory review, discussions of priority issues related to TNC policy, and future considerations related to TNC policy.

This research evaluates the policies introduced by TNC legislation intended to protect public safety and regulate TNC operations. Building upon a regulatory evaluation started in 2015, researchers reviewed TNC legislation passed in the 50 states and Washington, D.C., through August 2017. In the seven years since TNCs first emerged, TNC legislation has been introduced rapidly in states and cities across the United States. These laws address policy areas including permits and fees, insurance and financial responsibility, driver and vehicle requirements, operational requirements, passenger protections, data reporting, and regulatory and rule-making authority.

In addition, throughout the course of this research, priority TNC issues were identified based on a review of legislative activity nationwide, academic and industry literature, public discourse about TNC activities, and input from the Texas Legislature. As priority issues were identified, researchers developed policy briefs to review each of these issues.

The remainder of this report is organized into the following chapters:

- "Chapter 2. TNC Legislation and Policy in the United States."
- "Chapter 3. Priority TNC Policy Issues."
- "Chapter 4. Future Considerations."

Chapter 2. TNC Legislation and Policy in the United States

TNCs have provided app-based ride-sourcing services in the United States, including Texas, since 2012. However, they do not fit neatly into the existing regulatory environment for transportation and have caused disruption in the transportation marketplace. This chapter summarizes an evaluation of TNC legislation across the United States and the policy areas addressed in that legislation.

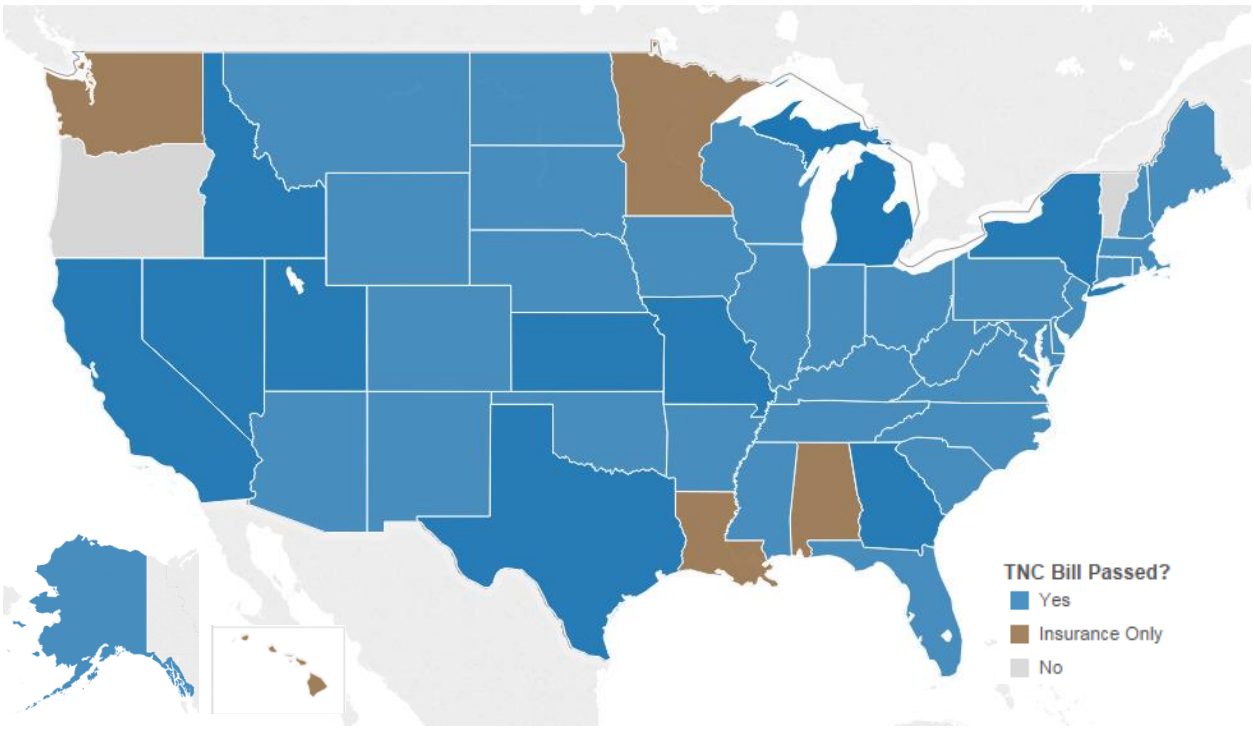
State TNC Legislation in the United States

Since the introduction of ride sourcing, state and local policy makers and regulators have acted quickly to respond to these new and disruptive companies. In 2013, the California Public Utilities Commission (CPUC) released the first state-level ruling that legalized TNC services statewide and defined the term *transportation network company*. In 2014, Colorado enacted the first state-level legislation to authorize and regulate TNC operations.

As of August 2017, 48 states and Washington, D.C., have passed at least one piece of legislation regulating some aspect of TNCs. The amount and degree of regulation varies from state to state:

- 43 states and Washington, D.C., have laws that address operating permits and fees, background check requirements, operational standards, and protections for passengers.
- Five states—Alabama, Hawaii, Louisiana, Minnesota, and Washington—have laws that address only insurance requirements for TNCs and TNC drivers.
- Two states—Oregon and Vermont—have no statewide legislation, though TNCs are regulated under local city or county regulations.

Figure 2 shows the states that have passed state TNC legislation, states that passed legislation that regulates insurance only, and states that do not have statewide legislation. Researchers have tracked legislative activity through August 2017 to create a database of TNC legislation across the United States. The database provides the status and overview of state-level TNC legislation passed in the 50 states and Washington, D.C., as discussed in the rest of this section.



Last update: August 18, 2017
Source: (*4*)

Figure 2. State Legislation for Transportation Network Companies. Darker blue shading indicates multiple bills passed. Alaska and Hawaii not drawn to scale.

Policy Summary of State TNC Legislation

Each state differs in terms of how issues related to TNCs are addressed and the amount and degree of regulation introduced. For example, five states address only insurance requirements in legislation, while other states have more comprehensive legislation and address issues such as operating permits and fees, background check requirements, operational standards, and protections for passengers.

TNC policy and regulations can be categorized into seven broad policy areas:

- Permits and fees.
- Insurance and financial responsibility.
- Driver and vehicle requirements.
- Operational requirements.
- Passenger protections.
- Data reporting.
- Regulatory and rule-making authority.

Table 1 provides descriptions of the types of policies that are included within each policy area.

Table 1. Broad Policy Areas Addressed in State TNC Legislation.

Policy Area	Description
Permits and fees	Authorizing TNCs, collecting fees, and establishing basic requirements for companies that want to provide TNC services
Insurance and financial responsibility	Setting minimum requirements for insurance coverage, outlining the different periods of TNC driver operations (logged in and waiting for ride request, en route to passenger, and carrying passenger in vehicle), and, in some cases, noting the legal definition of an employee versus contractor
Driver and vehicle requirements	Establishing minimum requirements for driver qualifications, including a background check, and vehicle safety standards
Operational requirements	Setting standards and actions required for TNC drivers and vehicles, relating to fares, signage, prohibition of alcohol and drug use, etc.
Passenger protections	Requiring TNCs to protect passenger personal information, accommodate individuals with disabilities, and comply with existing discrimination laws
Data reporting	Establishing minimum requirements for maintaining driver and trip information
Regulatory and rule-making authority	Granting authority to states, agencies, and/or airports to regulate TNC activities

Researchers identified 30 policies and regulations that have been introduced into state legislation across the United States. Researchers documented the presence of these policies and regulations in all state TNC legislation and summarized the findings. Table 2 summarizes the policies found in states with statewide TNC legislation. The counts in the table exclude two states without state TNC legislation and five states with insurance-focused regulation only. The five insurance-focused states are discussed independently. The table presents 30 TNC policies, as well as the number and proportion of state legislation included in that policy.

Most Common Policies in State TNC Legislation

While the legislation and policy introduced across states vary, there are some common trends. The policies most frequently introduced at the state level are:

- Meet insurance requirements for the TNC and TNC driver (48 states and Washington, D.C.).
- Define ride-sourcing companies as TNCs (44 states and Washington, D.C.).
- Conduct or comply with background check requirements for drivers (42 states and Washington, D.C.).
- Require TNCs to disclose fares or rates to passengers (40 states and Washington, D.C.).
- Preempt some or all local authority to regulate TNCs (40 states).

Table 2. Policies and Regulations in State TNC Legislation as of August 2017.

Policy Areas and Policies	Number of States	Percent of States
TNC legislation with broad regulatory framework (including Washington, D.C.)	44	100%
Permits and fees		
Define companies as TNCs	41	93%
Require a TNC permit	36	82%
Establish or specify a fund for TNC revenue	12	27%
Require a permit or license for the TNC driver/operator	6	14%
Insurance and financial responsibility		
Meet insurance requirements for the TNC and TNC driver	44	100%
Comply with some definition of employee or workers compensation criteria	17	40%
Driver and vehicle requirements		
Conduct or comply with a background check requirement	43	98%
Meet a set of driver requirements/submit an application to the TNC	42	95%
Comply with a TNC driver age minimum	40	91%
Have a drug and alcohol use prohibition or policy (zero tolerance)	38	86%
Complete a vehicle safety inspection or compliance requirement	35	80%
Establish a driver training program	3	7%
Operational requirements		
Disclose fares and rates to passengers	41	93%
Make available driver identifying information to passengers	39	89%
Provide electronic receipt to passengers	37	84%
Prohibit street hails	36	82%
Prohibit cash payments	26	59%
Display a trade dress, logo, or emblem on the TNC vehicle	19	43%
Impose a limitation on TNC driver hours	6	14%
Limit dynamic pricing in a state of emergency	7	16%
Disclose dynamic pricing and require passenger confirmation	4	9%
Passenger protections		
Adopt a nondiscrimination policy	37	84%
Provide passengers an opportunity to request a wheelchair-accessible ride	24	55%
Protect passengers' personally identifying information	18	41%
Collect data on accessible ride requests	5	11%
Data reporting		
Retain driver and trip records	34	77%
Comply with additional reporting requirements	6	14%
Regulatory and rule-making authority		
Preempt local authority to regulate TNCs (includes partial)	40	91%
Establish airport rule-making authority	23	52%
Establish agency rule-making authority	18	41%

Note: Washington, D.C., is counted as a state in this table. Colored shading reflects the proportion of states introducing a particular policy, from high (green) to low (red). States that are not included in this table are five states with insurance-only regulations (Alabama, Hawaii, Louisiana, Minnesota, and Washington) and two states with no statewide TNC legislation (Oregon and Vermont) as of August 2017.

Other Notable Policies in State TNC Legislation

In this evaluation of TNC regulation, researchers considered a range of policies including some that were not common. These policies highlight aspects of TNC operations that policy makers in some states chose to include in TNC legislation, including:

- Limit use of dynamic pricing in a state of emergency (six states and Washington, D.C.).
- Impose limitations on driver hours (six states).
- Comply with additional reporting requirements (other than retaining driver and trip records and performing occasional audits) (six states).
- Disclose to the passenger use of dynamic pricing or changing prices based on real-time demand (four states).
- Collect data on ride requests for accessible vehicles (four states and Washington, D.C.).
- Establish a driver training program (two states and Washington, D.C.).

States with Insurance-Focused TNC Legislation

Five states have TNC legislation that primarily regulates insurance requirements for TNCs and TNC drivers. Unlike the states with more complex regulatory frameworks, these five states impose almost no restrictions or requirements on other aspects of TNC operations. When TNCs first emerged, there was uncertainty about how and if existing insurance programs met the needs of TNC operations. Concern about public safety and liability in the event of a crash or other incident led many states to introduce legislation requiring insurance for TNC drivers. Table 3 summarizes policies introduced by states with insurance-focused TNC legislation.

Table 3. Regulations in States with Insurance-Only TNC Legislation.

State	Year Legislation Passed	Permits and Fees	Insurance and Financial Responsibility		Data Reporting
		Define Companies as TNCs	Require Insurance	Comply with Some Definition of Employee or Workers Compensation Criteria	Retain Driver and Trip Records
Alabama	2016	x	x		
Hawaii	2016	x	x		x (5 years)
Louisiana	2015	x	x		
Minnesota	2015	x	x		
Washington	2015		x	x	
Number of States		4	5	1	1

Local TNC Regulation

Oregon and Vermont are the two states that do not have statewide TNC legislation as of August 2017. Instead, cities can introduce local TNC ordinances to regulate TNC operations. Cities such as Burlington, Vermont, and Portland, Oregon, have developed TNC ordinances. In some states, local and state regulations coexist. For example, in South Dakota, lawmakers passed state TNC legislation that only prohibits local jurisdictions from enacting regulations about insurance requirements. South Dakota cities can introduce local operational regulations. Similarly, in states that introduced insurance-only legislation—Alabama, Hawaii, Louisiana, Minnesota, and Washington—cities are not prohibited from passing local TNC ordinances (*13,14*).

Policies at the local level include similar policies to those found at the state level, such as operating permits, insurance requirements, and zero tolerance policies for drivers. Cities have also introduced policies that are not typically found at the state level. For example, Houston passed requirements to require wheelchair-accessible vehicles among TNC vehicles in order to increase accessibility of the service for individuals with disabilities and older riders. In Texas cities that previously introduced local TNC ordinances, policies included requiring the disclosure of dynamic pricing to passengers and limits on how that kind of pricing was used. Only Massachusetts, Connecticut, and Nebraska include a similar policy at the state level. Several Texas cities also addressed the regulation of taxi operations at the same time as introducing TNC regulations that reflect the new business models and the use of technology introduced by TNCs.

TNC Policy in Texas

In September 2012, the first TNC services launched in Dallas, Texas (*1*). As of August 2017, at least six TNCs operate in Texas and provide service in dozens of Texas cities. According to the 2016 Texas Transportation Poll, about 22 percent of Texans surveyed have used a TNC (*2*). State and local lawmakers in Texas considered and passed TNC regulations. This section provides an overview of local TNC ordinances and statewide TNC legislation in Texas.

State-Level TNC Legislation in Texas

The following is a summary of legislation passed in Texas concerning TNCs. Figure 3 summarizes the policies House Bill (HB) 1733 and HB 100 enacted.

House Bill 1733

In 2015, Texas lawmakers passed HB 1733, which introduced a set of insurance liability requirements for TNCs and TNC drivers. This legislation went into effect on January 1, 2016 (*5*). The law requires TNC drivers to have primary automobile insurance that allows them to operate as TNC drivers. The TNC, TNC driver, or a combination of both can maintain the automobile insurance.

House Bill 100

In May 2017, Texas lawmakers passed HB 100, which introduced a more comprehensive statewide regulatory framework than was previously in place for TNCs. HB 100 introduced a set of regulations that require a TNC permit, operational requirements, driver and vehicle standards, and passenger protections. In addition, HB 100 nullified local TNC regulations and established one set of statewide regulations governing TNCs.

Policy Areas and Policies	Policy Enacted in Texas Legislation
Permits and fees	
Define companies as TNCs	x
Require a TNC permit and pay a $5,000 permit fee	x
Establish or specify a fund for TNC revenue	
Require a permit or license for the TNC driver/operator	
Insurance and financial responsibility	
Meet insurance requirements for the TNC and TNC driver	x
Comply with some definition of employee or workers compensation criteria	x
Driver and vehicle requirements	
Conduct or comply with a background check requirement	x
Meet a set of driver requirements/submit an application to the TNC	x
Comply with a TNC driver age minimum of 18 years	x
Have a drug and alcohol use prohibition or policy (zero tolerance)	x
Complete a vehicle safety inspection or compliance requirement	x
Establish a driver training program	
Operational requirements	
Disclose fares and rates to passengers	x
Make available driver identifying information to passengers	x
Provide electronic receipt to passengers	x
Prohibit street hails	x
Prohibit cash payments	x
Display a trade dress, logo, or emblem on the TNC vehicle	
Impose a limitation on TNC driver hours	
Limit dynamic pricing in a state of emergency	
Disclose dynamic pricing and require passenger confirmation	
Passenger protections	
Adopt a nondiscrimination policy	x
Provide passengers an opportunity to request a wheelchair-accessible ride	x
Protect passengers' personally identifying information	x
Collect data on accessible ride requests	
Data reporting	
Retain driver and trip records for two years	x
Comply with additional reporting requirements	
Regulatory and rule-making authority	
Preempt local authority to regulate TNCs (includes partial)	x
Establish airport rule-making authority	x
Establish agency rule-making authority	

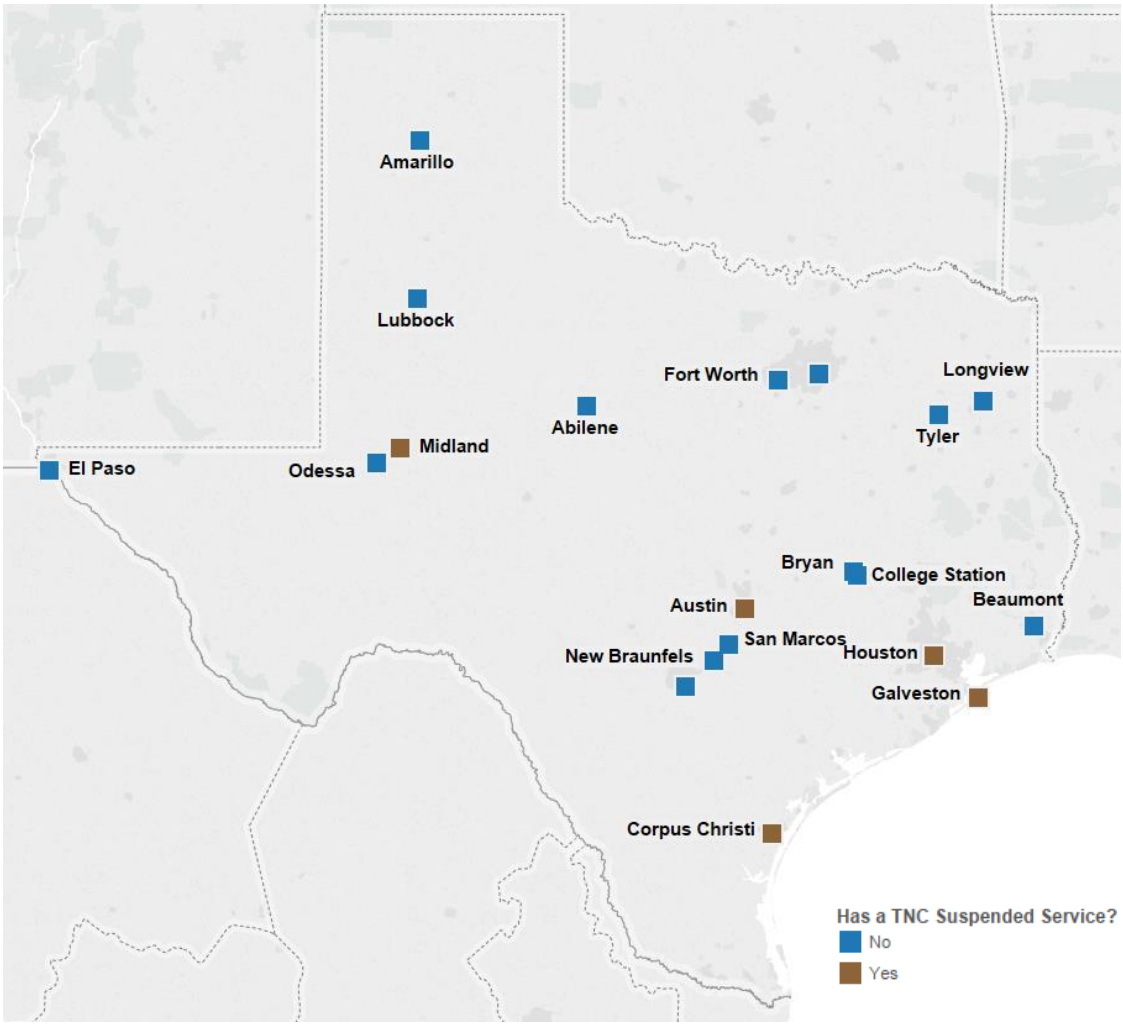
Figure 3. Texas TNC Policies (Enacted by HB 1733 or HB 100).

Local TNC Regulations in Texas

Between 2014 and 2016, 20 Texas cities approved regulations concerning TNCs. These regulations were overruled and nullified by the state-level regulations introduced by HB 100. These local ordinances addressed issues such as operating permits and fees, background check

requirements, operational standards, and protections for passengers. Figure 4 provides a map of the cities in Texas that passed a local ordinance concerning TNCs.

TNCs suspended service in several Texas cities where TNC ordinances were enacted with policies that TNCs did not support. For example, in May 2016, Uber and Lyft suspended operations in Austin after a public vote affirmed an ordinance that required fingerprint-based background checks for TNC drivers (*15*). Uber and Lyft returned service to Austin on May 29, 2017, shortly after Governor Greg Abbot signed HB 100 into law (*16*).



Note: Data for this map were collected through March 2017. Subsequent action by the 85th Texas Legislature Regular Session to preempt local ordinances supersedes this information.
Last update: March 2017

Figure 4. Texas Local TNC Ordinances (No Longer in Effect).

Chapter 3. Priority TNC Policy Issues

As policy makers in Texas and across the United States consider the role and implications of TNCs, many issues related to public safety, transportation impacts, and the economic and social implications of TNCs have been raised in public debate.

In the 2017 Texas legislative session, Texas policy makers introduced and discussed legislation to authorize and regulate TNCs statewide. This chapter presents brief assessments of a set of priority issues related to TNCs based on those discussed in the legislative session and in academic and public discourse. The following priority issues were evaluated in more detail, and the findings are summarized in the following sections:

- Are TNCs considered motor carriers in the Texas Transportation Code?
- State preemption of local TNC authority.
- TNCs and impaired driving.
- Concerns with driver background checks.
- Maintaining public safety.
- Equity and accessibility considerations.
- Data sharing.
- TNC and transit partnerships.

This chapter presents a brief discussion of each priority issue, including background on the issue, a summary of relevant research findings, the implications for the policy areas discussed in Chapter 2, and a summary of key takeaways for policy makers, transportation providers, and the public.

Are TNCs Considered Motor Carriers in the Texas Transportation Code?

TNCs introduced new technologies and business models that do not fit neatly into the existing regulatory frameworks in the transportation industry. Specifically, the use of a vehicle for commercial purposes raised the question of whether TNCs or TNC drivers are subject to existing regulations for commercial vehicles and drivers. This research summarizes the findings of an exploration of the definitions and exemptions in the Texas Transportation Code's motor carrier regulations to identify whether these regulations may legally apply to TNCs operating in Texas. The question posed was: Are TNCs and/or TNC drivers subject to Texas regulations that govern motor carriers as defined in Sections 643.001 and 643.002 of the Texas Transportation Code (*17*)?

In May 2017, Texas lawmakers passed HB 100, which further clarified the relationship of TNCs and motor carriers under Texas law. Section 2402.002 of HB 100 states, "Transportation network companies and drivers logged in to the company's digital network are not common carriers, contract carriers, or motor carriers" (*3*). The analysis presented in this section presents the analysis undertaken before the passage of HB 100. Relevant laws and exemptions in the existing code were identified and evaluated to determine if and how existing regulations of motor carriers apply to TNCs and TNC drivers in Texas. The full evaluation of the Texas motor carrier definitions and exemptions can be found in a supplementary technical memorandum (*18*).

Background

The motor carrier regulations are found within Subtitle F Commercial Motor Vehicles of the Texas Transportation Code. In practice, it seems that motor carrier regulations are typically imposed on commercial motor vehicles that are trucks and buses. Entities subject to the Texas motor carrier regulations, such as trucks and buses, must comply with regulations overseen by the Texas Department of Motor Vehicles including registration, permit fee, safety, vehicle, and insurance requirements. Passenger travel services such as taxi services are regulated at the municipal level and are not regulated as motor carriers in Texas.

TNCs are corporate entities that provide transportation network services by connecting passengers to TNC drivers. TNC drivers are individuals who drive personal vehicles used to transport customers from place to place, which is a function of some motor carriers as well. TNC vehicles, which are exclusively passenger vehicles that hold fewer than 15 passengers, do not fit the definition of a commercial motor vehicle in Texas. However, the size and capacity attributes are not specified in the Texas motor carrier definition, and therefore, for the purposes of this review, the assumption is that a legal ruling could find a passenger vehicle subject to motor carrier regulations.

Existing regulations governing motor carriers were created before the advent of the TNC model and the technologies it relies on, but the existing legal framework is likely flexible enough to provide guidance on these new transportation activities. Section 643.001 Definitions of Texas Transportation Code, Title 7 Vehicles and Traffic, Subtitle F Commercial Motor Vehicles, Chapter 643 Motor Carrier Registration, defines a motor carrier as (*17*):

> …an individual, association, corporation, or other legal entity that controls, operates, or directs the operation of one or more vehicles that transport persons or cargo over a road or highway in this state.

TNCs are explicitly, but partly, excluded from this definition by Texas Insurance Code Section 1954.102 Control of Transportation Network Company Drivers, which clarifies that (*19*):

> …a transportation network company does not control, direct, or manage a personal vehicle or a transportation network company driver who connects to the company's digital network except as agreed by written contract.

Legal Review Findings

Although existing regulations governing motor carriers were created before the advent of the TNC model and the technologies it relies on, the existing legal framework in Texas is flexible enough to provide guidance on these new transportation activities. However, since this review is not a formal legal analysis, the authors do not make a legal judgment on whether a TNC or TNC driver is or is not considered a motor carrier under Texas law. This review does offer several non-binding findings.

TNCs as Motor Carriers

A review of the existing regulatory framework and case law suggests that TNCs are probably not considered motor carriers but cannot be clearly excluded from the definition of a motor carrier in Texas Transportation Code Section 643.001 or exempt under Section 643.002. The existing legal context does not provide enough factual material to conclusively reject the possibility that a TNC may be considered a motor carrier under Texas law. As defined in the Texas Insurance Code Section 1954.102, a TNC does not control, direct, or manage a personal vehicle or a TNC driver. This presents a case to say that a TNC does not fit the definition of a motor carrier. However, while case law provides some guidance on similar determinations where entities not directly involved in the physical driving of vehicles could still be considered motor carriers, no prior cases focused on passenger transportation.

Most of the exemptions in Texas Transportation Code Section 643.002 do not apply to TNCs. However, this review could not conclusively reject that a TNC could be found exempt from the motor carrier regulations under the following two exemptions in Section 643.002:

- A motor vehicle the department by rule exempts because the vehicle is subject to comparable registration and a comparable safety program administered by another governmental entity.
- A motor vehicle used to transport passengers and operated by an entity whose primary function is not the transportation of passengers, such as a vehicle operated by a hotel, daycare center, public or private school, nursing home, or similar organization.

TNC Drivers as Motor Carriers

A review of the existing regulatory framework suggests that a TNC driver may fall under the definition of a motor carrier under Texas law. A TNC driver, as defined in the Texas Insurance Code, seems to conform to the definition of a motor carrier in the Texas Transportation Code more closely than a TNC due to the driver's role in operating the vehicle. Applying the definition of a TNC driver from the Texas Insurance Code, a TNC driver—an individual who operates a vehicle to provide transportation—could reasonably be considered a motor carrier. In the Texas Transportation Code, Section 643.001, a motor carrier is defined as an individual or legal entity that "controls, operates, or directs the operation of one or more vehicles that transport persons or cargo over a road or highway in this state."

Only one exemption in Texas Transportation Code Section 643.002 may be deemed applicable to TNC drivers and could not be conclusively rejected in this review: a motor vehicle the department by rule exempts because the vehicle is subject to comparable registration and a comparable safety program administered by another governmental entity.

Lessons from Other State Legislation

Other states have addressed the question of whether TNCs are considered motor carriers. In some states, TNCs have been considered motor carriers under similar state statutes. Other states have addressed this question by including amendments to the definition of motor carrier to clarify whether a TNC is or is not considered a motor carrier under state law. Three examples of how other states addressed this issue are as follows:

- In Colorado, TNCs were deemed to be subject to the authority of the state Public Utilities Commission. Colorado Senate Bill 14-125 clarifies that TNCs are not "common carriers, contract carriers, or motor carriers" and that neither TNCs nor TNC drivers are considered common carriers. Instead, the bill adds a new Part 6 Transportation Network Companies to impose distinct regulations on TNCs in the same Article 10.1 Motor Carriers that regulates taxicabs, limousines, and other common and contract carriers (*20*).

- Montana lawmakers passed Senate Bill 0396 in 2015, which adds ride-sourcing companies to the state motor carrier code as transportation network carriers. A transportation network carrier is classified as a Class E motor carrier, a new class added to the state code under Title 69 Public Utilities and Carriers, Chapter 12 Motor Carriers (*21*). The term *motor carrier* is defined as "a person or corporation, or its lessees, trustees, or receivers appointed by a court, operating motor vehicles upon a public highway in this state for the transportation of passengers, household goods, or garbage for hire on a commercial basis, either as a common carrier or under private contract, agreement, charter, or undertaking. A motor carrier includes a transportation network carrier." (The underlined text was added by Senate Bill 0396.) The code clarifies that a transportation network carrier is not "deemed to control, direct, or manage the personal vehicles…or drivers."

- The Oklahoma Transportation Network Company Services Act clarifies that a TNC "shall not be considered motor carriers of persons as defined in Section 230.23 of Title 47 of the Oklahoma Statutes, nor shall TNCs or TNC drivers be considered to provide taxicab, limousine, or similar for-hire motor carrier service" (*22*). Taxis licensed by a municipal corporation to operate in a city or town are also excluded from the Oklahoma motor carrier code (*23*).

A review of legislative and regulatory activity related to TNCs in other states found that several states use amendments to existing motor carrier regulations and the introduction of TNC definitions to clarify the motor carrier status of TNCs. While in Texas passenger travel services

such as taxi services are not regulated as motor carriers under state law, in some states taxis, for-hire passenger vehicles, and now TNCs are regulated at the state level.

Summary

TNCs and TNC drivers offer commercial transportation services that have some similarities to commercial motor carrier activities that are regulated under motor carrier regulations in the Texas Transportation Code. A review of regulatory framework and case law was undertaken to evaluate whether a TNC or TNC driver is or is not considered a motor carrier under Texas law. However, since this review is not a formal legal analysis, the authors do not make legal judgment on whether a TNC or TNC driver is or is not considered a motor carrier under Texas law. This non-binding legal review identified the following findings:

- A TNC is probably not considered a motor carrier under Texas Transportation Code Section 643.001 because TNCs are explicitly defined to not "control" TNC drivers. However, TNCs cannot be clearly excluded from the definition of a motor carrier in the Texas Transportation Code.
- A TNC driver may be considered a motor carrier under Texas Transportation Code Section 643.001. A TNC driver, as defined in the Texas Insurance Code (*19*), conforms more closely to the definition of a motor carrier than a TNC because of the driver's direct role in operating the vehicle.

HB 100 further clarified the relationship of TNCs and motor carriers under Texas law with a clause that states, "Transportation network companies and drivers logged in to the company's digital network are not common carriers, contract carriers, or motor carriers" (*3*).

State Preemption of Local TNC Authority

In 2017, Texas lawmakers passed a statewide TNC bill (HB 100). This bill explicitly overruled existing TNC ordinances and prohibits local authority to regulate TNCs. This is sometimes called state preemption of local authority. *Preemption* is a term for the use of state statutory or constitutional law to supersede or nullify a municipal ordinance or authority. Lawmakers support statewide TNC legislation that overrules or preempts local ordinances because the legislation is expected to reduce barriers to TNC operations and enable expansion to more areas of the state. While state versus local authority is an important governance issue, the issue is intertwined with the regulatory question of how much TNCs should be regulated (if at all) and the extent to which TNC regulations need to be tailored to local context.

This section presents the background and key considerations related to the jurisdictional authority to regulate TNCs and summarizes state legislation in the United States to preempt local authority to regulate TNCs.

Background on State Preemption

In the United States, each state has the power to create or authorize the creation of local governments and to determine the powers granted to those entities (*24*). The autonomy granted to cities is argued to enable municipalities to more quickly resolve local issues and to allow the state legislature to focus on issues of statewide significance (*25*). In Texas, cities with more than 5,000 residents are granted local governing authority, with limitations, under the Texas Constitution. Qualified cities can adopt a charter, establish a city government, and draft ordinances (*26*). As stated in Texas Local Government Code Section 51.072, these municipalities have the "full power of local self-government" (*27*). However, local laws must be consistent with, and can be overruled by, the Constitution or general law of the State of Texas (*28*).

State preemption, the use of state statutory or constitutional law to supersede or nullify a municipal ordinance or authority, has been applied in Texas and other U.S. states in recent years to policy areas including minimum wage, paid leave, municipal broadband, and home-sharing regulation (e.g., Airbnb) (*29*).

State Preemption in U.S. TNC Legislation

A majority of state legislation includes preemption of the local authority to regulate, tax, or impose rules on TNCs. The status of state preemption in TNC legislation as of August 2017 is as follows:

- 33 states explicitly preempt all local authority to regulate TNCs.
- 7 additional states include some form of limitation, or partial preemption, of local authority.
- 10 states do not prohibit local authority to introduce regulations. These states include the five insurance-only states and the two states with no statewide TNC legislation.

The implementation of partial preemption among the states varies. In South Dakota, the state legislature has not superseded local authority to regulate most aspects of TNC operations, except to ensure that "no municipality or county may enact further regulations relating to the insurance requirements provided in this Act" (*30*). In Pennsylvania, the public utilities commission regulates TNCs statewide, except in Philadelphia where the Philadelphia Parking Authority regulates taxis and TNCs (*31*). Twenty-three states also explicitly grant airport authorities the right to impose fees and impose requirements on TNCs on airport grounds. Nebraska considers TNCs to be common carriers, which are exclusively regulated by the Public Service Commission as specified by TNC legislation passed in 2015.

In 2017, Texas lawmakers approved HB 100, introducing a statewide regulatory framework in Texas and preempting local regulatory authority of TNCs.

Potential Impacts of State Preemption of Local TNC Regulation

The discussion of state versus local regulation of TNCs has implications for business development, local rights to self-govern, and taxi markets. The potential impacts in each of these areas are briefly discussed in this section. Examples of policies from other states and cities that exhibit unique solutions are also noted.

Impact on Industry Expansion and Competition

One argument in support of preemption is that statewide TNC legislation eliminates a patchwork of municipal regulations that impose a different set of requirements in each jurisdiction (*32*). Multiple regulations may create administrative costs for TNCs or make it more difficult for one TNC to expand to other jurisdictions. One Texas lawmaker stated that TNCs cannot "operate effectively through a patchwork of inconsistent and anti-competitive regulations" (*33*). State-level TNC legislation typically mandates the same set of regulations and operational requirements for TNCs and TNC drivers across a state and creates a uniform environment for TNCs to operate in multiple cities. However, there is no reported evidence that enacted municipal regulations have significantly slowed the rapid growth of TNCs nationwide.

Disparity between Taxi and TNC Regulations

Taxis and limousines are regulated at the city level in Texas and in most other states. Some opponents of state preemption of TNC regulations argue that statewide TNC regulation amounts to "special treatment" for TNCs because taxis are still regulated locally (*34*). When Uber and Lyft first launched ride-sourcing services, some regulators and taxi companies argued that TNCs were operating illegally outside of the highly regulated taxi and limousine markets. TNCs claim that they are not taxi companies or even transportation providers because their role is to manage the application that connects drivers to passengers (*35*). In practice, TNCs provide similar services to taxis, compete in overlapping markets, and increasingly incorporate the same technologies.

The emergence of TNCs has undoubtedly changed the market conditions for taxis, yet in most states taxi regulations remain unchanged. Taxis are regulated at the city level in Texas and most other states. Taxi regulations are often viewed as more restrictive than newly developed TNC regulations. For example, cities often regulate the maximum number of taxi licenses, how prices are set, and what color a vehicle can be painted. Taxi drivers are often required to have special equipment (e.g., taximeters), obtain commercial driver's insurance, and undergo fingerprint-based background checks.

In some cases, policy makers have made efforts to align TNC and taxi regulations. In Michigan, lawmakers revised existing taxi and limousine laws to create a single set of regulations for all vehicles for hire (*36*). Washington, D.C., and Fort Worth, Texas, revised their existing ordinances by eliminating many requirements on taxis and implementing a single vehicle-for-

hire ordinance that applies to both taxi companies and TNCs (*37*). However, more commonly, when TNC regulation is passed at the state level, taxi regulation remains at the local level.

Furthermore, taxis have some operational practices that differ from TNCs, such as accepting street hails, accepting cash payments, and serving individuals with disabilities or who use a wheelchair. A study of New York City's for-hire vehicle market also reveals a decline in taxi ridership as TNC ridership has increased (*38*). If the regulatory environment contributes to the TNC market squeezing out taxis, the disparity may have negative consequences for individuals with disabilities and individuals without smartphones, credit cards, or bank accounts (who are not able to use the all-digital TNC payment system).

Capacity to Regulate and Enforce TNC Regulations

The question of whether a state should preempt local authority to regulate for-hire ride services may also weigh the interest in encouraging competition in the for-hire ride services market with regulations deemed necessary to protect public safety and welfare. A case in favor of local TNC authority is that established local agencies for taxi regulation and traffic enforcement can oversee and enforce TNC regulations. Local authorities and policy makers may also be able to more quickly adapt to changing TNC services and resolve local issues than a biennial legislature (*25*). Statewide regulation has the potential to enable TNCs to operate across jurisdictions, expanding access to transportation options and enabling individuals across the state to become drivers, while implementing uniform high-level public safety regulations. The Texas Department of Motor Vehicles and Department of Licensing and Regulation currently provide licensing and oversight for various vehicle and occupational activities in Texas.

The taxi industry provides evidence that for-hire ride services may require a range of regulatory needs and solutions in different contexts. Taxis are typically regulated at the municipal level, but variation is found across U.S. states. Schaller argues that the jurisdictional issues and regulatory needs are different for ride services based on street hailing or flagging down a ride (flag market) than for those that use dispatchers who receive requests and send out a driver (dispatch market) (*39*). TNCs operate like traditional dispatch services by using digital technologies to direct a driver to a passenger. In states with minimal flag markets, statewide regulation of both TNCs and taxis may create a regulatory environment that treats dispatch-based ride services similarly and achieves the desired level playing field for for-hire ride services.

Regions with extensive taxi flag markets have historically faced issues such as oversupply and fare gouging (Figure 5). These issues have been argued to require a local or regional regulatory authority with the ability to coordinate with other local transportation providers and to effectively enforce necessary regulations (*39*). As noted previously, some states address this with taxi regulation that is shared between state and local authorities. New York, Nevada, and Pennsylvania all have unique arrangements where a state agency includes a dedicated city-specific focus to address complex markets in one or more unique sub-markets (e.g., New York City, Las Vegas, and Philadelphia).

Photo credit: Maarit Moran

Figure 5. A Taxi Queue at Reagan National Airport in Virginia Highlights Traditional Taxi Regulations Used to Control Oversupply.

Conclusion

State preemption of local TNC authority is narrowly about the question of which level of government is best positioned to regulate TNCs, rather than how much or what kind of regulation is appropriate. Discussions on state and local authority are often intertwined with discussions about specific policies (such as the form of background checks that best ensure the safety of drivers and passengers) and how to achieve overarching goals (such as encouraging economic growth). In practice, state TNC regulation generally entails less intense regulation than local ordinances. Other states have demonstrated that regulation and oversight may be shared among state and local authorities, especially in regions with large for-hire markets.

Priority issues related to state preemption include the impact on industry expansion and competition, the disparity between taxi and TNC regulations, and the capacity of various agencies to monitor and enforce TNC regulations. Regardless of whether TNC regulation occurs at the state or local level, questions remain unanswered about the intensity of regulation that is required to protect public safety without hindering industry innovation and growth.

TNCs and Impaired Driving

Driving under the influence of alcohol (DUI), or impaired driving, is a major contributor to crashes and fatalities on roadways. Proponents argue that TNC services offer a safe transportation option for individuals who have been drinking, particularly among young adults, who are both more frequent TNC users and a segment of the population that may drive while impaired (*40*). According to the National Highway Traffic Safety Administration, the average economic and social cost associated with a single alcohol-related crash fatality is $10 million, including medical treatment, emergency services, legal fees, and lost wages (*41*). At this rate, alcohol-related crash fatalities cost Texans nearly $9.9 billion dollars in 2016 (*42*). Therefore, policy makers, enforcement agencies, and members of the public have expressed interest in the role that TNCs can play in reducing impaired driving.

This section presents the current findings from research and practice on the potential for TNCs to support efforts to reduce alcohol-impaired driving.

Background on TNCs and Impaired Driving

Existing alternatives to impaired driving include public transit, taxis, and safe-ride programs. TNCs are suggested as a solution that provides safer, late-night, and convenient on-demand transportation (*43*,*44*,*45*).

TNCs, alcoholic beverage companies, and other organizations with an interest in preventing impaired driving have sponsored various initiatives to promote TNCs as an alternative. For example, Uber and Diageo, an alcoholic beverage company, partnered for a two-month promotion in 2014 to provide $25 coupons to use Uber services (*46*). Miller Lite launched the Free Rides program in September 2015 to give people free rides from National Football League games using local transit or TNC services in seven NFL markets (*47*).

Cities are also integrating TNC services into their impaired-driving programs. In 2014, the City of Austin started its own initiative to encourage drivers to stay off the road after drinking. The city's transportation department reimbursed drivers for any parking tickets they received after leaving a car in the downtown area in order to take another travel mode to get back home. Eligible modes for the alternative travel initiative included TNCs, taxis, or public transit (*48*,*49*,*50*). Campaigns and initiatives undertaken by cities, alcoholic beverage companies, and TNCs operate under the assumption that TNC use will reduce impaired-driving behavior. Some organizations also use such programs as marketing tools. There are no reported evaluations of these programs for their efficacy at mitigating impaired-driving crashes.

Anecdotal evidence supports the idea that TNCs offer a safe transportation option for individuals who have been drinking. In 2015, a *Los Angeles Times* article quoted restaurant and bar owners who observed that customers ordered more drinks and were frequently picked up by TNCs since TNC services began. Restaurant and bar owners also noticed a decrease in valet parking services that they attributed to the use of TNCs (*51*). However, isolating the impact of TNC use on impaired-driving trends is complex. The *Los Angeles Times* also noted statistics from the California Highway Patrol that DUI citations in Los Angeles County dropped by approximately 6 percent from 2013 to 2014. In the same period, the Los Angeles Police Department did not observe a noticeable change in DUI-related traffic collisions (*51*). Several researchers have attempted to quantify the impact of TNC operations on impaired-driving behavior.

Research and Findings on TNCs' Effect on Impaired Driving

This section discusses the findings of several research studies that have investigated the effect of TNCs on impaired driving. However, research in this area is scarce. While anecdotal evidence suggests that TNCs are being used by individuals who go out drinking, formal research lacks data to attribute reductions in impaired driving and improved safety to any one factor, such as TNC services.

An independent analysis by Nate Good, a computer science professional from Pittsburgh, Pennsylvania, found a correlation between TNC entry into a new market and a reduction in DUI arrests, especially for drivers younger than 30 years. Good found that the average number of DUI

arrests per month in Philadelphia between April 2013 and December 2013 (after TNCs entered the Philadelphia market) decreased by 11 percent compared to the average number of DUI arrests per month from 2004 to 2013 (before TNCs entered the Philadelphia market) (*52*). Good notes that these findings do not prove that TNCs caused the change, and the analysis does not consider any other factors that could influence DUI arrests.

In 2015, Uber and Mothers Against Drunk Driving (MADD) co-released a report that compared the trends in Uber's ridership data to impaired-driving data. The report states that demand for Uber services reduced alcohol-related crashes and fatalities in cities such as Seattle and metropolitan areas of California (*53*). According to the Uber-MADD report, alcohol-related crashes in California decreased by 6.5 percent between January 2011 and July 2013 among drivers younger than 30 years after the introduction of UberX, Uber's lower-cost service. This finding is similar to the finding made by Nate Good for drivers under the age of 30 in Philadelphia (*52*). The report notes that demand for Uber service in large urban areas such as Miami, Florida, and Pittsburgh, Pennsylvania, is higher from around midnight to 2:00 a.m. on weekends—the time of night when people typically leave bars after drinking. In Chicago, Illinois, the report finds trip request origins are more common around businesses that serve alcohol. The Uber-MADD report also finds that in Austin, the available number of taxis declines after 8:00 p.m., while the number of available Uber vehicles steadily exceeds the taxi supply until midnight, suggesting that users have better access to TNCs than taxis for late-night trips (*53*). The Uber-MADD report does not go into details about the study methodology and does not provide details about statistical tests and significance of the findings. Therefore, evidence cited in the study must be viewed cautiously.

Uber also commissioned a survey targeting its customers in its larger markets about attitudes toward impaired driving (*53*). Of more than 800 respondents, 88 percent said that Uber's service made it easier to avoid drinking and driving. Fifty-seven percent of all survey respondents said that they would "probably end up driving more after drinking" if they did not have access to Uber's services (*53*). The study does not go into more detail about the respondents.

A 2015 study conducted by Temple University researchers Brad Greenwood and Sunil Wattal looked at the relationship between Uber's entry into California markets and fatal vehicle crashes between 2009 and 2014 using a difference-in-difference analysis (*54*). The authors theorized that individuals make a rational choice in choosing TNCs over driving impaired as long as individuals believe that the cost of TNC service is lower than the probability and cost of getting caught driving while impaired. Greenwood and Wattal found that the entry of a low-cost service like UberX into a California city is associated with a 3.6 to 5.6 percent decrease in alcohol-related vehicle fatalities per quarter. The researchers did not find a similar decrease in alcohol-related vehicle fatalities for Uber Black, a more expensive Uber service. Additionally, researchers find that the effect of Uber's service on reduced alcohol-related vehicle fatalities decreased during surge pricing. These findings indicate the importance of the price of the service in achieving reductions in impaired driving.

A 2017 study by Angel K. Dills and Sean Mulholland looked at whether Uber's entry into 155 counties throughout the United States had an effect on vehicle fatality rates and arrest rates by population (*55*). Dills and Mulholland focused on Uber for mainly two reasons:

- Uber's large service area.
- Availability of service start dates.

The authors found the effect of Uber's market entry on alcohol-related crashes was not statistically significant. Total night time crashes, which the authors used as a proxy for alcohol-related crashes, declined by 9 percent at the mean, but this was not statistically significant. The authors also found that Uber's availability was associated with a 6 to 27 percent reduction in DUI arrests. This study has a broader focus than the previously discussed study by Greenwood and Wattal in California (*54*) because it looks at 155 counties throughout the United States. Additionally, while the study by Greenwood and Wattal focused on alcohol-related vehicle fatalities, the Dills and Mulholland study focused on alcohol-related vehicle crash rates by population.

Not all studies find a correlation between TNC use and a reduction in impaired driving. Brazil and Kirk (*56*) examined the relationship between alcohol-related vehicle fatalities and Uber's entry into 100 most populated metropolitan counties in the United States. The authors found no significant correlation between the two variables using negative binomial and Poisson regression models (*56*). Like Greenwood and Wattal (*54*), the authors looked at total alcohol-related vehicle fatalities and separately looked at weekend- and holiday-specific vehicle fatalities. They found no significant correlation in either case. The authors cite several possible reasons for this result, including that Uber users are a small proportion of the total drivers in the United States. Another reason is that Uber services are being used as a substitute for other forms of transportation but not as a substitute for driving impaired. The Brazil and Kirk conclusion is that a majority of Uber users in metropolitan areas such as New York are not vehicle owners (*56*).

Several researchers have found that TNC entry into a new market is associated with reduced alcohol-related crashes and fatalities. This effect is stronger when a lower-cost option like UberX is used and there is an absence of surge pricing. This observation suggests that an individual's decision to drive impaired is cost sensitive, and individuals may take a TNC if the price is considered reasonable (*54*). From this line of reasoning, Uber's assertion that a higher supply of Uber vehicles during late hours offsets impaired-driving behavior may be challenged by the potential for surge pricing to be in effect during late hours in busy bar districts (*53*,*57*). Additionally, people visiting bars in more remote locations may also face higher service charges due to the greater distance from bars and a smaller supply of TNC drivers to serve remote locations (*57*). This suggests that to incentivize TNC use, some sort of rider subsidy may be desirable. Additionally, more research in the area of price elasticity of TNC demand is necessary to better understand the relationship.

Summary

Existing research presents promising findings to suggest that TNCs may provide a useful tool to help decrease incidents of impaired driving. However, empirical studies in this area have been scarce. Several studies find correlations between TNC activity and impaired-driving activity but cannot conclusively conclude that TNCs are directly responsible for these trends. Researchers have difficulty controlling for the effects of enforcement trends, population change, economic effects, or other unknown factors. For example, the *Los Angeles Times* noted that DUI citations declined from 2013 to 2014, but the Los Angeles Police Department did not observe a noticeable change in DUI-related traffic collisions (*51*). Research findings cannot conclude whether fewer DUI citations are a result of people switching from driving to taking TNCs or other factors such as few impaired drivers getting caught (*58*).

Data suggest that individuals under 30 years of age use TNCs frequently, and this demographic group also has the highest likelihood of being involved in an alcohol-related crash. Additional research is needed to link TNC ridership data to impaired-driving outcomes with a focus on younger drivers. However, more robust information about how, by whom, and where ridesharing services are being used is needed to effectively explore such relationships. Survey research can obtain ridership information such as age, gender, income, education level, distance from home, income, vehicle ownership, and reasons for using TNCs. Furthermore, the ability to link ridership information to TNC trip information such as routes and number of annual miles driven can make the empirical findings more robust.

Concerns with Driver Background Checks

Many factors affect the safety of TNC operations, but policy makers and regulators have paid particular interest to the background check policies of TNCs. During the 2017 Texas legislative session, and across the country, vigorous public debates centered on the nature and effectiveness of the use of different approaches to background checks.

In 2016, the Austin City Council voted to require that all TNC drivers undergo fingerprint-based background checks by the city and the Texas Department of Public Safety—the state department authorized to facilitate background checks with the Federal Bureau of Investigation (FBI). Uber and Lyft opposed the requirements on the grounds that their internal background check policies were sufficient and the city's requirements would limit their ability to do business. When Austin residents upheld the city's requirement in a public referendum in May 2016, Uber and Lyft suspended service in the city until the requirement was nullified by Texas HB 100 in May 2017 (Figure 6).

Policy makers in cities and states have sought to mandate minimum requirements for these background check policies. Forty-two states and Washington, D.C. require TNCs to conduct or have conducted background checks on potential TNC drivers as part of the hiring process. Legislation varies in terms of who conducts the background check, what databases are reviewed, and what disqualifies a driver from work eligibility. In addition, TNCs typically have company policies that require applicant drivers to submit personal information and comply with background check requirements.

Different standards and expectations for background checks among TNCs, policy makers, the taxicab industry, and the public have led to some controversy. Commercial background checks are the preferred screening approach of some TNCs (notably Uber and Lyft) while many critics argue that state and FBI fingerprint-based background checks are more effective. More broadly, the discussion involves questions about the accuracy and completeness of the background checks and the cost and timeliness of the process to on-board drivers.

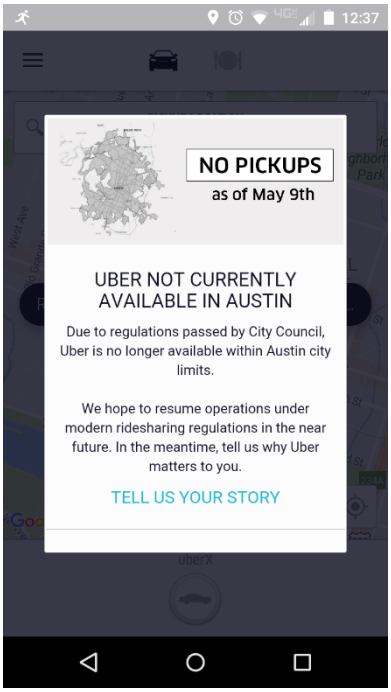


Figure 6. Uber App Message after Uber Suspended Its Operations in Austin, Texas, in 2016.

This section discusses common background check processes, state and local TNC background check policies introduced in Texas and the United States, and what is known about the limitations of these processes based on available research.

Background on Criminal Background Check Practices

The two primary types of criminal background checks conducted to screen potential TNC drivers are commercial background checks and biometric state and FBI criminal background checks.

Commercial background checks are general background checks that provide a range of information, whereas biometric FBI criminal background checks only screen an individual's criminal history (*59*,*60*). The following sections provides a more in-depth discussion of each.

Commercial Background Checks

Commercial background checks, often referred to as name-based background checks, are conducted by private companies and designed for employment decisions. Commercial background checks use a combination of resources to gather information about an individual's criminal history (*61*).

To determine criminal history, commercial background checks use one or a combination of databases that aggregate publicly available criminal records. Public criminal data include records from county courthouses, state repositories, federal courts, and international courts (*61*). However, the databases that provide criminal information that are available to commercial

background check companies do not include records from all states or all agencies within each state.

Commercial background checks typically use personal identifiers such as name and Social Security number to establish the identity of the individual being screened. Personal identifiers can introduce the possibility of a false positive (incorrectly associating a criminal record with a person of the same name) or false negative (missing a criminal record associated with a person because of a false or mistaken personal identifier). A 1998 study conducted by the U.S. Attorney General compared the use of personal identifiers and fingerprints to run background checks on 93,000 public housing applicants in Florida. The study found that, using personal identifiers, 5.5 percent of the checks produced false positives and 11.7 percent produced false negatives (*59,60*). In Massachusetts, legislation requires TNCs to undergo government-implemented background checks that do not include fingerprinting. Still, over 8,000 drivers who had been approved under TNC-conducted checks were rejected (*62*). While these examples highlight the different results obtained with different types of background checks, no recorded evaluation of whether this reduces crime or increases safety is available.

Biometric State and FBI Background Checks

Biometric FBI background checks (often referred to as fingerprint background checks) refer only to criminal background checks conducted by state or local agencies and based on state or FBI criminal databases. The main differences between commercial background checks and biometric FBI background checks are that:

- FBI background checks require fingerprinting as opposed to personal identifiers.
- FBI background checks establish criminal history based on state criminal records, and the FBI criminal history database is a more comprehensive pool of criminal records than publicly available records.
- FBI background checks are conducted by state agencies as opposed to private companies. (*59*).

Each state develops its own process for how to coordinate and conduct FBI background checks. Typically, the state agency responsible for criminal background checks reviews an individual's history in state records using name- and fingerprint-based comparisons to state records. State agencies then coordinate with FBI to match the fingerprints to records in FBI databases (*59*).

FBI criminal background checks use two database components:

- The Integrated Automated Fingerprint Identification System (IAFIS) compiles the Automated Fingerprint Identification Systems for all 50 U.S. states into one database. IAFIS contains more than 100 million identities based on criminal and civil fingerprint records. Individuals having their criminal background checked through FBI have their fingerprints cross-referenced against IAFIS to confirm their identity (*59,60*).

- The Interstate Identification Index (III) contains criminal records that include information submitted by state, local, and federal criminal justice agencies that includes arrest information and corresponding disposition information (if available) (*59*,*60*).

The III provides an extensive source of criminal information in the United States; however, the III does not include all criminal history for all individuals. Gaps exist for reasons such as:

- Some state criminal history records or associated fingerprints do not meet the standards established by FBI for inclusion in the III.
- Information is missing due to inconsistent state reporting standards concerning what crimes are reported to FBI (*59*).
- Disposition information is missing. As of 2012, 10 states reported that 50 percent or less of the arrest records in the III had final disposition information, which can include critical information such as acquittals and reduced or dropped charges (*63*).

The FBI created the III in order to aid law enforcement during investigations, and the database was not designed to be a complete repository of criminal history to determine if someone is eligible for a work opportunity (*64*). Law enforcement officials use the III as one of many resources when compiling a comprehensive criminal history of an individual (*59*). FBI does not provide expansive access to its criminal databases for non-criminal justice purposes. There are also concerns that background checks that rely on arrest records may disproportionately exclude disadvantaged and minority populations. Generally, FBI only conducts criminal checks for employment screening purposes where fingerprint background checks are required by state or federal law. Examples of these positions include civil servants, daycare workers, school employees, nursing home workers, taxi drivers, and private security guards (*59*).

State Legislation to Regulate Background Checks

Forty-two states and Washington, D.C., require TNCs to have a background check conducted for a TNC driver before, or within a specified amount of time after, that driver is allowed to operate. State TNC legislation varies in terms of who conducts the background check, what databases are reviewed, and what disqualifies a driver from work eligibility. However, no state law currently requires fingerprint-based background checks for TNC drivers. Nevada and Kansas previously passed TNC bills that required fingerprint-based background checks, but those requirements were then amended or repealed. In Kansas, Uber halted operations after a bill passed that required a background check by the Kansas Bureau of Investigation. After a revised bill was passed that allowed TNCs to conduct their own background checks, Uber resumed operations within minutes of the bill's signing (*65*).

Municipal Regulation of Fingerprint-Based Background Checks

At the municipal level, policy makers in some U.S. cities have introduced requirements that require fingerprint-based background checks for TNC drivers. In New York City and other cities,

taxi and other vehicle-for-hire drivers conventionally undergo fingerprint-based background checks. U.S. cities that have approved fingerprinting requirements for TNC drivers include New York City and Pasco, Washington.

New York City requires that TNC drivers comply with all of the same licensing requirements as taxi, chauffeur, and limousine drivers including a fingerprint-based background check (*60*). In New York City, TNC drivers must apply for a license with the Taxi Licensing Commission (TLC), the organization that conducts background checks for all for-hire drivers. TLC sends fingerprints to the New York State Division of Criminal Justice Services (DCJS). The State Identification Bureau at DCJS processes the fingerprints to determine positive identification, past criminal history, and warrant information. DCJS processes background checks in fewer than two hours, and the reports are typically returned electronically to TLC within 48 hours to make suitability determinations regarding the applicant. DCJS also notifies TLC if the licensed driver is later arrested (*60*).

On April 3, 2017, the city council in Pasco, Washington, approved an ordinance to legalize and regulate TNCs. The ordinance requires TNC drivers to undergo the same fingerprint-based background check required of taxi drivers in the city. According to a local report, city officials are aware that Uber may not be willing to comply with fingerprint requirements. However, the city hopes to attract other TNCs willing to comply with the local regulations (*66*).

Prior to Texas' statewide TNC legislation, five Texas cities—Austin, Corpus Christi, Galveston, Houston, and San Antonio—introduced TNC requirements that included fingerprint-based background checks for TNC drivers. Uber and/or Lyft suspended or threatened to suspend operations because of disagreements about the nature of background check requirements among other issues. Houston was the only Texas city to successfully negotiate with Uber to comply with fingerprint-based background check requirements, which are similar to the city's requirements for taxi drivers. After HB 100 overruled local regulations, TNCs were no longer required to comply with local background check requirements.

In 2015, the San Antonio City Council passed a requirement for fingerprinting TNC drivers but replaced that with an optional fingerprinting program after Uber and Lyft suspended service in the city. After negotiations, San Antonio introduced an optional fingerprint-based background check program that incentivizes drivers to voluntarily submit to a free fingerprint-based check by the San Antonio Police Department. The program recently launched an incentive program, supported by TNC operating fees and funding from local organizations Tech Bloc and Centro, to offer a $25 gas card incentive for drivers, a streamlined two-step process, and a verification number that identifies drivers who have passed fingerprint-based background checks (*67*).

Summary

Background checks are commonly introduced as one requirement to increase public safety of TNC activities. While much of the public discussion has compared name-based background checks to fingerprint-based background checks, there are also considerations about whether a

government agency or private third party implements the check, the time and monetary costs for TNCs and TNC drivers, and what should disqualify an individual from driving for a TNC.

TNCs take the position that the company's background check processes are safe and reliable. TNCs have also expressed concerns that more burdensome policies introduce costs for drivers and slow down the driver contracting process. Limited information is available to estimate the effect of background check policies on TNC business activities, but TNCs have operated in cities such as New York and Houston while complying with fingerprint-based background check requirements.

While FBI's III is an extensive database of criminal history in the United States, the database has gaps, such as incomplete disposition information. Research suggests that the use of fingerprints to confirm an individual's identity eliminates the risk of false positives and false negatives. Using personal identifiers increases the risk of false identification and increases the possibility that a criminal record will be missed during the criminal background check process. Databases used by commercial background check companies are also incomplete because these databases rely on public records, and not all states and criminal justice agencies make this information publicly available. Ultimately, however, no background check process can guarantee that an individual will not commit a crime in the future.

Maintaining Public Safety

Policy makers, TNCs, and the public see public safety as a primary consideration for TNC operations. In addition to background checks, which received heightened attention during public and legislative discussions of TNC safety, other features of TNCs have implications for the safety of the services and the need for safety regulations. Often public policy, and transportation policy, is designed to ensure that market activities are not presenting undue risk on the public. Cities and state agencies impose regulations such as speed limits, driving tests, and vehicle inspections on personal vehicles to ensure roadway safety. However, pinpointing high-risk concerns, addressing real and perceived risks to the public, and determining if and when policy can increase safety are complex. The introduction of TNCs raises questions about whether there are externalities or other market failures that could pose safety risks. Indeed, many of the policies implemented under state TNC legislation are intended to ensure that certain risks to passengers, drivers, and the general public are managed. At the same time, TNCs have an interest in providing safety for their customers as well and integrate safety features in order to get and retain customers.

This section reviews selected policies and regulations related to maintaining public safety, highlights notable policies in certain states, and discusses how each policy may have implications for achieving the goal of maintaining public safety.

TNC Safety Features

TNCs point out that certain features of TNC services may serve to increase safety. For example, TNCs note features such as making identifying information of the driver and vehicle available before a ride, tracking and sharing routes, and collecting feedback and a rating for each trip. These features can make for-hire travel safer for both passengers and drivers. TNC drivers may be safer drivers compared to the general public because they are providing a competitive service where their work is subject to a rating system.

A 2016 study by Aite Group in partnership with Zendrive evaluated 1 million trips made by approximately 12,000 drivers (both TNC and non-TNC drivers) over 15 million miles to compare TNC drivers' behavior to that of average U.S. drivers. The study found that TNC drivers drive more safely than average drivers, based on attributes such as speeding, aggressive driving, phone use, and hard braking. The report concludes that TNC drivers have a vested interest in being good citizens on the road, and the rating system used by TNCs is likely a factor that contributes to TNC drivers' behavior (*7*).

Policies to Maintain Public Safety

Driver Age Minimum

Uber and Lyft, the largest TNCs in the United States, have company policies that require drivers to be 21 years or older (*68*,*69*). Forty states introduced a driver age minimum policy. In some states, including Texas, the minimum allowable age for TNC drivers is as young as 18. In Florida, Montana, and South Dakota, there is no age minimum specifically for TNC drivers. The fatal crash rate per mile driven for drivers ages 16–19 is nearly three times the rate for drivers ages 20 and over (*70*). Policy makers may need to consider the higher crash rates typically associated with younger drivers if TNCs can adjust their company policy to allow younger, licensed drivers to be TNC drivers.

Prohibited Cash Payments

TNCs offer an app-based credit card payment system that offers users both convenience and potential safety benefits. Cashless transactions may provide added safety for drivers by reducing the attraction of robbery. According to the Occupational Safety and Health Administration, taxi drivers are 20 times more likely than other workers to be murdered while on the job. Occupational Safety and Health Administration indicates that implementing cashless fare systems for for-hire transportation services is a potential safety measure to discourage potential robbers (*71*). The Cato Institute discusses how the TNC service model of not accepting cash payments improves public safety: "Ridesharing's cash-free transactions and self-identified customers substantially mitigate one of the worst risks associated with traditional taxis: the risk of violent crime" (*72*).

Twenty-six states explicitly prohibit TNCs and TNC drivers from accepting cash payments for fares. While this may help reduce the crime risk related to the presence of cash, it may have other

undesirable consequences such as limiting access to TNC services for individuals who do not, or choose not to, use credit cards (see also the next section on equity).

TNC Driver Training

Driver training programs are frequently required for taxi drivers in many jurisdictions. Such programs may be used to address public safety concerns. Other training programs may be used to ensure that individuals who deal with the public are well equipped to deal with health emergencies.

California, Nebraska, and Washington, D.C., require TNCs to establish some form of driver training program. The training programs are not provided by or audited by regulators. CPUC requires that all licensed TNCs operating in California report on their driver training programs to "ensure all drivers are safely operating their vehicle prior to being able to offer service." CPUC requires TNCs to provide the total number of drivers that completed the training course each year (*73*). In addition, TNCs are required to provide driver training program details, which are published on the CPUC website (*74*). The following is a summary of Lyft's driver training program, as reported by the company to CPUC:

- **Driver education:** Each driver participates in a training program to learn the fundamentals of Lyft, how the app works, and safety and support while on the road. The training program includes comprehensive sessions, videos, and frequently asked questions about:
    - How Lyft works. Drivers learn about the company, the community, the details of driving, and the Lyft culture.
    - Technical aspects. Drivers learn how to use the app, how to adjust settings to reflect driver mode, hands-free safety and requirements on the road, confirmation of pickup, ending a Lyft, and providing feedback.
    - Driver/passenger safety and support. Drivers learn tips for ensuring safe trips, how to contact support, etc.
- **In-person mentor pairing:** After drivers complete their driver education, they are paired with a Lyft mentor. This meeting includes a safety ride-along that covers a driver's ability to obey traffic laws; reactions behind the wheel when dealing with other drivers, bicyclists, pedestrians, etc.; and the ability to focus on the road while holding a conversation.
- **Ongoing training:** Drivers have the opportunity to receive continued driver training via webinars, performance tracking, driver coaching, etc. (*75*).

Lyft's driver training program provides an example of some of the curriculum and areas that TNCs should focus on when providing their drivers with safety training and support. However, there is no mechanism for regulators to ensure that the training is being provided (other than the

self-reported total number of drivers who completed training), that the program's curriculum is being followed, or that ongoing training is being offered. In addition, there is no process to measure how effective a TNC's driver training is, which would be helpful in improving training programs and ultimately developing one standard for training programs for all TNCs.

TNC Vehicle Inspections

Twenty-three states require TNCs to complete a vehicle safety inspection or specify that the TNC is responsible for ensuring that TNC vehicles comply with a vehicle safety standard. While the wording of the requirements varies by state, TNCs are typically held to the same safety standards as private vehicles. In addition, TNCs such as Lyft have their own requirements for vehicle inspections before a vehicle is approved for use on the platform (*76*).

Lyft also has a program that allows mentors to conduct these vehicle inspections (Lyft's training program has a mentor pairing section). In these cases, mentors are not required to be licensed mechanics (*77*). In some states, such as California, a licensed third-party mechanic is required to complete the safety inspection of vehicles applying to operate as a TNC (*78*).

Most states require vehicles used on TNC platforms to complete a safety inspection that is consistent with those required for privately operated vehicles. The question as to whether these inspections are redundant (these vehicles would have already passed a state inspection to get registered and insured) or less thorough than is necessary requires further research.

Limitations on TNC Driver Hours

Six states restrict the number of hours that a TNC driver can operate (Table 4). In these states, drivers are limited to 12 to 16 hours of work during a 24-hour period or limited on consecutive hours worked. While a small proportion of states enacted this rule for TNCs, taxi drivers and other transportation providers are typically held to similar standards.

Lyft states that it does not allow drivers to remain active in the driver application for more than 14 hours without a six-hour break (*79*). However, TNC drivers are generally allowed to switch between different TNC apps as they choose. Neither TNC company policy nor legislative policy addresses the possibility of a driver working for two or more TNCs in order to exceed hour restrictions. This could result in unsafe driving behavior.

Table 4. States Limitations on TNC Driver Hours.

State	Policy Summary
Colorado	A driver shall not offer or provide TNC services for more than 12 consecutive hours. Drivers also may not operate a TNC vehicle for more than 16 hours in a 24-hour period or 70 hours in a seven-day period.
Connecticut	No TNC driver shall use a digital network or provide prearranged rides for more than 14 consecutive hours or for 16 hours within a 24-hour period.
Nebraska	A TNC driver may operate no more than 12 hours in each 24-hour period.
New Mexico	A TNC driver shall not provide prearranged rides for more than 12 hours out of any 24-hour period.
Nevada	Drivers may not operate a TNC vehicle for more than 16 hours within a 24-hour period, and may not transport passengers for more than 12 hours within a 24-hour period
Virginia	Drivers may not operate a TNC vehicle for more than 13 hours within a 24-hour period.

Summary

Public safety is a primary consideration for transportation regulation and policy. Numerous TNC operational attributes and legislatively mandated TNC policies have been introduced to increase safety for passengers, drivers, and the public. Driver age minimums, no cash payments, driver training, vehicle inspections, and limitations on driver hours may provide safety benefits. Such policies are implemented in different forms in different states, and the impacts on safety are not documented. Furthermore, some policies may have other costs that can be weighed against perceived safety benefits. For example, digital credit card payments may increase safety for drivers but exclude individuals who do not or cannot use credit cards. More research is needed to identify which safety features and regulatory policies contribute to increasing safety, and to ensure that policies are not unnecessarily hindering market innovation.

Equity and Accessibility Considerations

TNCs have introduced a new transportation option, but TNC services may not benefit all populations equally. The TNC service model has the potential to fill gaps in transportation networks and introduces a convenient travel option. At the same time, there are questions about whether TNC services are accessible to transportation-disadvantaged groups, such as older adults, low-income individuals, individuals with disabilities, or individuals who live in rural areas.

Equity can be measured by evaluating how proportionately or disproportionately costs and benefits are distributed among different segments of the population (*80*). In transportation planning, equity is often measured by determining whether one community bears a disproportionate amount of the negative environmental impacts of a transportation project, or if the allocation of transportation resources disproportionately benefits one community more than another (*81*). The Federal Highway Association (FHWA) defines equity in transportation as seeking “fairness in mobility and accessibility to meet the needs of all community members” (*82*).

This section discusses concerns that have been raised about the availability and accessibility of TNC services to transportation-disadvantaged groups, and provides examples of how TNCs are being used to increase access to travel options. This section also discusses policy considerations that may affect the equity and accessibility of TNCs.

Background on TNC Use and Availability

TNCs are still a relatively new service, and there is limited information available about the activity and use of their services. This section reviews findings from existing research that reports on the users and geographic scope of TNC service availability.

Who Uses TNC Services?

Uber and Lyft were the first TNCs to launch ride-sourcing services that use private drivers and their personal vehicles in 2012. Since then, Uber, Lyft, and a number of smaller TNCs have expanded to hundreds of cities and have served millions of rides. Information on the demographics of users of TNCs is limited, but some surveys and studies have been undertaken to determine who uses TNCs.

A 2015 study about TNC user behavior in San Francisco surveyed more than 300 TNC users and found that:

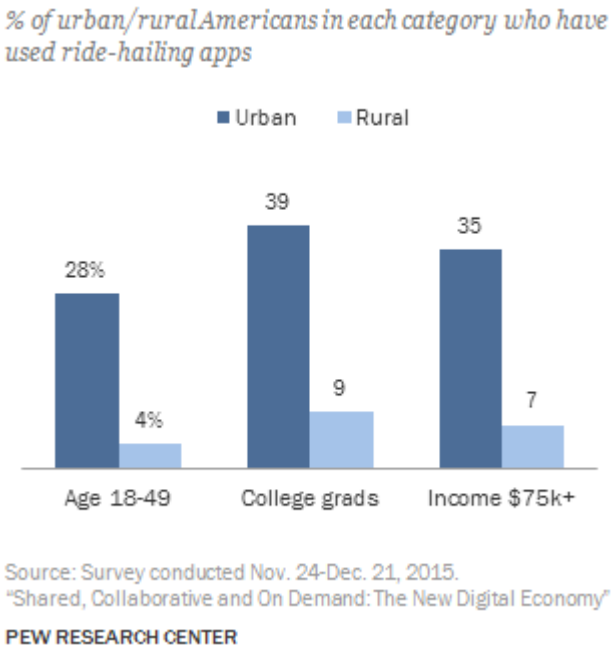
- 73 percent of respondents were younger than 35 years of age (compared to 32 percent of the population citywide).
- 1 percent were over age 55.
- 84 percent had earned at least a bachelor's degree (compared to 53 percent of the population citywide).
- 43 percent reported no vehicle available at home (compared to 19 percent of the population citywide) (*83*).

This survey cannot be considered reflective of the population of San Francisco or the United States as a whole.

A Pew Research Center survey conducted in late 2015 reported that 15 percent of U.S. adults have used a TNC. The survey also found that Americans who were college graduates, higher income, and younger were more likely to have used TNC services. In urban areas, 21 percent of adults have used a TNC, while in rural areas that percentage was 3 percent. Figure 7 provides an additional breakdown of TNC use by demographics and geography. Minority status did not correlate with less usage of TNCs. The percentage of white adults who have used a TNC (14 percent) was lower than the percentage of black (15 percent) and Latino (18 percent) adults. The survey did not report on the frequency with which different races and ethnicities use TNCs.

Where Do TNCs Operate?

TNCs expanded rapidly to many cities across the United States after launching in San Francisco in 2012; however, TNC services are still concentrated within urban areas. Hall and Krueger report that in December 2014, 85 percent of Uber drivers operated in 20 major cities in the United States (*85*). By November 2015, 68 percent of Uber drivers were represented in 25 cities in the United States, suggesting that the TNC market is expanding to new, but still urban, markets.



Source: (*84*)

Figure 7. TNC User Demographics: TNC Use Is More Likely among Urban Residents than Rural Residents.

According to a 2017 Global Web Index survey of Uber app users, 6 percent of respondents live in rural locations and 48 percent live in suburban areas. This may indicate that TNCs are serving individuals who previously had few alternatives to driving alone (*86*). The survey was conducted among self-reported Uber app users between the ages of 16 and 64.

Potential Disparities in Access to TNCs

Limited information is available about the demographics or travel behavior of TNC users. Several researchers have attempted to determine whether TNC services are equally accessible to individuals of different races and/or geographic areas within a city.

Hughes and MacKenzie found that wait times in Seattle, Washington, were shorter in the more dense and urban areas of the city (*87*). The authors also found that wait times for TNC rides in Seattle were similar, on average, for areas with a higher percentage of minorities than other areas (*87*).

Ge et al. found that TNC users who are black experience longer wait times in Seattle, Washington, and the use of "African American-sounding" names resulted in more frequent cancellations in Boston, Massachusetts (*88*). Researchers also note that the study did not compare the level of discrimination in TNC services to discrimination in taxi service. Some argue that the use of an application to connect drivers to riders can mitigate the kind of discrimination that is possible in a taxi (i.e., a driver deciding not to stop for individuals based on their physical appearance). Ge et al. suggest that a policy such as using anonymous identification codes could reduce the potential for discrimination.

Examples of TNC Programs for Transportation-Disadvantaged Groups

TNCs have launched a number of pilots and programs with the goal of providing or expanding transportation options for populations that historically lack transportation access. This section discusses a selection of such programs.

TNC Programs That Provide Mobility to Older Adults

Mobility among older adults tends to decline as individuals stop driving and increasingly face physical or mental limitations that restrict mobility. TNCs have partnered with transit agencies, health care providers, and assisted living facilities to provide on-demand transportation for older adults. In May 2017, the Laguna Beach (California) City Council began a pilot program with Uber to provide rides to medical appointments at area hospitals and medical centers. Riders have the option to request rides by calling Uber directly, in addition to arranging rides through the app (*89*).

TNC Programs That Provide Access for Low-Income Populations

Transportation and non-profit organizations have introduced programs to leverage TNC services to support low-income populations who may face high transportation costs.

Pinellas County Transportation Disadvantaged Program

Uber partnered with Pinellas County, Florida, to provide TNC service to lower-income travelers. The Pinellas County Transportation Disadvantaged (TD) Program subsidizes transportation for residents who earn less income than the 150 percent of the federal poverty guidelines. As part of that program, TD Late Shift offers free TNC rides to participants who have late-night jobs. Eligible participants can request up to 23 free late-night (between 9 p.m. and 6 a.m.) TNC rides per month (*90*).

Tarrant County Job Access Program Pilot

The county government in Tarrant County, Texas, partnered with the nonprofit Catholic Charities on a pilot project to engage TNC services to provide transportation to low-income individuals as part of an employment program. Tarrant County outside the jurisdiction of the Fort Worth Transportation Authority lacks robust transit options, and program participants often do not have access to a personal vehicle. The pilot is testing and gathering data regarding the impact of bundling Uber and Lyft's ride-share services with intensive case management services. The objective is to provide a temporary transportation solution until participants can transition to their own independent transportation solution, rather than providing TNC rides as a long-term commute solution. The pilot covers the cost of work and work-related trips for participants over a 12-week period as they transition into the workforce. The pilot is designed to review the relative cost of outsourcing travel to a TNC; explore ways to help participants transition to the workforce; and to determine the feasibility of scaling up the program. As of August 2017, trips in the program cost an average of $15 per passenger trip, which is below the Catholic Charities-operated service cost per passenger trip.

TNC Programs That Provide Access for Individuals with Disabilities

Transit, taxi, and other transportation services can be more difficult to access for individuals with disabilities. TNCs offer accessible options in some markets such as UberACCESS, UberWAV, UberASSIST, and Lyft's Accessible Vehicle Dispatch option. TNCs also incorporate accessible technologies that assist individuals who are blind, visually impaired, deaf, or hearing impaired to use TNC applications. TNCs have faced criticism and lawsuits that argue that adequate service is not being provided to users with disabilities (57).

UberASSIST

UberASSIST is an option designed for seniors and individuals with disabilities to provide additional assistance while providing rides. Drivers must be able to accommodate folding wheelchairs, walkers, and scooters. Drivers are trained by organizations such as Open Doors Organization, a non-profit dedicated to making consumer opportunities accessible to individuals with disabilities (*91*). UberASSIST was available in more than 40 cities worldwide as reported by Uber in 2017 (*92*).

Pennsylvania Wheelchair-Accessible Vehicle Requirement

Pennsylvania SB 984 requires that TNCs operating in Philadelphia have a combined minimum of 70 wheelchair-accessible vehicles (WAVs) on the road by June 30, 2017. Uber and Lyft reportedly have WAVs operating in the city as of the deadline to meet the requirement (*93*). While TNCs have met the quota, data on wait times for WAVs or the relative number of conventional TNC vehicles operating in Philadelphia are not publicly available to further access the program outcomes.

TNC Programs That Provide Access for Rural Communities

Liberty Mobility Now is a TNC that focuses on providing mobility services primarily to rural and small urban communities. The company partners with local transit providers, taxis, and other transportation providers and in some cases provides its own drivers. Liberty began with funding from a Federal Transit Administration (FTA) Small Business Innovation and Research grant and first launched in Nebraska in 2015 (*94*). As of 2017, Liberty is expanding in seven states including the Coastal Bend region of Texas.

The Texas project, called Mobility NOW!, is a partnership with the Texas Department of Transportation and the Coastal Bend Center for Independent Living, set to launch in September 2017. The program aims to increase awareness of transportation options among seniors, train drivers to provide transportation for individuals with disabilities, and integrate with existing rural and urban transit (*95*).

How TNC Legislation Affects Equity Considerations

Some aspects of the TNC service model results in increased accessibility to the service, while other aspects may limit its use by some segments of the population. For example, individuals who are blind can more easily and safely request an on-demand ride from a TNC with the

assistance of app-based tools that read text from a smartphone aloud. The ability to use a smartphone to request a private ride service directly to one's location can make travel easier for any individual—with a smartphone. Although TNCs are exploring programs that allow trips to be scheduled by an institution, such as a nursing home or hospital, or via a phone dispatcher, the TNC model is based on smartphone applications and excludes individuals without smartphone access.

Thirty-six states and Washington, D.C., require TNCs to adopt a nondiscrimination policy, and 23 states and Washington, D.C., require TNCs to *provide the opportunity* for passengers to request a WAV for their trip. Nondiscrimination policies typically include stipulations that TNCs must accept service animals and cannot charge higher rates for passengers with special needs. TNCs are generally not required to provide WAVs under state TNC legislation. Other policies included in state TNC legislation may have implications for the services' capacity to serve all users, such as prohibitions against cash payments and street hails.

Cash Payment Prohibition

Twenty-six states prohibit TNCs and TNC drivers from accepting cash payments for fares. TNCs introduced the industry-standard cashless app-based payment system as a way to provide a more convenient and hassle-free ride. As noted previously, it may reduce risks of theft for drivers because taxi drivers historically face a high risk of workplace violence. Only accepting credit card payments also means that individuals who do not have access to a bank account or credit card are excluded from being able to use the service. The Federal Deposit Insurance Corporation reports that 7 percent, or approximately 9 million households, of the U.S. population do not have a bank account (*96*). Unbanked households tend to have lower incomes.

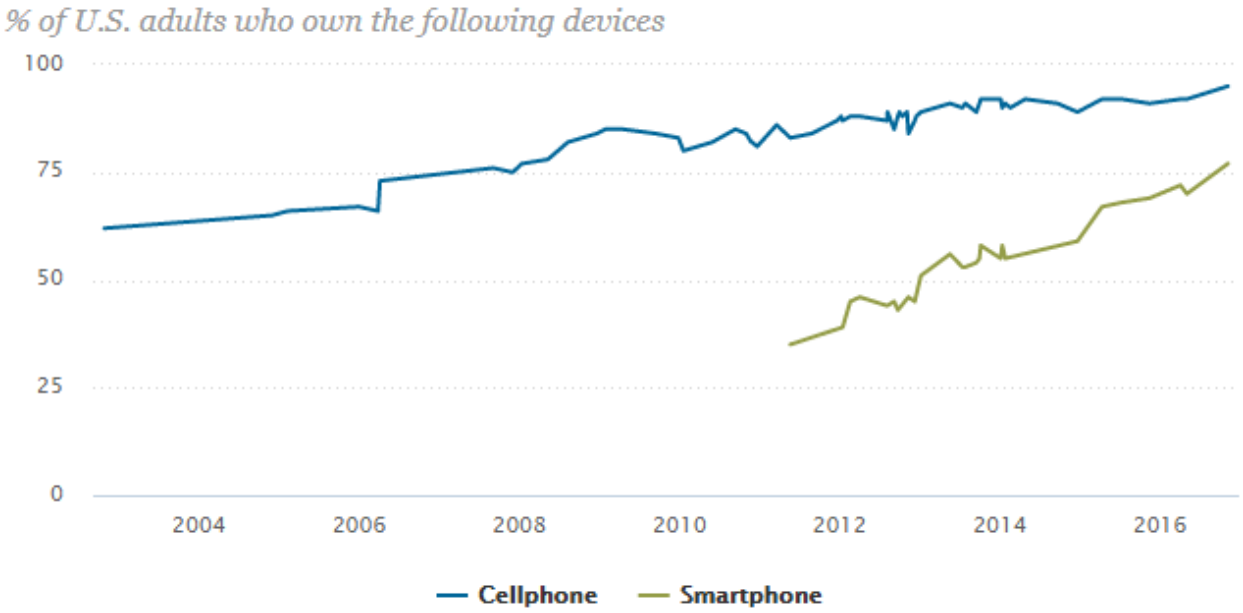
TNCs have demonstrated that cash payments may be a feasible feature for their business model. Since May 2015, Uber has introduced cash payments in other countries including India, Indonesia, Philippines, and Kenya (*97*). In January 2017, Uber launched a cash payment option in Colorado Springs, Colorado, the first example in the United States. Change is provided as a credit on the passenger's account. An Uber spokesman stated that Uber developed a solution to enable cash payments because "[n]ot everyone has a credit card or feels OK handing one over to a service they've never used" (*98*). Additional solutions that may help to overcome the obstacle of cashless TNC services include:

- Prepaid cards that can be purchased in stores and used to pay for Uber rides.
- Programs aimed at seniors through which rides can be requested from a third party who inputs the request into the app.

Street Hail Prohibition

Thirty-six states explicitly prohibit TNCs from accepting street hails, or being flagged down by a passenger on a street as people can do with a traditional taxi. Rides generally need to be coordinated through the digital application, which is the standard model for TNCs. This prevents

potential travelers who do not own smartphones from using TNC services. While most Americans do own a mobile phone, certain segments of the population are more likely to be excluded by this requirement. Seventy-seven percent of U.S. adults own a smartphone (Figure 8), but only 42 percent of adults over 65 years of age own a smartphone. Adults without a high school diploma who are lower income or live in a rural area are also less likely to own a smartphone (*99*).



Source: (*99*)

Figure 8. Mobile Device Use in the United States.

Summary

TNCs have introduced a new transportation service option that has the potential to expand travel options in areas not well served by transit, and offer a convenient option for individuals without access to a personal vehicle. However, the limited information available about TNC users and service areas suggests that TNCs primarily serve users who have higher incomes in urban areas. Features of TNCs that may improve equity include the following:

- Requesting a ride through the app may reduce the likelihood that an individual is rejected based on traits such as race, gender, or appearance compared to street hails.
- Drivers do not know the destination of a trip before it is accepted, so they cannot try to avoid neighborhoods they consider unappealing.

Features of TNCs that risk creating inequity include the following:

- Individuals without access to a credit card cannot use TNC services.
- Individuals without access to a smartphone are less able to request rides.

Policy makers and planners can consider how TNC policies influence the equity implications of TNC services. Data collection efforts, such as the monitoring of wheelchair-accessible TNC ride requests that is required in some states, offer an opportunity to learn more about the demand for rides.

Data Sharing

The technologies—wireless internet, global positioning systems (GPS), and smartphone applications—that TNCs leverage to provide ride services make data sharing an important, and challenging, issue for TNC policy. The wealth of data created and stored by TNCs raises concerns about personal privacy and, for TNCs themselves, competitive advantages among rival services. For policy makers and planners, TNC data hold valuable information that may help researchers better understand travel behavior, congestion, safety, and land use that can be used to inform decision making.

This section presents the background on data-sharing guidance related to TNCs, examples of TNC data sharing agreements, and key considerations related to data sharing.

State Legislation to Regulation Data Use and Privacy

Thirty-four states and Washington, D.C., introduced basic data retention requirements that require TNCs to retain driver and trip records for one or more years. These regulations typically do not include a more involved data-sharing agreement, but in some states, the regulation allows regulators to audit these records in the case of a crash or violation. Six states require additional data-sharing requirements. Some of these data that regulators request include travel data, such as ride origin and destination, time stamp of ride, trip duration and cost, and vehicle occupancy. These data are useful in allowing policy makers and transportation planners to understand how TNCs impact and affect the transportation system. Moreover, transportation professionals can use these data to better understand the travel behavior and transportation needs of their constituencies.

In some states, TNC legislation has included provisions to collect data that help policy makers ensure that TNCs are meeting the disability and accessibility requirements of state and local regulations. At the state level, California, Maryland, Pennsylvania, Virginia, and Washington, D.C., require that TNCs collect data and report on accessible ride requests. These data enable policy makers and regulators to monitor if and how TNCs are meeting this requirement. Data also provide the ability for transportation professionals to determine where demand for WAVs exists and how TNCs are meeting that need. These data can enable planners and policy makers to better accommodate the transportation needs of their communities.

The following sections provide an overview of guidance that has been developed regarding TNCs and data sharing, and examples of U.S. states and cities that require data sharing, including what data are provided to regulators.

Data-Sharing Guidance from FHWA and the National Association of City Transportation Officials

FHWA and the National Association of City Transportation Officials (NACTO) provide guidelines for regulators to consider regarding TNCs and data sharing, summarized in this section.

FHWA Guidance

FHWA provides general guidance for shared mobility services including TNCs in a report titled *Shared Mobility: Current Practices and Guiding Principles* (*100*). The report identifies the critical need for local and regional governments to develop best practices that identify data standards that balance the data-sharing needs of transportation agencies with the need for private companies to protect the privacy of their customers and proprietary information. The report focuses broadly on shared mobility (e.g., car sharing, bike sharing, ride sourcing, etc.), so no specific guidelines or standards for data-sharing agreements with TNCs are provided.

NACTO Guidance

In January 2017, NACTO, along with 49 cities in the United States, released a framework for private data releases from private transportation service providers, including TNCs. The report, titled *City Sharing Principles: Integrating New Technologies into City Streets*, notes that data sharing is vital to proactive planning and policy making (8). The framework provided includes three areas where data-sharing standards can improve policy making and transportation planning:

- Better data for transportation planning in order to manage city streets, manage curb space, and prioritize moving people.
- Equitable access to mobility options and services for all segments of the population.
- Better tools for safety in order to identify design issues (*8*).

Table 5 provides a summary of the data-sharing standards put forth by NACTO to meet the needs of these three areas.

Table 5. Suggested Data Framework for Data Sharing for TNCs.

Area	Relevant Data	Data Source
Better data for transportation planning	Speed	Corridor
	Volume	
	Travel time	
	Pickup location and time	Block face
	Drop-off location and time	
	Vehicle occupancy	Corridor
	Non-revenue vehicle miles traveled	Log: miles/month
	Vehicle dwell time	Log: hours/month
Equitable access to mobility options and services	Number, date, and time of unfulfilled rides	Log: number/quarter
	Number, date, and time of declined rides	
	Number, date, and time of canceled rides	
	Vehicle availability by type	GPS location data
Better tools for safety	Collision occurrence	GPS location data
	Collision severity	
	Rapid acceleration	
	Rapid deceleration	
	Autonomous vehicle operation disengagement	Time, location, and protocol

Source: (8).

Examples of TNC Data-Sharing Agreements

California and a number of municipalities in the United States have developed regulations that require data sharing from TNCs. As of April 2016, California, Chicago, Houston, New Orleans, New York City, Portland, San Antonio, and Seattle have received data from Uber based on rules that require data sharing. In some situations, TNCs have not complied with these regulations. In 2015, Uber was also forced to shut down five of its six New York City–based dispatch centers for declining to provide required trip data to the New York City Taxi and Limousine Commission. Within a month, Uber complied with the request, and the suspension of the five centers was lifted (*101*). Uber also has shared data with the City of Boston in a voluntary agreement. These municipalities have large markets for ride services and may have more leverage when negotiating with TNCs than smaller cities.

CPUC is the state agency that regulates TNCs in California. CPUC requires TNCs to provide six data-sharing reports each quarter. These reports are primarily for enforcement purposes, and CPUC does not share any data with municipalities or the general public. The six reports required by CPUC include data about:

- Provision of vehicles providing services to disabled persons.
- Service provision by zip code.
- Problems reported about drivers.
- Hours logged by driver.

- Miles logged by drivers.
- Drivers completing a driver training course (*101*).

In 2016, Uber paid a $7.6 million fine for failing to comply with CPUC data-sharing requirements. Uber has since met the requirements but argues that the extent of the data requested creates a privacy risk for its passengers (*102*).

Transportation Uses of Shared TNC Data

Data-sharing agreements only exist in a small selection of cities where TNCs operate. Within these cities, analyses have been conducted with TNC data that provide policy makers and transportation planners with insight into how TNCs impact transportation in their jurisdictions.

New York City Trip Data Analysis

One notable example of a robust analysis of TNC trip data was conducted by Schaller Consulting using TNC trip data that were publicly available for rides within New York City (38). Among the findings of the report, the data showed:

- TNCs provided as many car-for-hire trips as the 43,000 registered taxicabs/black cars/ride services in the fall months of 2016.
- Ridership growth in car-for-hire ridership (including TNCs) outpaced transit ridership growth in 2015, and for-hire ridership is the leading source of growth in non-auto travel in New York City.
- TNCs accounted for the addition of 600 million miles of vehicular travel to the city's roadway network between 2014 and 2016. This exceeds the mileage driven by yellow cabs in Manhattan. In total, the mileage driven by TNCs, taxicabs, black cars, and car services increased from 14 percent to 19 percent of the total citywide mileage from 2013 to 2016 (38).

The findings of Schaller Consulting's analysis provide insight into the types of analyses that can be performed when data-sharing agreements are reached with TNCs. Recognizing that TNCs are contributing to an increase in congestion in New York City is useful information for transportation planners and policy makers, and having access to these data provides the ability for policy makers and planners to recognize and plan for future trends.

Uber Movement

In response to continual requests for TNC-generated data, Uber has developed a website called Uber Movement, which provides the company's trip data. The website is not widely available as of mid-2017, but Uber claims that it will provide anonymized and aggregated data by geographies such as census tracts and traffic analysis zones (*103*).

Summary

TNC data can provide meaningful information to understand the role of TNCs and to inform decision making about transportation policy. However, due to TNCs' concerns about privacy and competition, data-sharing agreements have not been common between TNCs and government agencies. Data-sharing agreements that provide specific and accurate data, protect the privacy of TNC passengers and drivers, and do not limit TNC competition could help inform better transportation decision making.

TNCs and Transit Partnerships

TNCs have a growing presence in many U.S. cities where transit agencies operate. Transit agencies were initially wary of TNCs as possible competition for providing rides to the same market for passengers. While TNCs are more clearly in direct competition with taxicabs, empirical data are not available to document whether TNCs are in competition for public transportation riders.

This section discusses the background for TNC and transit partnerships, existing partnerships, the results of those partnerships, and policy considerations for future partnerships.

Background on TNCs and Transit

Little data are available to clarify whether TNC trips are replacing transit trips and how transit ridership or user behavior may be changing. Some early research indicates that shared modes largely complement public transit and that the use of shared modes including TNCs is associated with a greater likelihood of using transit frequently (*104*,*105*). TNCs also provide service during late hours when public transit services are less frequent or unavailable (*106*). Paratransit services tend to have higher per-trip costs than general transit, and transit agencies may also use partnerships with TNCs to provide paratransit services, reducing high operating costs and improving the travel options for customers (*107*), although this raises considerations about driver training and WAVs (*104*,*108*).

Conceptually, partnerships between TNCs and transit agencies can benefit both parties by lowering operational costs, identifying new passengers, and providing improved service. For TNCs, transit users are likely to demand their service at the beginning and/or end of a transit trip to reach the final destination (*109*). For transit agencies, TNCs can increase transit ridership by connecting passengers to transit stations and improving connections to transit in areas with limited availability and/or low-density neighborhoods (*110*). The shared mobility model of TNCs may also provide an alternative to existing (and often costly) transit feeder services and lead to a reduced demand for parking infrastructure (*111*).

In 2016, FTA created the Mobility on Demand (MOD) Sandbox program to conduct research on new service options and available technologies to increase individual mobility. Activities eligible in the program included demonstrations of business and service models, software/hardware interfaces, and service operations integrating MOD and transit. In October 2016, the program

allocated almost $8 million to transit agencies and transportation authorities, including partnerships with TNCs (*112*). Public and private partners continue to explore options for partnerships to provide greater access and complement transit service.

Partnerships between TNCs and Transit Agencies

Transit agencies across the country are exploring partnership opportunities with TNCs to identify the potential for mutual benefits. Most agreements can be classified into five categories based on the type of service provided:

- Technology integration and data sharing.
- First-mile/last-mile service connections.
- Gap service/carpooling.
- Promotional fares/marketing services.
- Special populations/paratransit services.

Some partnerships straddle multiple classifications, such as a one-time promotional fare to use a TNC to access a rail station. This section discusses each category.

Technology Integration and Data Sharing

Some partnerships connect transit agency customers to TNC services through a common mobile app platform, aimed at customers comfortable using smartphone apps for either transportation service and taking advantage of existing available application programming interfaces on mobile apps. An example is a customer using a transit agency app to book a TNC trip and pay the fare, helping the customer complete the remainder of the journey to the destination. For example, Dallas Area Rapid Transit (DART) in Dallas, Texas, entered into partnerships with Lyft and Uber to allow riders to pay for TNC rides through DART's GoPass mobile ticketing application (Figure 9) (*113*). DART received federal funding to expand GoPass connections to TNCs, with the goal of improving first-mile/last-mile connections (112).

First-Mile/Last-Mile Service Connections

In the transit industry, the *first mile* refers to the leg of a trip between a person's origin (e.g., home) and a transit stop where the person boards a transit vehicle; the *last mile* refers to the leg of a trip between the transit stop where the person alights the transit vehicle and the final destination (e.g., work location).

First-mile/last-mile partnerships leverage TNC services to connect customers to transit service that is too far to walk to or otherwise inconvenient, instead of foregoing transit altogether. The customer pays a lower overall fare than the cost of a TNC-only trip, and both the TNC and transit agency serve more passengers. Examples include the following:

- Pinellas Suncoast Transit Authority in Pinellas Park, Florida, created the Direct Connect program with Uber and United Taxi to partially subsidize trips (up to $3 of the total cost) going to/from designated bus stop zones during a one-year pilot (*115*).
- A similar six-month partnership launched in August 2016 between the City of Centennial, Colorado, and Lyft to provide fare-free Lyft rides for persons going to/from the Dry Creek station on the Denver Regional Transit District light-rail lines (*116*). The Go Centennial pilot was funded by $200,000 from the city with matching funding from the Southeast Public Improvement Metropolitan District (*117*). The pilot was designed to improve upon the city's limited dial-a-ride service and is estimated to triple ridership capacity without increasing operational expenses.

Source: (*114*)

Figure 9. DART GoPass App.

Gap Service/Carpooling

Gap service partnerships address the challenges of providing adequate and cost-effective transit in areas with low population densities. Faced with this issue, transit agencies sometimes reduce service frequency outside of central business districts and on nights and weekends. In TNC/transit gap service partnerships, TNCs provide transit-like service for customers in a designated zone. The transit agency subsidizes the trip fare because of the potential to save on operating expenses by using TNC vehicles and drivers rather than a transit vehicle.

The Kansas City Area Transportation Authority (KCATA) created a one-year program called RideKC: Bridj, a partnership providing on-demand service within and between two service zones of the city (*118*). Bridj, although now defunct, provided microtransit service with smaller buses rather than drivers with personal automobiles, and all trips in the service zones cost a $1.50 fare for the customer, equal to the regular local regional bus fare. KCATA subsidized the rest of the cost to Bridj through funds of about $1.3 million in leftover sales taxes (*119*). The RideKC: Bridj pilot concluded in spring 2017 with 1,480 total rides, lower than originally projected. The pilot still offers an early demonstration of using microtransit to provide service (119).

Promotional Fares/Marketing Services

Promotional partnerships are designed as temporary programs to encourage people to begin using TNC services to connect to transit on a regular basis or during large events (*120*). Some partnerships have used subsidized fares or a free TNC trip promotion to announce a new rail/bus

service opening or to make people aware of available travel options during a special event, such as the following.

- In October 2016, Sacramento Regional Transit in California partnered with Lyft, Uber, and Yellow Cab to create the Station Link Program, offering $5 TNC fares to specific transit stations up to the first 10 trips for the individual user. The program is funded by a $50,000 grant from the Sacramento Metropolitan Air Quality Management District (*121*).
- A different type of marketing partnership formed between Metra in Chicago and Uber in December 2014; the three-year agreement makes Uber the official rideshare partner of Metra. The agency generates non-fare revenue from the partnership and displays Uber's name on promotional materials throughout its locations, vehicles, and marketing channels (*122*).

Special Populations/Paratransit Services

Transit agencies with fixed-route service are required to provide demand-responsive paratransit services for individuals with disabilities, which are typically more expensive to provide than general transit service. Some TNC/transit partnerships aim to provide on-demand service for specific customer groups and reduce paratransit operating expenses. Examples include the following:

- The Massachusetts Bay Transportation Authority (MBTA) in Boston partnered with both Lyft and Uber for an on-demand paratransit pilot. The program is offered in addition to the mandated complementary paratransit service MBTA provides. The pilot allows same-day booking and vehicle tracking through the MBTA mobile app, subsidizes trip costs up to $13 per trip, and emphasizes the availability of WAVs for TNC trips. MBTA projects that the pilot program will decrease costs for riders and the agency, saving MBTA up to $10 million annually in paratransit trip costs. Uber provides smartphones to MBTA paratransit customers who do not already own one, and Lyft established a call center for ride requests and works with local firms to provide WAVs (*123*).
- The Pinellas Suncoast Transit Authority in Florida created the TD Late Shift program with Uber and United Taxi, providing up to 23 free weeknight rides per month for qualifying low-income riders. The program is funded by a $300,000 grant from the Commission for the Transportation Disadvantaged, and rides must connect to either the rider's place of employment or residence (*124*).

Partnership Results

Partnerships between transit agencies and TNCs are intended to be beneficial to both parties while providing customers with additional travel mode options and increased access to transportation. However, the long-term benefits in terms of ridership and operating costs for most partnerships remain unknown. Many of the partnerships noted in this section are still underway and have yet to release evaluation results or outcomes. Few studies or published

results have been made available about the ridership, cost savings, or other measures of partnership success. Analyses of existing pilot projects note the following findings:

- The Pinellas Suncoast Transit Authority estimated the Direct Connect partnership would save the agency $70,000 compared to the cost of providing fixed-route service in the partnership area (124).
- The Go Centennial six-month pilot provided 1,302 trips and incurred costs of $60,760 for service provision, $26,000 for app development, and $42,947 for implementation and evaluation. TNC trip costs subsidized by the city averaged $4.70 per trip, compared to an average cost of $18.54 for regular call-and-ride scheduled service (*125*).

Policy Challenges to TNC/Transit Partnerships

TNC and transit partnerships face challenges related to existing funding and regulatory frameworks for transit agencies; liability, insurance, and driver training concerns; and nondiscrimination and accessibility policies.

Funding and Regulatory Frameworks

There are still no clear rules from FTA about working with TNCs, particularly on how regulatory obligations of transit agencies extend to TNC partners (*104*). Federal and state rule making informs how transit agencies can use certain grant programs to provide service, as well as requirements for service availability and quality. The requirements and goals under these frameworks do not necessarily align with the objectives and performance metrics of TNCs. Transit agencies use metrics such as on-time performance, availability of service, and schedule-based frequency for measuring success, while TNCs focus on wait times for vehicles and costs (120).

In addition, statutory limitations on federal transit funding create uncertainty about whether federal transit funding can be used to subsidize TNC trips in long-term contracting. There are questions regarding training of TNC drivers compared to transit agency drivers, particularly in the case of Americans with Disabilities Act (ADA) paratransit service. Other uncertainties that complicate TNC/transit partnerships include the following:

- The contracting agreements between transit agencies and TNCs are not publicly available but would increase understanding of partnership goals and outcomes.
- FTA has not issued rule making for transit agencies to contract for long-term use of TNCs to provide ADA complementary paratransit service.
- Partnerships involving TNC trip subsidies or service provided in lieu of transit have all been pilot programs to test the effectiveness of TNCs' roles in transit.

- While there are no FTA rules for TNCs to provide ADA complementary paratransit service, TNCs in these types of partnerships have focused driver training to work with individuals with disabilities and increased the availability of WAVs.

Liability, Insurance, and Driver Training

A key driver of cost savings from partnerships is the difference in labor models between transit agencies and TNC services. TNCs employ drivers as independent contractors rather than full-time employees, using independent and quickly trained drivers in a manner different from how transit agency drivers are hired and trained.

Another consideration is risk allocation; most pilot programs allocate risk to public transit agencies contracting the service rather than the TNC (120). The subject of sharing more risk could become a topic of greater concern should partnerships start becoming long-term contracts. Driver training is important for partnerships that focus on riders with disabilities as well as the general public.

Nondiscrimination and Accessibility Policies

Transit and paratransit services are required to meet strict standards for serving individuals with disabilities and offering accessible vehicles under strict federal policy. The MBTA partnership demonstrates a partnership geared toward paratransit needs, but TNC policies in most states do not include requirements for WAV availability.

TNCs offer some accessible options in some markets such as Uber's UberACCESS, UberWAV, and UberASSIST and Lyft's Accessible Vehicle Dispatch option. However, TNCs are generally not required to provide accessible vehicles under the state legislation discussed in this report. While 35 states and Washington, D.C., require that TNCs adopt a nondiscrimination policy and enable passengers to request a WAV for their trip, these policies do not require TNCs to directly provide WAV services (*126*).

Summary

Partnerships between transit agencies and TNCs are intended to be beneficial to both parties while providing customers with additional travel mode options and increased access to transportation. However, the long-term benefits in terms of ridership and operating costs for most partnerships remain unknown. Few studies or published results have been made available about the ridership, cost savings, or other measures of partnership success.

To date, most TNC/transit partnerships have been pilot programs or one-time grants without a permanent funding source (120). The FTA MOD Sandbox program launched in 2016 allocated almost $8 million in October 2016 to transit agencies and transportation authorities, with projects that included partnerships with TNCs in areas of first-mile/last-mile solutions, on-demand paratransit service, and mobile app integrations (112). Longer-term funding strategies may be required to continue piloting and monitoring TNC-transit partnerships.

Currently, FTA provides guidance in the form of frequently asked questions about shared mobility funding eligibility and compliance with federal laws (*127*). For example, FTA notes the distinction between shared-ride and exclusive-ride services. Shared-ride services may be eligible for both operational and capital expenditures. How TNC services are defined in this context will impact future partnerships. Additional federal rule making and guidance, along with performance metrics and best practices for partnerships, will help guide transit agencies and TNCs.

Chapter 4. Future Considerations

Policy makers in Texas and across the United States acted quickly to respond to the rapid growth of TNC services in cities across the United States. Early legislation authorized TNC services, addressed ambiguity about insurance liability, and introduced standards intended to protect the safety of the traveling public. TNCs have the potential to support many transportation programs and goals by offering new travel modes for individuals who have difficulty driving themselves or accessing public transportation, an alternative for individuals who might otherwise drive impaired, a means to increase vehicle occupancy, or a tool to incentivize ride pooling and control growth in vehicle miles traveled. As policy makers in cities and states across the country authorize TNC activities, there are still many unanswered questions about how, and if, TNCs contribute to transportation goals such as increasing roadway safety, managing congestion, and improving accessibility.

As TNC services continue to evolve, policy makers can monitor emerging considerations for the future of TNC activities, including the following.

TNC and Taxi Regulation Harmonization

Typically, when TNC regulation has passed at the state level, taxi regulation remains at the local level. Going forward, state and local policy makers may want to consider whether changes should be made to taxi regulations that allow that industry to evolve. Lawmakers in Connecticut and Michigan, for example, revised existing taxi and limousine laws to create more uniform regulations for all vehicles for hire (*4*). Washington, D.C., revised its existing ordinances by eliminating many requirements for taxis and implementing a single vehicle-for-hire ordinance that applies to both taxi companies and TNCs (*4*).

Some evidence suggests that TNC expansion is having a negative impact on the taxi industry. Evaluations in markets from New York City to Nebraska suggest that taxi ridership has declined as TNC ridership has increased. Taxis currently accept street hails, accept cash payments, and are often required to serve individuals with disabilities or who use a wheelchair. If the regulatory environment contributes to the TNC industry overtaking taxis, there may be negative consequences for individuals with disabilities and individuals without smartphones, credit cards, or bank accounts.

TNCs and Automated Vehicles

While TNCs and other new mobility services are evolving, the development of automated vehicles (AVs) is presenting another potential disruption in the transportation arena. Companies like Uber and Lyft, as well as many automobile manufacturing companies, are pursuing AV programs. Most recently, Lyft announced its AV research program and plans to develop a shared automated vehicle fleet (*128*). AVs operated by TNCs could lead to different transportation outcomes based on the degree of sharing that occurs and whether AVs enable longer trips or

generate more vehicle trips. While the timeline and implications of AVs themselves are still highly uncertain, policy makers can continue to monitor the activities of TNCs in this industry.

Effects of TNC Policy on Future Market Activity

During legislative and public debates on statewide TNC legislation in Texas and elsewhere, policy makers and TNC representatives have pointed to goals including supporting economic growth, maintaining public safety, and increasing transportation options. As the TNC market responds to the implementation of legislation introduced over the last five years, policy makers may consider monitoring how current legislation impacts TNCs and the public. Policy decisions can lead to unanticipated or undesirable side effects, such as efforts by incumbent companies to support regulations that create a situation where one party benefits from the decreased competition created by regulation (*9*).

Annual fees provide an example of how specific policy choices can impact the TNC market. TNCs are required to obtain a permit in 35 states and pay a fee to support administrative costs or transportation funding. However, the annual fees, which range as high as $111,250 per year, present a financial barrier limit for smaller, start-up TNCs to enter the market in those states. To better ensure fair market competition among TNCs, some states have introduced more nuanced fee schedules. For example, in Georgia and Rhode Island, TNCs pay graduated fees that are correlated with the number of registered TNC vehicles they have in operation. Georgia's master license fee ranges from $1,500 for one to five vehicles to $300,000 for over 1,001 vehicles. Monitoring the impact of legislation and considering approaches that adjust to the rapidly changing environment that disruptive technologies create will help policy makers ensure that TNCs contribute to local, regional, and statewide goals.

References

1. Thompson, Steven R. Uber Brings Controversial Driver Service to Dallas. *Dallas Business Journal*, September 14, 2012. https://www.bizjournals.com/dallas/print-edition/2012/09/14/uber-brings-controversial-driver.html. Accessed July 30, 2017.
2. Simek, C., and T. Geiselbrecht. *2016 Texas Transportation Poll*. PRC 16-16 F. Texas A&M Transportation Institute, December 2016. *h*ttps://static.tti.tamu.edu/tti.tamu.edu/documents/PRC-16-16-F.pdf. Accessed July 30, 2017.
3. Texas House Bill 100. 2017. https://legiscan.com/TX/bill/HB100/2017.
4. Texas A&M Transportation Institute. Transportation Network Company (TNC) Legislation. https://tti.tamu.edu/policy/technology/tnc-legislation/. Accessed April 4, 2017.
5. Texas House Bill 1733. 84th Regular Session, 2015. https://legiscan.com/TX/bill/HB1733/2015. Accessed July 17, 2016.
6. Texas Insurance Code, Title 10. Property and Casualty Insurance, Subtitle C. Automobile Insurance, Chapter 1954. Insurance for Transportation Network Company Drivers. http://www.statutes.legis.state.tx.us/Docs/IN/htm/IN.1954.htm. Accessed July 12, 2017.
7. Bezard, Gwenn. *Driving Analytics: Ridesharing Drivers Are Safer than Average American Drivers.* Aite Group, LLC, 2016. https://d1x6dm64pjo2h2.cloudfront.net/casestudies/Zendrive+and+Aite+Study.pdf. Accessed July 30, 2017.
8. National Association of City Transportation Officials. *City Data Sharing Principles: Integrating New Technologies into City Streets.* 2017. https://nacto.org/wp-content/uploads/2017/01/NACTO-Policy-Data-Sharing-Principles.pdf. Accessed October 3, 2017.
9. Bardach, Eugene. *A Practical Guide for Policy Analysis: The Eightfold Path to More Effective Problem Solving*. Chatham House Publishers, Seven Bridges Press, 2000.
10. Shared-Use Mobility Center. *Shared-Use Mobility Reference Guide.* 2015. http://sharedusemobilitycenter.org/wp-content/uploads/2015/09/SharedUseMobility_ReferenceGuide_09.25.2015.pdf. Accessed July 6, 2016.
11. Theis, Michael. Updated: The Complete Field Guide to Austin's Ridesharing Apps. *Austin Business Journal*, June 7, 2017. https://www.bizjournals.com/austin/news/2016/06/07/the-complete-field-guide-to-austins-ridesharing.html. Accessed July 28, 2017.

12. Rao, Leena. UberCab Takes the Hassle out of Booking a Car Service. Tech Crunch, July 5, 2010. https://techcrunch.com/2010/07/05/ubercab-takes-the-hassle-out-of-booking-a-car-service/. Accessed July 28, 2017.

13. Fischenich, Mark. City Finalizes Regulations on Uber, Lyft. Mankato Free Press, July 21, 2017. http://www.mankatofreepress.com/news/city-finalizes-regulations-on-uber-lyft/article_913dde7c-6da2-11e7-b78f-b7be633fa72f.html. Accessed July 28, 2017.

14. Bach, Jonathan. Statewide Ride-Sharing Bill Heads for Public Hearing Monday. *Statesman Journal*, April 2, 2017. http://www.statesmanjournal.com/story/news/2017/04/02/statewide-ride-sharing-bill-heads-public-hearing-monday/99954734/. Accessed July 28, 2017.

15. Benning, Tom. Even after Austin Vote, State House Transportation Chair Wants to Leave Ride-Hailing to Cities. Trail Blazers Blog, *The Dallas Morning News*, May 9, 2016. http://trailblazersblog.dallasnews.com/2016/05/even-after-austin-vote-state-house-transportation-chair-wants-to-leave-ride-hailing-to-cities.html/. Accessed May 9, 2016.

16. Samuels, Alex. Uber, Lyft Returning to Austin on Monday. *Texas Tribune*, May 25, 2017. https://www.texastribune.org/2017/05/25/uber-lyft-returning-austin-monday/. Accessed July 30, 2017.

17. Texas Transportation Code, Title 7. Vehicles and Traffic, Subtitle F. Commercial Motor Vehicles, Chapter 643. Motor Carrier Registration. http://www.statutes.legis.state.tx.us/docs/tn/htm/tn.643.htm. Accessed July 30, 2017.

18. Moran, Maarit, Gretchen Stoeltje, and Leah Dintino. *Motor Carrier Code Review—Considerations for the Legislation of Transportation Network Companies*. Technical Memorandum. January 2016. https://tti.tamu.edu/policy/technology/motor-carrier-code-review-considerations-for-tnc-legislation/. Accessed July 12, 2017.

19. Texas Insurance Code, Title 10. Property and Casualty Insurance, Subtitle C. Automobile Insurance, Chapter 1954. Insurance for Transportation Network Company Drivers. http://www.statutes.legis.state.tx.us/Docs/IN/htm/IN.1954.htm. Accessed July 12, 2017.

20. Colorado Senate Bill 14-125—Transportation Network Companies Regulation. 2014. http://www.legispeak.com/bill/2014/sb14-125. Accessed July 12, 2017.

21. Montana Code Annotated, Title 69. Public Utilities and Carriers, Chapter 12. Motor Carriers, Part 3. Classification and Motor Carrier Certificates. http://leg.mt.gov/bills/mca/title_0690/chapter_0120/part_0030/sections_index.html. Accessed July 12, 2017.

22. Oklahoma Title 47. Motor Vehicles, Chapter 73A—Oklahoma Transportation Network Company Services Act, Section 1012—Transportation Network Companies and Drivers Not Considered Motor Carriers of Persons, Taxicabs, Etc. 2015. http://www.oscn.net/applications/oscn/deliverdocument.asp?id=476698&hits=366+365+364+330+329+328+207+206+205+203+202+201+113+112+111+96+95+94+74+7+6+5+3+2+1+. Accessed July 12, 2017.

23. Oklahoma Title 47. Motor Vehicles, Chapter 56—Motor Carrier Act of 1995, Section 230.23—Definitions. 2005. http://www.oscn.net/applications/oscn/DeliverDocument.asp?citeid=443091. Accessed July 12, 2017.

24. The White House. State and Local Government. https://www.whitehouse.gov/1600/state-and-local-government. Accessed April 4, 2017.

25. Vanlandingham, K. E. Municipal Home Rule in the United States. *William and Mary Law Review*, Vol.10, No. 2, Winter, 1968. http://heinonline.org/HOL/Page?handle=hein.journals/wmlr10&div=25&g_sent=1&collection=journals. Accessed July 27, 2017.

26. Texas Constitution, Article 11. Municipal Corporations. http://www.statutes.legis.state.tx.us/Docs/CN/htm/CN.11.htm. Accessed July 27, 2017

27. Texas Local Government Code, Title 2. Organization of Municipal Government. http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.51.htm. Accessed July 27, 2017.

28. Blogdett, Terrell. Home Rule Charters. *Handbook of Texas Online*, Texas State Historical Association, 1994. https://tshaonline.org/handbook/online/articles/mvhek. Accessed April 7, 2017.

29. National League of Cities. *City Rights in an Era of Preemption: A State-by-State Analysis.* 2017. www.nlc.org/sites/default/files/2017-02/NLC Preemption Report 2017.pdf. Accessed April 4, 2017.

30. South Dakota House Bill 1091, Sec. 24. 2016. http://sdlegislature.gov/legislative_session/bills/Bill.aspx?File=HB1091ENR.htm&Session=2016. Accessed April 7, 2017.

31. Hook, Jim. PUC Approves Two More Ride-Hailing Services. Public Opinion News, February 9, 2017. http://www.publicopiniononline.com/story/news/local/2017/02/09/puc-approves-two-more-ride-hailing-services/97709840/. Accessed April 4, 2017.

32. Begley, Dug. Lawmakers Mull State Regulations to Usurp City Controls on Uber, Lyft. *Houston Chronicle*, March 14, 2017. http://www.houstonchronicle.com/news/transportation/article/Lawmakers-mull-state-regulations-to-usurp-city-11001870.php. Accessed April 7, 2017.

33. Collier, Kiah. After Austin Vote, GOP State Senator Announces Ride-Hailing Legislation. *The Texas Tribune*, May 8, 2016. https://www.texastribune.org/2016/05/08/top-senator-announces-ridesharing-legislation/. Accessed April 4, 2017.

34. Lawler, Emily. Michigan Bill to Eliminate Patchwork Regulations for Uber, Lyft Rideshare Apps Advances. MLive, December 4, 2014. http://www.mlive.com/lansing-news/index.ssf/2014/12/committee_swipes_uber_app_regu.html. Accessed July 30, 2017.

35. Moran, Maarit. *Policy Implications of Transportation Network Companies*. Texas A&M Transportation Institute, August 2016.

36. Lawler, Emily. Snyder Signs Bills Upping Uber Regulations, Decreasing Them for Taxis. MLive, December 21, 2016. http://www.mlive.com/news/index.ssf/2016/12/snyder_signs_bills_upping_uber.html. Accessed April 4, 2017.

37. Fort Worth, Texas, Ordinance No. 22308-06-2016. July 2016.

38. Schaller, Bruce. *Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of New York City.* Schaller Consulting, Inc., February 27, 2017. http://www.schallerconsult.com/rideservices/unsustainable.pdf. Accessed August 24, 2017.

39. Schaller, B. Unfinished Business: A Blueprint for Uber, Lyft and Taxi Regulation. Schaller Consulting, September 2016. http://www.schallerconsult.com/rideservices/blueprint.htm. Accessed April 4, 2017.

40. Elgart, Z., E. Shipp, J. Cardenas, T. Hansen, and A. Pant. *Role of Transportation Network Companies (TNCs) in Reducing Alcohol-Impaired Driving: An Overview*. 2016.

41. Blincoe, L., T. Miller, E. Zaloshnja, and B. Lawrence. *The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised)*. Report No. DOT HS 812 013. National Highway Traffic Safety Administration, 2015. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812013. Accessed June 13, 2017.

42. Texas Department of Transportation. Total and DUI (Alcohol) Fatal and Injury Crashes Comparison. 2016. http://ftp.dot.state.tx.us/pub/txdot-info/trf/crash_statistics/2016/37.pdf. Accessed June 13, 2017.

43. Jackson, C., and E. Owens. One for the Road: Public Transportation, Alcohol Consumption, and Intoxicated Driving. *Journal of Public Economics*, Vol. 95, No. 1-2, 2011, pp. 106–121. http://dx.doi.org/10.1016/j.jpubeco.2010.09.010. Accessed June 13, 2017.

44. Spata, C. Scheduling an Uber Ride in Advance Now Possible with Rezzie. *Tampa Bay Times*, 2015. http://www.tbo.com/news/business/scheduling-an-uber-ride-in-advance-now-possible-with-rezzi-20151029/. Accessed November 10, 2015.

45. Van Sack, J. Uber Easy Plan for Events. *Boston Herald*, 2015. http://www.bostonherald.com/business/business_markets/2015/11/uber_easy_plan_for_events. Accessed December 10, 2015.

46. Schultz, E. J. Free Rides: Booze Brands Align with Transportation Apps. Advertising Age, 2013. http://adage.com/article/news/free-rides-booze-brands-align-transportation-apps/245771/. Accessed February 7, 2016.

47. PR Newswire. Miller Lite Kicks Off Football Season with Free Rides for Fans. 2015. http://www.prnewswire.com/news-releases/miller-lite-kicks-off-football-season-with-free-rides-for-fans-300138442.html. Accessed February 7, 2016.

48. Betts, K. Uber Drivers, Riders Trying to Save Lives This Month. KVUE, December 2, 2015. http://www.kvue.com/story/news/local/2015/12/02/uber-drivers-and-riders-trying-to-save-lives-this-month/76703586. Accessed February 7, 2016.

49. City of Austin. Know before You Go, Get Home Safe. 2014. https://austintexas.gov/gethomesafe. Accessed May 8, 2017.

50. Friel, K. City of Austin Waives Parking Ticket Fees for Drinkers Who Leave Cars Overnight. CultureMap, 2014. http://austin.culturemap.com/news/city-life/05-06-14-parking-ticket-fees-waives-city-overnight-drinking. Accessed May 8, 2017.

51. Virbila, S. I. (2015). It's Confirmed: Uber Lets You Drink More. *Los Angeles Times*, October 2, 2015. http://www.latimes.com/food/dailydish/la-dd-uber-restaurant-drinking-20150921-story.html. Accessed May 8, 2017.

52. Good, N. DUI Trends and Ride Sharing. 2015. http://bl.ocks.org/nategood/5868e870b1c668c660f1 Accessed May 8, 2017.

53. Uber Technologies, Inc.. *More Options. Shifting Mindsets. Driving Better Choices*. Uber and MADD, 2015. https://newsroom.uber.com/wp-content/uploads/2015/01/UberMADD-Report.pdf. Accessed May 8, 2017.

54. Greenwood, B. N., and S. Wattal. Show Me the Way to Go Home: An Empirical Investigation of Ride Sharing and Alcohol Related Motor Vehicle Homicide. *SSRN Electronic Journal*, December 16, 2016. http://dx.doi.org/10.2139/ssrn.2557612. Accessed May 8, 2017.

55. Dills, A., and S. Mulholland. Ride-Sharing, Fatal Crashes, and Crime. *SSRN Electronic Journal*, May 8, 2017. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2783797. Accessed May 8, 2017.

56. Brazil, N., and D. S. Kirk. Uber and Metropolitan Traffic Fatalities in the United States. *American Journal of Epidemiology*, Vol. 184, No. 3, 2016, pp. 192–198. http://dx.doi.org/10.1093/aje/kww062. Accessed May 8, 2017.

57. Daus, M. *The Expanding Transportation Network Company "Equity Gap": Adverse Impacts on Passengers with Disabilities, Underserved Communities, the Environment and the On-Demand Workforce*. 2016. http://www.whosdrivingyou.org/wp-content/uploads/2016/08/Equity-Report-Final-11232642.pdf. Accessed May 8, 2017.

58. Torre, M. A Look at Austin DWI Data ahead of Uber, Lyft Vote. CBS Austin, December 15, 2015. http://cbsaustin.com/news/local/a-look-at-austin-dwi-data-ahead-of-uber-lyft-vote. Accessed May 8, 2017.

59. Office of the Attorney General. *The Attorney General's Report on Criminal History Background Checks.* United States Department of Justice, June 2006. https://www.bjs.gov/content/pub/pdf/ag_bgchecks_report.pdf. Accessed December 1, 2016.

60. Daus, Matthew, and Pasqualino Russo. *One Standard for All: Criminal Background Checks for Taxicab, For-Hire, and Transportation Network Company (TNC) Drivers*. City University of New York, May 2015. http://www.utrc2.org/sites/default/files/pubs/Background%20Check%20Report.pdf. Accessed on December 1, 2016.

61. Purchase, G., and B. Check. *The Facts about Background Checks.* National Association of Professional Background Screeners, 2013. http://pubs.napbs.com/pub.cfm?id=0822433E-CAEA-32D3-A1F2-C4970C002321. Accessed February 15, 2017.

62. Vaccaro, Adam. Mass. Ride-Hailing Checks Have Other States Weighing More Thorough Driver Reviews. *Boston Globe*, April 10, 2017.

63. National Association of Professional Background Screeners. *Incomplete Records Can Delay Checks and Affect Applicants Seeking Employment.* February 2015. http://pubs.napbs.com/pub.cfm?id=0C28B569-A388-C89D-67F4-8EE2170B0B55. Accessed February 15, 2017.

64. National Association of Professional Background Screeners. *NAPBS Position: Transportation Network Companies*. 2015. http://pubs.napbs.com/pub.cfm?id=3D9931CA-F4A8-E7DC-56BB-1ADFBEF5B4BB. Accessed February 15, 2017.

65. Lowry, Bryan. Uber Returns to Kansas after Bill-Signing Friday. *The Wichita Eagle*, May 22, 2015. http://www.kansas.com/news/politics-government/article21673137.html. Accessed May 2, 2016.

66. Kraemer, Kristin M. There May Be an App for That, but Pasco Only Welcomes Fingerprinted For-Hire Drivers. *Tri-City Herald*, April 4, 2017. http://www.tri-cityherald.com/news/business/article142754424.html. Accessed April 6, 2017.

67. Zielinksi, Alex. City Will Pay Uber, Lyft Drivers to Take a Criminal Background Check. *San Antonio Current*, March 8, 2017. http://www.sacurrent.com/the-daily/archives/2017/03/08/city-will-pay-uber-lyft-drivers-to-take-a-criminal-background-check. Accessed April 1, 2017.

68. Lyft, Inc. Driver Requirements. https://help.lyft.com/hc/en-us/articles/213585758. Accessed June 15, 2016.

69. Uber Technologies, Inc. Driving Jobs vs. Driving with Uber. https://www.uber.com/driver-jobs. Accessed May 20, 2016.

70. Insurance Institute for Highway Safety. Teenagers. November 2016. http://www.iihs.org/iihs/topics/t/teenagers/fatalityfacts/teenagers. Accessed August 23, 2017.

71. Occupational Safety and Health Administration. *Preventing Violence against Taxi and For-Hire Drivers*. U.S. Department of Labor, April 2010. https://www.osha.gov/Publications/taxi-driver-violence-factsheet.pdf. Accessed August 23, 2017.

72. Feeney, Matthew. Is Ridesharing Safe? Cato Institute, January 27, 2015. https://www.cato.org/publications/policy-analysis/ridesharing-safe. Accessed August 23, 2017.

73. California Public Utilities Commission. Required Reports TNCs Must Provide the CPUC. State of California. http://www.cpuc.ca.gov/General.aspx?id=3989. Accessed August 24, 2017.

74. California Public Utilities Commission. TNC Accessibility Plan and Driver Training Program Details. State of California. http://www.cpuc.ca.gov/General.aspx?id=3046. Accessed August 24, 2017.

75. Lyft, Inc. *Lyft Accessibility Plan.* http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Licensing/Transportation_Network_Companies/LyftAccessibilityPlan.pdf. Accessed August 24, 2017.

76. Lyft, Inc. The Mentor Inspection. https://help.lyft.com/hc/en-us/articles/214219507. Accessed July 30, 2017.

77. Lyft, Inc. Set Your Vehicle Up Correctly. https://help.lyft.com/hc/en-us/articles/213706398-California-Driver-Information#setup. Accessed July 30, 2017.

78. Miranda, Hazel. AB 650 (Low)—Public Utilities Commission: Regulation of Taxicabs. As Amended: May 27, 2016. Memorandum submitted to the California Public Utilities Commission from the Office of Governmental Affairs–Sacramento, June 6, 2016. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M163/K108/163108949.PDF. Accessed July 30, 2017.

79. Lyft, Inc. Taking Breaks and Time Limits in Driver Mode. https://help.lyft.com/hc/en-us/articles/214585717-Taking-breaks-and-time-limits-in-driver-mode. Accessed August 22, 2017.

80. McCahill, C., and M. Ebeling. *Tools for Measuring Accessibility in an Equity Framework.* Congress for the New Urbanism 23rd Annual Meeting, 2015. https://www.cnu.org/sites/default/files/ssti_transpo_equity.pdf. Accessed July 10, 2017.

81. Litman, Todd. *Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transportation Planning*. Victoria Transport Policy Institute, June 11, 2014. https://nacto.org/wp-content/uploads/2015/07/2014_Litman_Evaluating-Transportation-Equity.pdf. Accessed July 13, 2017.

82. Federal Highway Administration. Environmental Justice, Title VI, Non-discrimination, and Equity. U.S. Department of Transportation, March 17, 2017. https://www.fhwa.dot.gov/environment/environmental_justice/equity/. Accessed July 10, 2017.

83. Rayle, L., D. Dai, N. Chan, R. Cervero, and S. Shaheen. Just a Better Taxi? A Survey-Based Comparison of Taxis, Transit, and Ridesourcing Services in San Francisco. *Transport Policy*, No. 45, 2016, pp. 168–178. http://dx.doi.org/10.1016/j.tranpol.2015.10.004. Accessed May 8, 2017.

84. Smith, Aaron. On-Demand: Ride-Hailing Apps. Pew Research Center, May 19, 2016. http://www.pewinternet.org/2016/05/19/on-demand-ride-hailing-apps/. Accessed July 10, 2017.

85. Hall, Jonathan V., and Alan B. Krueger. *An Analysis of the Labor Market for Uber's Driver-Partners in the United States.* Working Paper 22843. National Bureau of Economic Research, November 2016. http://www.nber.org/papers/w22843. Accessed on June 21, 2017.

86. McGrath, Felim. The Demographics of Uber's US Users. Global Web Index, August 16, 2017. https://www.globalwebindex.net/blog/the-demographics-of-ubers-us-users#. Accessed October 3, 2017.

87. Hughes, Ryan, and Don Mackenzie. Transportation Network Company Wait Times in Greater Seattle, and Relationship to Socioeconomic Indicators. *Journal of Transport Geography*, Vol. 56, October 2016, pp. 36–44. http://dx.doi.org/10.1016/j.jtrangeo.2016.08.014 Accessed July 11, 2017.

88. Ge, Y., C. Knittel, D. MacKenzie, and S. Zoepf. *Racial and Gender Discrimination in Transportation Network Companies.* October 27, 2016.

89. Ritchie, Erika. Laguna Beach Partners with Uber to Provide Transportation for Seniors and the Disabled—A First in the U.S. *The Orange County Register*, May 10, 2017. http://www.ocregister.com/2017/05/10/laguna-beach-partners-with-uber-to-provide-transportation-for-seniors-and-the-disabled-a-first-in-the-u-s/. Accessed July 11, 2017.

90. Pinellas Suncoast Transit Authority. Transportation Disadvantaged Program. https://www.psta.net/programs/td-transportation-disadvantage/. Accessed July 7, 2017.

91. Uber Technologies, Inc. Introducing UberAssist. July 14, 2015. https://www.uber.com/blog/los-angeles/introducing-uberassist-la/. Accessed August 23, 2017.

92. Uber Technologies, Inc. Riders with Assistance Needs. Uber Newsroom, August 18, 2017. https://accessibility.uber.com/#riders-with-assistance-needs. Accessed August 23, 2017.

93. Laughlin, Jason. Uber and Lyft's Wheelchair Access Grows, with Room to Improve. *The Inquirer*, July 6, 2017. http://www.philly.com/philly/business/transportation/ubers-wheelchair-accessibility-grows-with-room-for-improvement-20170706.html. Accessed August 23, 2017.

94. Liberty Mobility Now. About Us. http://libertymobilitynow.com/about-us/. Accessed July 11, 2017.

95. Liberty Mobility Now. Liberty in Texas. http://libertymobilitynow.com/texas/. Accessed July 11, 2017.

96. Federal Deposit Insurance Corporation. 2015 FDIC National Survey of Unbanked and Underbanked Households. June 29, 2017. https://www.fdic.gov/householdsurvey/. Accessed July 13, 2017.

97. Bhattacharya, Ananya. Uber Now Accepts Cash in 6 Countries. CNN Money, November 5, 2015. http://money.cnn.com/2015/11/05/technology/uber-cash-payments-indonesia-the-philippines/index.html. Accessed July 11, 2017.

98. Heilman, Wayne. A First for Uber in the US—and It's Happening in Colorado Springs. *The Gazette*, January 11, 2017. http://gazette.com/uber-to-debut-new-technology-for-us-drivers-in-colorado-springs/article/1594117. Accessed July 11, 2017.

99. Pew Research Center. Mobile Fact Sheet. January 12, 2017. http://www.pewinternet.org/fact-sheet/mobile/. Accessed July 12, 2017.

100. Shaheen, S., A. Cohen, and I. Zohdy. *Shared Mobility: Current Practices and Guiding Principles*. No. FHWA-HOP-16-022. Federal Highway Administration, 2016.

101. Transportation Research Board. *Special Report 319 Between Public and Private Mobility: Examining the Rise of Technology-Enabled Transportation Services.* National Academies of Sciences, 2015. http://onlinepubs.trb.org/onlinepubs/sr/sr319.pdf. Accessed July 12, 2017.

102. Conger, Kate. Uber Shared 14 Million Users' Info with the Government, Transparency Report Says. Tech Crunch, April 12, 2016. https://techcrunch.com/2016/04/12/uber-shared-14-million-users-info-with-the-government-transparency-report-says/. Accessed July 28, 2017.

103. Uber Technologies, Inc. Introducing Uber Movement. January 8, 2017. https://newsroom.uber.com/introducing-uber-movement/. Accessed July 30, 2017.

104. Feigon, Sharon, and Colin Murphy. *TCRP Research Report 188: Shared Mobility and the Transformation of Public Transit.* Transit Cooperative Research Program, 2016.

105. American Public Transportation Association. APTA Study: Uber, Lyft Users More Likely to Use Public Transit. *Passenger Transport*, March 18, 2016. http://newsmanager.commpartners.com/aptapt/issues/2016-03-18/index.html. Accessed July 30, 2017.

106. Cohen, Boyd, and Jan Kietzmann. Ride On! Mobility Business Models for the Sharing Economy. *Organization and Environment*, Vol. 27, No. 3, 2014, pp. 279–296.

107. Lazo, Luz. Uber Flirts with Transit Agencies across the U.S. for a Share of Paratransit Services. *The Washington Post*, March 5, 2016. https://www.washingtonpost.com/local/trafficandcommuting/uber-flirts-with-transit-agencies-across-the-us-for-a-share-of-paratransit-services/2016/03/05/5eb8b118-d751-11e5-9823-02b905009f99_story.html. Accessed July 30, 2017.

108. Koffman, David. Transportation Network Companies and Paratransit: Issues and Opportunities. *Paratransit: Shaping the Flexible Transport Future*, 2016, pp. 377–390.

109. Silver, Nate, and Reuben Fischer-Baum. Public Transit Should Be Uber's New Best Friend. FiveThirtyEight, August 28, 2015. http://fivethirtyeight.com/features/public-transit-should-be-ubers-new-best-friend/. Accessed July 30, 2017.

110. Spector, Julian. Why Transit Agencies Are Finally Embracing Uber. CityLab, April 11, 2016. https://www.citylab.com/transportation/2016/04/uber-lyft-ridesharing-apps-public-transportation/475908/. Accessed July 28, 2017.

111. Shaheen, Susan, and Nelson Chan. Mobility and the Sharing Economy: Potential to Facilitate the First- and Last-Mile Public Transit Connections. *Built Environment*, Vol. 42, No. 4, 2016, pp. 573–588.

112. Federal Transit Administration. Fiscal Year 2016 Mobility on Demand (MOD) Sandbox Program Projects. May 18, 2017. http://www.transit.dot.gov/research-innovation/fiscal-year-2016-mobility-demand-mod-sandbox-program-projects. Accessed May 23, 2017.

113. Hudson, Travis. DART, Lyft Collaborate to Give North Texans More Transit Options. DART Daily, October 26, 2015. http://dartdallas.dart.org/2015/10/26/dart-lyft-collaborate-to-give-north-texans-more-transit-options/. Accessed June 19, 2017.

114. Dart Daily. DART Receives $1.2 Million to Improve Its GoPass Ticketing App. October 13, 2016. https://dartdallas.dart.org/2016/10/13/dart-receives-1-2-million-to-improve-its-gopass-ticketing-app/. Accessed July 28, 2017.

115. Pinellas Suncoast Transit Authority. Public Private Partnership Increases Transportation Access in Pinellas Park and East Lake. https://psta.net/about-psta/press-releases/2016/public-private-partnership-increases-transportation-access-in-pinellas-park-and-east-lake/. Accessed June 19, 2017.

116. Bliss, Laura. A Denver Suburb Bets Big on Free Lyft Rides to Light Rail. CityLab, August 9, 2016. http://www.citylab.com/transportation/2016/08/centennial-lyft-transit-partnership/495080/. Accessed June 19, 2017.

117. Centennial, Colorado. Staff Report. August 5, 2016. http://sire.centennialco.gov/sirepub/cache/2/ylz1zjmf1eki12rkezwxgde2/9886010032017085923350.PDF. Accessed October 3, 2017.

118. Mass Transit. RideKC: Bridj Expands Service to the River Market. May 2, 2016. http://www.masstransitmag.com/press_release/12201824/ridekc-bridj-expands-service-to-the-river-market. Accessed June 19, 2017.

119. Marshall, Aarian. How a Failed Experiment Could Still Be the Future of Public Transit. Wired, March 6, 2017. http://www.wired.com/2017/03/failed-experiment-still-future-public-transit/. Accessed June 19, 2017.

120. Corporate Partnership Board. *Shaping the Relationship between Public Transport and Innovative Mobility.* International Transport Forum, 2017.

121. Kramer, Matt. Ticket to Deride: Sacramento Labor Group, RT Clash over New Ride-Sharing Partnership. News Review, October 13, 2016. http://www.newsreview.com/sacramento/ticket-to-deride-sacramento-labor/content?oid=22461909. Accessed July 28, 2017.

122. Metra. Uber Named Metra's Official Rideshare Partner. December 14, 2016. http://metrarail.com/about-metra/newsroom/uber-named-metra%E2%80%99s-official-rideshare-partner. Accessed June 19, 2017.

123. Sung, Morgan. MBTA Partners with Uber and Lyft for Paratransit Ride Pilot Program. WGBH News, September 19, 2016. http://news.wgbh.org/2016/09/19/politics-government/mbta-partners-uber-and-lyft-paratransit-ride-pilot-program. Accessed June 19, 2017.

124. Schena, Susan C. PSTA, Uber Offer Free, Late-Night Rides for Low-Income Residents. Patch, July 21, 2016. http://patch.com/florida/clearwater/psta-uber-offer-free-late-night-rides-low-income-residents. Accessed June 19, 2017.

125. City of Centennial. *Go Centennial Final Report: June 2017.* 2017.

126. Macek, Nathan M., Elizabeth G. Neely, and Ella C. Claney. *TCRP Research Report 191: Public Transportation Guidebook for Small- and Medium-Sized Public-Private Partnerships.* Transit Cooperative Research Program, 2017.

127. Federal Transit Administration. Shared Mobility. U.S. Department of Transportation, January 30, 2017. https://www.transit.dot.gov/shared-mobility. Accessed August 23, 2017.

128. Buhr, Sarah. Lyft Launches a New Self-Driving Division and Will Develop Its Own Autonomous Ride-Hailing Technology. Tech Crunch, July 21, 2017. https://techcrunch.com/2017/07/21/lyft-launches-a-new-self-driving-division-called-level-5-will-develop-its-own-self-driving-system/. Accessed July 30, 2017.