Ride-hailing and Urban Transportation: Evidence and Policy*

Jonathan D. Hall†

February 6, 2026

Abstract

Ride-hailing has evolved from a disruptive innovation into ordinary infrastructure used daily by millions of people around the world. While this growth reflects the substantial benefits ride-hailing provides to travelers, it has not come without costs, and important policy questions remain unresolved. Answering these questions is increasingly urgent as autonomous vehicles promise to lower the cost of ride-hailing trips, expanding the scale of the sector. This paper identifies key unresolved policy questions and research priorities in four areas: externalities and market interactions, taxation, integration with public transit, and labor market regulation. Beyond these policy applications, this paper examines how ride-hailing provides an empirical laboratory for studying economic behavior more broadly.

KEYWORDS: Ride-hailing, public transportation, two-sided markets, autonomous vehicles, labor regulation, taxation

JEL CODES: R40, R48, O33, J88, H23

1 Introduction

Since its introduction in the early 2010s, ride-hailing has become an ordinary part of urban travel. In 2024, Uber, Lyft, and Didi facilitated more than 28 billion trips worldwide (Uber Technologies, Inc., 2025c, DiDi Global Inc., 2025, Lyft, 2025).[1] In the United States, ride-hailing accounted for 0.4% of all person-trips in 2022, more than twice the share of air travel and nearly eight times that of taxicabs or limos (U.S. Department of Transportation, 2024).

Ride-hailing's rapid growth reflects genuine consumer benefits. Ride-hailing is cheaper, quicker to show up, and more reliable than taxis (Rayle et al., 2016, Brown and LaValle,

*I thank Grant Benjamin, Bryn Walsh, the editor, and the two anonymous referees for their helpful comments.

†Department of Economics, Finance, and Legal Studies, University of Alabama, Box 870224, Tuscaloosa, Alabama 35487, USA jonathan.hall@ua.edu

[1] Trips include both ride-hailing and delivery orders.

2020). These service improvements translate into large, measurable consumer welfare gains. Cohen et al. (2016) use surge pricing variation to estimate that consumers gain $1.60 in surplus for every dollar spent on UberX; extrapolating nationally, total U.S. consumer surplus in 2015 was approximately $6.8 billion. Ming et al. (2025) finds similar magnitudes in China, estimating consumer surplus at $13.25 billion in 2024. Christensen et al. (2023) conduct a price discount experiment in Egypt, finding that a 50% reduction in the cost of ride-hail would yield consumer welfare benefits worth 6.1% of GDP. Castillo (2025) estimates that surge pricing alone increases rider surplus by 3.57% of gross revenue.

These consumer benefits, however, have not come without costs, and there remain a number of unresolved policy questions. This paper examines unresolved policy questions and research priorities in four areas: externalities and market interactions, taxation, transit integration, and labor market regulation. Beyond these policy applications, this paper examines how ride-hailing provides an empirical laboratory for studying economic behavior more broadly.

The urgency of resolving these policy questions stems from the rapid scaling of autonomous vehicles (AVs), which are already operating on public roads and expanding rapidly. Waymo alone completed over 4 million autonomous rides in 2024 (Waymo, 2024), up from 700,000 in 2023 (Waymo, 2023), and as of May 2025 provides more than 250,000 rides per week—an annualized rate of 13 million—across four cities (Waymo, 2025b), with plans to be operating in 17 cities by the end of 2026 (Waymo, 2025c, Bellan, 2025, Waymo, 2025a,d,e, Metzger, 2025). Inasmuch as AVs are deployed via ride-hailing models, rather than private ownership, this will amplify the policy challenges already evident with human-driven ride-hailing. While Waymo rides currently cost 31–41% more than Uber or Lyft for comparable trips (Obi, 2025), if AVs reduce costs substantially, ride-hailing's modal share could grow from today's 0.4% (U.S. Department of Transportation, 2024) to a much larger fraction of trips. The policy frameworks established for human-driven ride-hailing will shape the governance of a much larger AV-based mobility system; therefore, establishing sound frameworks now is essential. Path dependence and entrenched interests will make later reform increasingly difficult.

2 Externalities and Market Interactions

Because ride-hailing relies on automobiles, it imposes the familiar unpriced automobile externalities: congestion, fatalities, and pollution. Understanding ride-hailing's impact on these externalities requires examining how ride-hailing affects urban systems through three key channels: mode choice, vehicle supply responses, and spatial equilibrium adjustments. A fundamental analytical challenge lies in understanding the interactions between these channels: congestion affects mode choice, which alters vehicle supply, which reshapes spatial equilibrium, which feeds back into mode choice, and so on.

2.1 Causal Channels

I examine each channel in turn, beginning with mode choice. The externalities from ride-hailing depend fundamentally on its mode-substitution patterns. When ride-hailing draws travelers from transit, walking, or biking, it increases automobile trips and worsens congestion and air pollution. When it enables car-free lifestyles or reduces drunk driving, it generates substantial social benefits. The net effect is ambiguous even for car-to-car substitution: replacing a personal automobile trip with ride-hailing eliminates cruising for parking (Shoup, 2011) and reduces per-passenger vehicle miles when trips are pooled, but adds deadheading miles as drivers travel to pick up the next passenger. A growing empirical literature attempts to resolve this ambiguity, with particular focus on substitution from public transit.

The simple trip-by-trip substitution patterns conceal more complex mechanisms. Understanding modal substitution requires distinguishing short-run, trip-level effects from long-run, system-level adjustments. Hall et al. (2018) and Gonzalez-Navarro et al. (2025) formalize this distinction: at the trip level, ride-hailing can substitute for any existing mode by offering greater convenience at lower cost than traditional taxis, but it can also complement other modes by addressing their limitations. First, it fills systematic gaps in other modes' service coverage: transit's fixed routes and schedules limit geographic and temporal reach, while walking and biking face natural distance constraints. Second, it provides insurance against uncertain contingencies: adverse weather that makes active modes unappealing, transit delays or service disruptions, late-night returns after scheduled service ends, or unexpected schedule changes that strand travelers away from their vehicles. These complementarity mechanisms are asymmetric; travelers who use transit or walk outbound can easily use ride-hailing to get home, while those who drive must recover their stranded vehicle later.

An empirical challenge is that short-run and long-run substitution patterns differ. For example, consider a traveler who sold her car because ride-hailing now provides insurance for urgent trips. On a day when she actually uses ride-hailing, the short-run substitution is from transit to ride-hailing. But without ride-hailing's insurance value, she would have kept her car and driven, so the long-run substitution is from automobile to a portfolio of mostly transit and occasionally ride-hail. This means we must be cautious in interpreting survey evidence on substitution patterns.

The second channel operates through vehicle supply. The existence of ride-hailing changes the incentives to own a vehicle. Those who become ride-hail drivers may purchase vehicles specifically for that purpose, while those who use ride-hailing for personal trips may reduce their household vehicle ownership. While increased demand for for-hire trips increases the number of vehicles, each vehicle is used more efficiently than traditional taxis (Cramer and Krueger, 2016), counteracting this effect at least somewhat. The net effect on the size of the vehicle fleet depends on the relative magnitudes of these opposing forces. As people change their vehicle ownership decisions, this impacts their marginal cost of driving, changing how much they drive, and, over longer horizons, where they choose to live.

The third channel operates through spatial equilibrium. Ride-hailing, like other new transportation technologies before it, changes transportation costs, altering the value of urban locations and inducing changes in land use.[2] This includes increasing accessibility to neighborhoods without good public transportation links (Gorback, 2024), stimulating demand for restaurants and other local consumption amenities (Norris and Xiong, 2023, Gorback, 2024), reducing the demand for parking (Henao and Marshall, 2019), and expanding the catchment area for public transit (Gonzalez-Navarro et al., 2025). These accessibility changes can reshape urban form along multiple margins. Improved access to transit-poor neighborhoods may flatten rent gradients, encouraging peripheral development. Conversely, reduced parking demand can free land for redevelopment in dense areas, while expanded transit catchment areas increase development potential along transit corridors. The net effect on citywide density and form remains theoretically ambiguous; however, these changes will further impact vehicle ownership and mode-choice decisions.

2.2 Empirical Estimates and Open Questions

The three channels outlined above—mode substitution, vehicle supply, and spatial equilibrium—explain how ride-hailing generates urban externalities. Good policy requires quantitative estimates of these mechanisms and the resulting externalities, yet the empirical literature reveals substantial disagreement over ride-hailing's externalities and impact on related markets. Cairncross et al. (2026) conduct a meta-analysis of the literature estimating the impact of ride-hailing on transit ridership, congestion, and fatalities, finding substantial heterogeneity in estimated effects. For example, transit ridership effects range from -38.9% to +146% while travel time effects span from -4.5% to +29.0%. Despite this variation, average effects across transit, congestion, and fatalities are statistically insignificant and near zero, with 25–41% of studies reporting null results. Studies of the impact of ride-hailing on vehicle ownership reveal similarly divergent findings: Barrios et al. (2022) and Ward

[2] For example, LeRoy and Sonstelie (1983), Baum-Snow (2007), and Heblich et al. (2020) document how automobiles, highways, and steam railways have reshaped cities.

et al. (2021) find an increase, Diao et al. (2021) and Pang and Shen (2022)[3] find no effect, and Ward et al. (2019), Liu et al. (2025), and Guo et al. (2019) find a decrease.

This heterogeneity likely reflects two sources. First, genuine contextual differences: the externalities from ride-hailing should vary across cities depending on their local context (e.g., baseline transit service, population density, parking costs, regulatory frameworks, etc.). The mechanisms outlined above operate differently in San Francisco than in Phoenix. Second, methodological differences: variation in identification strategies, data quality, and treatment definitions across studies can generate divergent estimates even when true effects are similar.

Disentangling these sources of heterogeneity is a research priority. First, improved identification strategies and better data are essential. Anderson and Davis (2023) demonstrate the value of granular data: using Census tract-month variation in ride-hailing activity, rather than binary market entry, they find ride-hailing reduces U.S. traffic fatalities by 5.2% in areas where it operates. Similarly, many existing studies use two-way fixed effects, but recent research shows this is problematic when treatment timing varies and treatment effects evolve dynamically (Roth et al., 2023). Re-examining these studies with robust difference-in-differences methods could alter our understanding of ride-hailing's effects. Second, future research must identify which contextual factors determine ride-hailing's externalities. Without an understanding of mechanisms and context, policymakers cannot assess how ride-hailing is impacting their city, let alone which interventions are called for.

Beyond methodological refinements, the literature lacks evidence on long-run impacts. Studies typically estimate treatment effects within a few years of market entry, yet the three channels identified above operate on different timescales. Mode substitution adjusts almost immediately as travelers experiment with ride-hailing and revise travel patterns. Vehicle ownership responds more slowly, perhaps over 3–5 years, as households replace or forgo purchasing cars. Spatial sorting and land-use adjustments unfold over decades as leases expire, zoning changes, and developers respond to altered accessibility patterns. This suggests that entry effects may not reflect steady-state impacts.

The complexity of ride-hailing's urban impacts demands structural models that capture feedback between mode choice, vehicle supply, and spatial equilibrium. Current reduced-form estimates cannot predict how interventions targeting one margin affect others through equilibrium adjustments. Dynamic models that jointly incorporate land use, transportation, and housing markets would enable counterfactual analysis of policies affecting all three channels simultaneously. Additionally, distributional analysis deserves greater attention. Ride-hailing may enhance mobility for carless households while imposing congestion costs

[3] Pang and Shen (2022) finds a 0.5% increase in the share of households with automobiles but no change in the total number of automobiles.

on all travelers, a trade-off that requires explicit welfare weighting across heterogeneous populations.

Addressing these empirical and modeling challenges is vital because they inform the policy-relevant question: how to address ride-hailing's externalities. Policymakers cannot predict how interventions will impact their city without understanding which mechanisms dominate locally and how they interact. Optimal policy must account for multiple margins simultaneously, as interventions targeting one externality affect others through the channels identified above.

3 Taxation

Economists typically justify taxing a specific industry by appealing to externalities, and ride-hailing generates familiar ones: congestion, emissions, road wear, and crash risk. In practice, however, taxation reflects multiple objectives. Lehe et al. (2025) identifies three motivations: addressing externalities, raising revenue, and incorporating ride-hailing into existing for-hire vehicle regulatory structures. Documenting 51 distinct excise taxes across U.S. jurisdictions, Lehe et al. (2025) reveals substantial heterogeneity in design. Jurisdictions differ in whether the tax is per-ride (76%) or ad valorem (24%), and whether it is a flat charge (78%) or depends on trip characteristics (22%), such as solo vs. pooled rides, low-emissions vehicles, or pickup location. While there is some work on the optimal taxation of ride-hailing, summarized below, there is still much to learn about the optimal structure of these taxes.

Recent theoretical work examines the interaction between ride-hailing taxes, urban spatial structure, and congestion externalities. Agrawal and Zhao (2023) use a pseudo-monocentric city model to show that whether ride-hailing complements or substitutes for transit depends on policy design, not just technology. Interestingly, they find that a tax on ride-hailing improves welfare and reduces congestion more than a broad-based congestion charge raising the same revenue, though the optimal congestion charge still dominates their ride-hailing tax.

Zhang and Nie (2022) compare three policy instruments in a two-zone spatial equilibrium model with endogenous congestion: trip-based fees on solo rides, cordon-based tolls on vehicles entering the central business district, and cruising caps that mandate minimum fleet utilization rates. The trip-based fee performs best, modestly reducing congestion while promoting pooling and generating tax revenue. The cruising cap, however, can backfire. To meet utilization requirements, platforms reduce fares in the already-congested center, attracting more trips and worsening traffic despite reducing vacant cruising. This result underscores that policies targeting symptoms, such as empty vehicles circling for passengers, can fail if they distort price signals that would otherwise allocate trips efficiently.

Ostrovsky and Yang (2024) identify a design flaw in New York City's congestion pricing scheme: the policy imposes much higher per-trip charges on personal vehicles than on taxis, ride-hail, and delivery vehicles.[4] This differential treatment violates both equity and efficiency principles. Equity requires that similar contributors to congestion face similar charges; yet ride-hail and personal vehicles generate comparable congestion per mile traveled, while facing vastly different per-trip fees. Efficiency requires that prices reflect marginal social cost; yet the policy charges based on vehicle type rather than congestion contribution.

The efficiency loss extends beyond misaligned prices. Personal vehicles account for only one-third of vehicle miles traveled in Manhattan's central business district, so two-thirds of congestion-generating activity faces minimal taxation. As the tax reduces trips in personal vehicles, congestion initially improves and travel times fall. Lower travel times then induce additional trips by taxi and ride-hail (the relatively untaxed modes), partially offsetting the original congestion reduction. The policy thus provides less congestion relief per dollar of revenue than a uniform per-mile charge would deliver.

Zha et al. (2016) and Vignon et al. (2021, 2023) propose an alternative regulatory instrument: a cap on the platform's per-trip commission, defined as the absolute difference between the rider fare and the driver payment. They show that such caps can achieve second-best outcomes addressing both market power and congestion externalities. Capping commissions limits the platform's markup, so the platform can increase profit only by serving more trips. Residual prices continue to signal congestion costs to riders, with optimal caps set higher for pooled rides, which generate lower per-passenger externalities, than for solo trips. A practical benefit of this approach is that it regulates a single policy variable rather than requiring complex multi-part tax schedules.[5]

There is a growing body of empirical work on the impact of these taxes. Tarduno (2025) and Leccese (2024) both find that ride-hailing taxes are borne primarily by passengers rather than drivers, consistent with earlier findings that driver labor supply is highly elastic (Hall et al., 2023). Incidence, however, varies spatially with access to alternatives: demand is highly inelastic in neighborhoods with poor transit and low car ownership, and more elastic where substitutes are available. Leccese (2024) documents that minority

[4]Passenger vehicles pay $9.00 per entry during daytime hours ($4.50 per trip assuming round-trip travel). Taxis and ride-hail vehicles pay $0.75 and $1.50 per trip, respectively. The MTA designed these differential rates to equalize total daily payments: taxis making approximately 12 trips per day and ride-hail vehicles making 6 trips both pay roughly $9.00 daily (Traffic Mobility Review Board, 2023).

[5]The cap must be an absolute dollar amount; a percentage-based cap would allow the platform to raise revenues by increasing fares, preserving the market-power distortion. Platforms may also try to evade the cap by introducing ancillary fees, so the cap should encompass all platform-retained revenue per trip.

neighborhoods bear a disproportionate share of the tax burden because they tend to have fewer transit alternatives, paying higher effective tax rates because their less elastic demand prevents them from substituting away from ride-hailing as easily as riders in better-served areas.

Several open questions remain for research on ride-hailing taxation. First, what is the optimal tax design in two-sided markets with congestion externalities?[6] Ride-hailing markets exhibit some, but not all, canonical features of two-sided markets. Platforms coordinate matching and pricing between riders and drivers, creating cross-side network effects. However, drivers typically multihome across platforms, and riders face low switching costs, which weakens the platform's ability to exploit network externalities as predicted by classic models. Whether these deviations meaningfully alter optimal tax design remains an open question.

Second, how does market structure impact optimal policy? Most theoretical models assume platform monopoly, yet ride-hailing markets exhibit varying degrees of competition across cities and over time, and optimal policy likely depends on market structure.

Third, should taxes designed to internalize congestion vary by time of day and location, as optimal congestion charges would? The app-based nature of ride-hailing makes such differentiation technically feasible. However, this adds complexity, and the literature on second-best pricing shows that when some congestion sources remain unpriced, such as taxis, private vehicles, or delivery services, it is optimal to undertax the margin that can be taxed (e.g. Verhoef, 2002). This logic cautions against aggressive taxation of ride-hailing alone.

Fourth, the theoretical models so far have assumed perfect information. Setting any of these instruments optimally requires knowledge of local demand and supply elasticities, and externality magnitudes that vary across contexts. What spatial and temporal resolution for taxation is feasible given realistic information constraints remains an open question. What instruments are most robust to imperfect information, or require less information ti implement? For example, if regulators lack real-time congestion data while platforms possess it, can mechanism-design principles yield implementable contracts such as congestion-indexed surcharges that induce platforms to reveal and act on superior information?

Finally, does behavioral incidence matter? If riders respond differently to explicit taxes labeled as "congestion fees" than to equivalent fare increases framed as "airport surcharges," optimal policy may depend not only on elasticities but also on how charges are presented.

[6] For a comprehensive treatment of two-sided markets, see Jullien et al. (2021).

4 Integrating Ride-hailing with Public Transportation

While taxation addresses ride-hailing's externalities through price signals, complementary policies can enhance ride-hailing's potential benefits. The goal of integrating ride-hailing with public transportation is to pair the strengths of traditional transit fixed-route service with the flexibility of ride-hailing. However, the best ways of doing so remain an open question.

Such integration can be coordinated by transit agencies, organized by ride-hailing platforms, or emerge organically as riders combine modes on their own. Whether public coordination improves on these market-driven approaches—through better information, subsidies, or service design—remains an open question. This section focuses on transit agencies' experiments, an area of active policy debate.

Transit agencies have experimented with on-demand services to achieve three objectives: improving first- and last-mile connectivity to fixed-route transit,[7] replacing underperforming fixed routes in low-density areas or providing service in areas where fixed-route service is infeasible,[8] and reducing paratransit costs.[9] Programs differ in structure. Some agencies operate in-house on-demand services,[10] while others contract with Uber, Lyft, or Via,[11] typically capping riders' fares at transit-equivalent levels or providing a per-trip subsidy.[12]

Transit agencies choosing between fixed-route buses and on-demand services, such as ride-hailing or microtransit, face a classic trade-off. Fixed-route buses entail high fixed

[7]Examples include Metrolinx's *GO Connect* pilot with RideCo in the Greater Toronto Area (Canada); MARTA Reach in Atlanta; the Bridj demand-responsive shuttle pilots in Sydney and Adelaide (Australia); MuvMi in Bangkok (Thailand), which uses electric tuk-tuks to connect neighborhoods to the mass-transit network; the *PSTA Direct Connect* program in Pinellas County, Florida; *AC Transit Flex* in California's East Bay; Summit, New Jersey's Rideshare Program connecting commuters to train stations; Seattle's *Via to Transit* service; and Denver's *Go Centennial* pilot feeding light rail.

[8]Examples include *Innisfil Transit* in Ontario, which replaced local bus service with subsidized Uber trips; *GoMonrovia Lyft Pass* in California; *SV Hopper* in Cupertino and Santa Clara, California; *MK Connect* in Milton Keynes (UK); *Go2* in Sevenoaks (UK); Berlin's *BerlKönig* pilot and Munich's *IsarTiger*, each targeting low-density suburbs; *GoLink* zones of Dallas Area Rapid Transit (U.S.); *OmniRide Ridesharing* in northern Virginia; *Via Jersey City* and *Via West Sacramento*; Arlington, Texas' Via service that replaced all fixed routes; and *Sydney On Demand* in New South Wales (Australia).

[9]Paratransit serves riders with disabilities under the Americans with Disabilities Act. Examples include Massachusetts Bay Transportation Authority's *The RIDE Flex* program with Uber and Lyft in Boston; *MetroAccess Abilities-Ride* in Washington, DC; and the *Go Sudbury! Transportation Program* in Sudbury, Massachusetts.

[10]Examples include *Marin Transit Connect* in California, which operated its own fleet with wheelchair-accessible vehicles; *LA Metro Micro*; *BerlKönig* in Berlin; and *GoLink* zones of Dallas Area Rapid Transit, which use agency-operated vans supplemented by Uber for overflow demand.

[11]Examples include *Innisfil Transit* in Ontario (subsidized Uber trips); Summit, New Jersey's Rideshare Program for commuters; *GoMonrovia Lyft Pass* in California; *MBTA The RIDE Flex*'s integration with Uber and Lyft for paratransit; and *PSTA Direct Connect* using Uber and taxi partners.

[12]Fare structures vary: Innisfil charges CA$4–$6 depending on destination; GoMonrovia Lyft Pass subsidizes up to $15 (after a $6 co-pay) with riders covering any excess; MBTA subsidizes up to $40 per paratransit trip (after a $3 co-pay); and Pinellas Direct Connect initially capped agency subsidy at $5 per trip.

costs but low marginal costs, while on-demand services reverse this pattern—low fixed costs but high marginal costs. For areas with low demand, this reduces average operating costs. The on-demand service is also usually better since the door-to-door service provides shorter travel times than an infrequent fixed-route service that likely requires transfers. This reduction in time costs leads to more people using the service; however, if too many people do so, then the transit agencies' total costs can increase. An additional issue is that while shared rides reduce costs, providing door-to-door rather than stop-to-stop service can add detours that undermine the time savings of on-demand service.

The same economic logic explains agencies' interest in using on-demand services to improve first- and last-mile connectivity to fixed-route transit. The cost of reaching a transit stop (the access cost) is often a large share of total travel time, especially in low-density or transit-poor areas where walking distances are long and feeder buses run infrequently. By reducing these access costs, ride-hailing can expand the effective catchment area of high-capacity modes such as rail and bus rapid transit, increasing their ridership and improving welfare. Better access may also increase the spatial efficiency of the transit network by allowing agencies to concentrate fixed-route service on high-demand corridors while relying on on-demand service for local distribution. A further benefit of lowering access costs is that it enables high-capacity fixed-route services to operate with fewer stops and higher average speeds, reinforcing their comparative advantage in dense corridors.

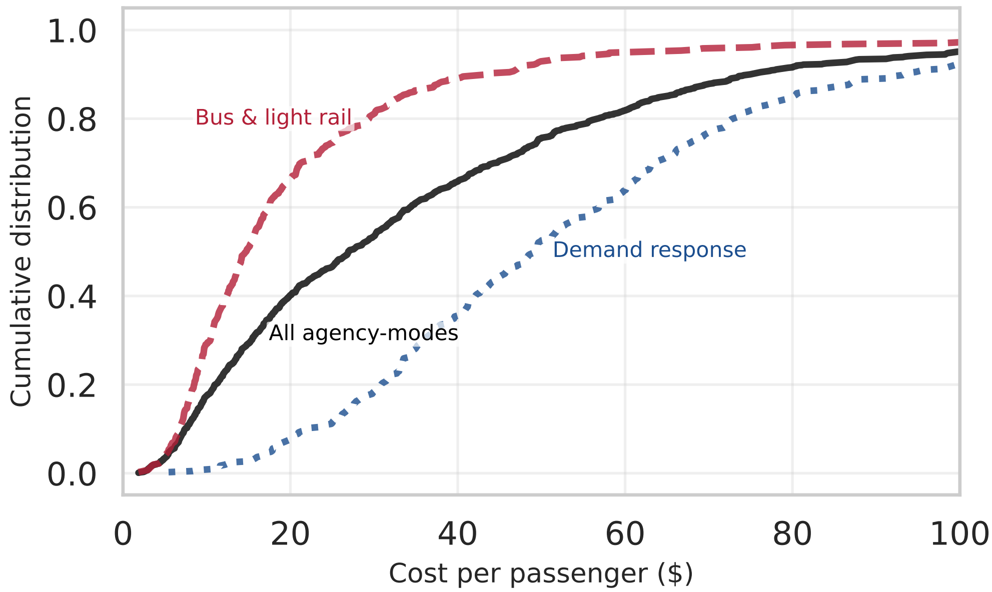
Designing programs that integrate public transit and on-demand service requires balancing the efficiency gains from flexible service against the economies of scale and network coordination inherent to fixed-route transit. Clarifying these trade-offs requires theoretical models that capture both user behavior and system-level externalities, together with empirical evidence on costs, travel times, and rider responses.[13]

The magnitude of these trade-offs becomes clear when comparing the cost of on-demand and fixed-route service. In the U.S., the median Uber and Lyft fare, $15.99 in 2024 (Lung, 2025b), is lower than what it costs many public transit agencies to provide a single trip. Figure 1a shows the distribution of operating costs per passenger for all U.S. transit agency–mode pairs in 2024, using data from Federal Transit Administration (2025). Most agencies spend more per passenger than the typical Uber or Lyft trip: 68% exceed the median ride-hail fare, and 43% spend at least twice that amount. Even when focusing on modes most directly comparable to ride-hailing, bus and light rail, nearly half of agency-mode pairs operate at higher cost, and about one in six spend more than double.

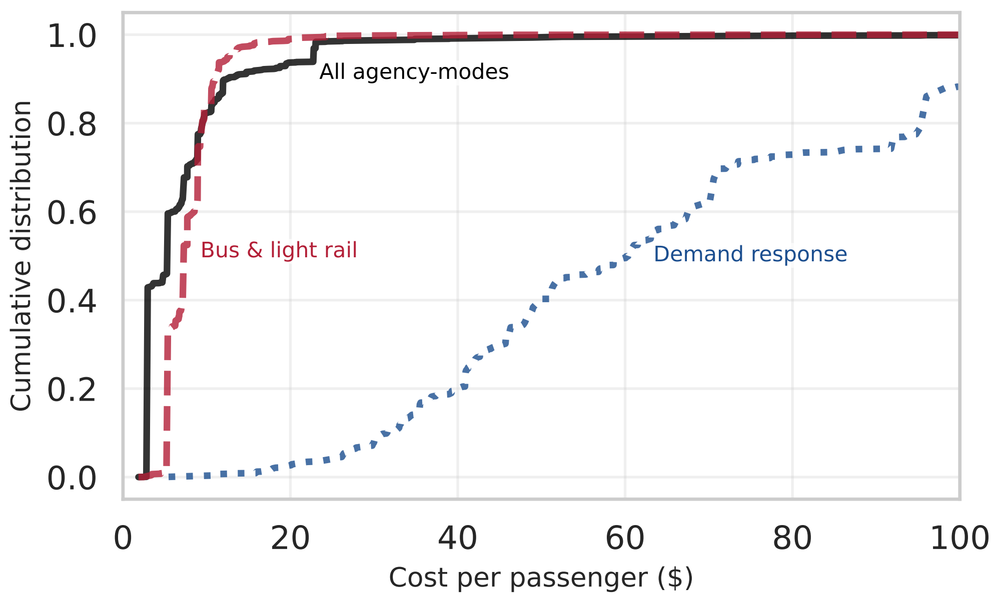
These averages conceal large differences in scale. The high-cost agency-mode pairs tend to have low ridership and account for a small share of transit trips in the United

[13]There is a small engineering literature on this topic (e.g., Papanikolaou and Basbas, 2020, Itani et al., 2024), and several case studies of existing projects (e.g., Hazan et al., 2019, Weigl et al., 2022).

Figure 1: Cost per Passenger



(a) Unweighted (across agency-modes)



(b) Weighted by unlinked passenger trips

Notes: This figure shows the cumulative distribution of operating costs per passenger for U.S. public transit agencies in 2024. Panel A plots each agency-mode pair as a single observation. Panel B weights each agency-mode pair by unlinked passenger trips, so the distribution reflects typical rider experience rather than typical agency operations. Operating costs exclude capital expenditures. The x-axis is truncated at 100 to improve readability. Data from Federal Transit Administration (2025).

States. To adjust for this, Figure 1b weights each observation by its ridership, so the resulting distribution reflects a typical rider's experience rather than a typical agency's. When viewed this way, only 8% of transit trips occur on systems with average costs above the median ride-hail fare, and just 1% on systems costing twice as much. Among bus and light-rail services, those shares fall to roughly 1.8% and 0.1%, respectively.

These figures suggest that ride-hailing is not a low-cost substitute for most public transit. However, it can be a viable complement in contexts where service is expensive and ridership is sparse, precisely the settings where agencies are experimenting with on-demand services. In such cases, using these services may reduce costs or expand access, but in the dense, high-volume core of the transit network, fixed-route service remains far more efficient on a per-passenger basis.

To understand why transit agencies are also experimenting with ride-hailing for paratransit (e.g., Boston's *RIDE Flex* and Washington DC's *MetroAccess Abilities-Ride*), Figure 1 additionally shows the distribution of operating costs for demand-response services (the National Transit Database category that includes paratransit, dial-a-ride, and other on-demand services). The median cost per passenger for demand-response service is $49.33, about 3.1 times the median Uber or Lyft trip. Fully 78% of agency–mode pairs have costs more than double the median ride-hail fare, and 89% of demand-response trips occur on systems with average costs exceeding twice that benchmark. Paratransit is particularly expensive because it must provide door-to-door service using wheelchair-accessible vehicles. While ride-hailing cannot fully replace these services or serve all passengers who rely on them, it can supplement agency operations and handle a substantial share of eligible trips at lower cost.

Comparing these costs is necessarily imperfect. The reported figures are agency-mode averages that mask considerable within-mode variation across routes and time of day, and they exclude capital costs. Fixed-route transit also has higher capacity, making direct one-for-one comparisons with ride-hailing somewhat misleading. Nonetheless, these data highlight that the economics of on-demand service are most compelling in low-density or specialized markets where the cost of traditional transit is already high.

A natural concern is that trip lengths differ across modes. Average door-to-door distances in the U.S. are 7.1 miles for ride-hailing, 6.5 miles for bus, and 8.4 miles for subway (U.S. Department of Transportation, 2024). On-vehicle distances differ more, and ride-hailing's non-linear pricing—with fixed, distance, and time components—complicates any adjustment. As a robustness check, I estimate a fare–distance relationship using Chicago data, finding predicted fare $= \$7.53 + \$1.40 \times$ distance.[14] Applying this to

[14] $N = 87$ million; $R^2 = 0.64$; standard errors < 0.01. The relatively large intercept reflects the presence of fixed and time-based fare components, as shorter trips tend to be slower on average. Data is for 2024 and is

each agency's average trip distance yields similar results to the per-trip analysis, though commuter bus and rail dominate ride-hailing when accounting for distance.

There are at least three additional ways to integrate ride-hailing with public transit. The first is to recognize that because ride-hailing is used for first- and last-mile trips, providing curb space for drop-offs and pickups is likely helpful. Second, coordinated trip planning can help travelers notice when using ride-hailing for the first- or last-mile is a good option.[15] Third, payment integration can make it easier for travelers to use ride-hailing and transit. While there is research on payment integration, often in the context of mobility-as-a-service subscriptions (e.g., Ho et al., 2018), there is no research on allocating curb space or trip planning.

These experiments raise economic questions that remain largely unresolved. What is the case for public involvement in transit-ride-hailing integration beyond cost-effective delivery of existing mandates? If there are additional market failures—matching externalities (e.g., Arnott, 1996), scale economies in on-demand service, coordination failures between platforms and agencies, or externalities from improved transit access—what is the optimal form of intervention? Should subsidies target ride-hailing directly, or would redesigning transit networks achieve similar goals more efficiently? These questions deserve more attention from researchers.

5 Labor Market Policy and Worker Classification

5.1 Worker Classification

A recurring policy question is how drivers should be classified: as employees, independent contractors, or something in between. The answer determines which protections apply—minimum wage, unemployment insurance, workers' compensation, and collective bargaining rights—and how much discretion platforms retain in structuring the relationship. Platforms argue that drivers value freedom and flexibility, which employee status would undermine (Khosrowshahi et al., 2019), while critics counter that employee status is needed to prevent platforms from shifting costs and risks onto workers (Rosenberg, 2020, Levine, 2025). However, the practical issue is not the legal label per se, but the underlying protections offered to drivers and how those protections constrain platforms.

A central empirical question in the classification debate is how much drivers actually value flexibility. Survey evidence suggests flexibility is a primary attraction: Hall and Krueger (2017) find that Uber drivers cite schedule flexibility as a top reason for working on the platform, and many continue traditional employment while driving part-time.

from City of Chicago (2024).

[15]Transit App and Uber's own app provide this.

Chen et al. (2019) quantify this value using revealed-preference methods. By estimating time-varying reservation wages from drivers' hour-by-hour labor supply decisions, they show that the median driver earns more than twice the surplus from flexible work compared to a counterfactual employment arrangement requiring fixed hours. To benchmark these magnitudes, Mas and Pallais (2017) experimentally vary job attributes in a traditional call-center setting and find that the average worker has low willingness to pay for flexibility, though a substantial right tail exists. The contrast suggests that Uber may disproportionately attract workers who value flexibility highly, precisely those for whom reclassification to employee status would impose the largest welfare losses.

This pattern aligns with evidence that gig economy labor supply responds to income shocks: Farrell and Greig (2016) and Koustas (2019) show that workers earn more from platforms following drops in other earnings, while Dao and Wilson (2025) show that access to gig opportunities reduces participation in SSDI, SSI, and SNAP by 2–5%, demonstrating that gig work serves as alternative insurance that partially crowds out traditional social programs. Koustas (2018) quantifies this insurance value, showing that rideshare income replaces 73% of income losses from main jobs and reduces spending sensitivity to earnings shocks by 82%. These findings indicate that flexibility enables consumption smoothing in ways that fixed-schedule employment cannot. These findings complicate the policy calculus: regulations that constrain when drivers work or impose minimum-hours requirements deliver protections at the expense of the flexibility that many drivers value.

Global jurisdictions have taken divergent approaches to classification. The United Kingdom's Supreme Court ruled in 2021 that Uber drivers are "workers," a middle category that entitles them to minimum wage and holiday pay but not full employee protections like collective bargaining rights or protection from dismissal (Russon, 2021). Ride-hailing drivers had employee status in the Netherlands following a 2021 Amsterdam District Court ruling; however, a 2025 Supreme Court decision complicated this, requiring individual rather than blanket assessment (Sagel et al., 2025). California voters passed Proposition 22 in 2020, explicitly preserving independent contractor status while grafting on targeted protections: earnings floors, partial healthcare subsidies, and occupational accident insurance (Hussain and Bhuiyan, 2020). Massachusetts and Ontario adopted similar hybrid models, guaranteeing minimum compensation without reclassifying drivers as employees (Johnston and Kohli, 2024, Draaisma and Weingarten, 2025). New York City and Seattle took a different path, implementing earnings standards without addressing classification directly, leaving drivers as contractors subject to algorithmic pay formulas (Brustein, 2018, Beekman, 2024). These approaches differ not just in the label applied, but also in the obligations they impose on platforms and the forms of control they permit or restrict.

The classification debate connects to foundational questions in organizational economics about where to draw the boundary of the firm. Coase (1937) and Williamson (1985) argue that when transaction costs are low, market contracting should dominate hierarchical employment. Ride-hailing platforms reduce coordination costs to near zero, suggesting contractor status should be efficient. Yet, the same technology enables cheap monitoring and algorithmic control that traditionally justified bringing production within firm boundaries. Holmstrom and Milgrom (1991) show that when workers perform multiple tasks (completing trips, maintaining service quality, ensuring safety), high-powered incentives like piece rates can distort effort toward measurable dimensions and away from hard-to-measure ones, suggesting that lower-powered wage-like incentives might improve efficiency. In ride-hailing, drivers face pure trip-based pay that rewards speed and volume, while platforms use rider ratings to incentivize service quality, safety, and professionalism, precisely the dimensions that piece rates would otherwise cause drivers to neglect.

The classification debate is an area where theory and empirical research have much to contribute. What is the exact connection between the foundational theories on the boundaries of the firm and the gig economy? Is there a hybrid classification, such as the portable-benefits model, that achieves the best balance of flexibility and protection? How do these different models impact drivers, riders, and platforms? Answering these questions requires models that account for equilibrium adjustments, heterogeneous treatment effects, and the distinctive features of platform labor markets.

5.2 Minimum Wages

One of the key places the issue of employee vs. independent contractor arises is how to respond to reports of drivers' low earnings (net of costs). Should governments take action to guarantee a minimum wage? One challenge in addressing this problem is that driver supply is quite elastic. Hall et al. (2023) finds that when Uber raises fares, drivers work more hours, leading to more idle time, and leaving hourly earnings roughly unchanged, and Chen et al. (2019) estimates the median driver's labor supply elasticity is 1.92.[16] Thus, minimum wage rules must apply to all the time a driver is logged in, rather than just the time they are "engaged" (i.e., have a passenger in the vehicle). Furthermore, for firms to raise workers' earnings, they must add barriers to entry. However, the more the platforms control the hours a driver works, the weaker the case for them being independent contractors, and adding barriers to entry will undermine precisely the flexibility that Chen et al. (2019) show workers value highly.

A growing number of jurisdictions have enacted minimum wage requirements for

[16] A more typical labor supply elasticity is 0.31 (Keane, 2011).

ride-hailing drivers. New York City implemented a $17.22 per hour earnings floor (after expenses) in 2019[17] (Brustein, 2018), followed by Washington State's minimum compensation ordinance in 2022 (Washington State Legislature, 2022). California's Proposition 22 established a 120% minimum wage floor for engaged time plus mileage reimbursement (Hussain and Bhuiyan, 2020). These policies have since spread globally and to state-level jurisdictions.[18]

Platforms have also responded to minimum wage policies by restricting driver access during low-demand periods. Following the implementation of New York City's minimum pay standard in 2019, both Uber and Lyft ceased onboarding new drivers and began limiting the number of drivers allowed on their apps during times of low utilization (Lung, 2025a). In several markets, delivery drivers may attempt to work on the spur of the moment but can only go online if demand permits; otherwise, they must reserve shifts in advance (Uber Technologies Inc., 2023, 2025a,b).

There is limited empirical analysis of these policies. Early descriptive evidence from New York City's 2019 policy shows that average driver earnings increased by approximately 9%, with aggregate driver pay rising by an estimated $340 million in 2019, while passenger wait times fell and trip volumes continued to grow (Koustas et al., 2020). This outcome is consistent with the mechanism described above: by restricting driver access, the platforms prevented the supply-side entry that would otherwise erode hourly earnings. However, total driver hours and trip volumes also changed, complicating welfare assessments. Several key questions remain unresolved: How are welfare effects distributed across driver types (full-time versus part-time, high versus low opportunity cost), rider types (price-sensitive versus time-sensitive), and urban contexts (dense cities with strong transit alternatives versus car-dependent suburbs)? What is the optimal design for earnings floors: should they apply to all logged-on time or only engaged time, and should platforms have flexibility in structuring compensation?

6 Beyond Ride-Hailing: Broader Economic Insights

The preceding sections identified open policy questions about ride-hailing policy. Distinct from these policy questions, ride-hailing provides a valuable empirical laboratory for studying economic behavior that extends well beyond transport policy. At its core, ride-

[17]This is not literally a minimum wage; instead, the minimum fare is adjusted "as needed" so that on average hourly wages are above the earnings floor (Lung, 2025a).

[18]Massachusetts negotiated $32.50 per hour with Uber and Lyft in 2024 (Johnston and Kohli, 2024), the United Kingdom imposed National Living Wage for engaged time following the 2021 Aslam ruling (Russon, 2021), France set a €10.20 minimum ride fare in 2023 (Rosemain, 2023), and Ontario adopted minimum wage for engaged time under its Digital Platform Workers' Rights Act of 2022 (effective 2025) (Draaisma and Weingarten, 2025).

hailing is a two-sided *market*, in which participants on both sides respond to incentives. Workers freely choose participation, effort, and location, while riders decide when and where to travel as prices and wait times adjust in real time. All of these interactions are app-mediated and time-stamped, giving the market enough structure to be analytically legible and enough autonomy to reveal participants' responses to incentives. Two concrete benefits follow from this structure: *(i)* detailed high-frequency data at scale, capturing every trip, price, and decision; and *(ii)* credible sources of exogenous variation, arising from randomized or quasi-random experiments run by the platforms, discontinuities in the algorithms, staggered rollouts of new features, and sharp geographic or institutional boundaries. This has allowed researchers to study questions ranging from consumer preferences and labor supply to behavioral biases and inequality.

Ride-hailing platforms' core transaction, matching passengers with drivers at a given price and wait time, provides an ideal setting for measuring riders' value of time. For example, Buchholz et al. (2025) exploit an auction mechanism in Prague where drivers bid on trips and consumers choose among competing offers that vary in both price and wait time. Using panel data on 1.9 million ride requests, they recover individual-level heterogeneity in the value of time (VOT), finding an average of $13.21 per hour, about 86% of the average rider's wage, with the top quartile valuing time about 3.5 times more than the bottom quartile. Similarly, Goldszmidt et al. (2020) use a different source of variation: two natural field experiments in which Lyft randomly varied both prices and wait times across 14.8 million ride requests. They estimate a VOT of $19.38 per hour, approximately 75% of the after-tax mean wage, and document substantial heterogeneity across contexts: VOT is 50% higher during peak commuting times and 20% higher in central business districts, with estimates correlating strongly with local wage rates across metro areas. These studies demonstrate how ride-hailing platforms can pin down preference parameters central to infrastructure investment decisions and welfare analysis.

The same data support the development and testing of new methods for estimating consumer preferences beyond just the value of time. Bodoh-Creed et al. (2023) develop a suite of tools suitable for partial identification in models of adverse selection with multidimensional unobserved heterogeneity. For example, consider estimating demand for health insurance when individuals differ not only in their baseline illness rate but also in which specific health conditions they may contract. Bodoh-Creed et al.'s (2023) empirical focus is on how a firm should set prices for a subscription-based consumption platform when consumers vary in their demand intensity and brand loyalty. They use data from two randomized controlled trials Lyft ran to estimate counterfactual outcomes under different pricing policies for Lyft's subscription plan, which provides a discount on rides.

Ride-hailing also provides a setting for testing the best way to respond when things go wrong. Cohen et al. (2022) conduct field experiments with Via showing that targeted credits offered after unusually long waits improve retention and profitability more than equivalent untargeted cash, while Halperin et al. (2021) use a 1.5-million-rider experiment on Uber to show that apologies for late rides are effective only when costly (e.g., a $5 coupon), and that repeated apologies without service improvement actively backfire.

List et al. (2023) use ride-hailing as a laboratory for testing for persistent behavioral biases and showing how they can persist even in highly competitive markets. They document left-digit bias at Lyft using 600 million ride requests plus a 21-million-user experiment. Approximately 50% of the decline in demand occurs discontinuously at dollar thresholds and optimal 99-cent pricing could increase profits by $160 million per year.

Ride-hailing data also enable novel measurement of discrimination and inequality. Platform pay structures provide natural experiments for isolating mechanisms. Cook et al. (2020) show that even with nominally identical pay schedules, men earn more than women on Uber because they have more experience on the platform and choose different locations and driving speeds. Because the algorithm treats all drivers identically, the earnings gap must stem from differences in opportunity costs, preferences, and constraints rather than explicit discrimination.

The same platforms can reveal discrimination when it occurs. Ge et al. (2020) conduct a randomized audit study, finding that Uber drivers, who see passenger names after accepting a trip, are twice as likely to cancel on riders with African American-sounding names. Importantly, Knittel et al. (2024) show that platform design can mitigate such discrimination: increasing the font size of passenger ratings (focusing attention on passenger quality) eliminates racial bias in cancellations, while showing names upfront has no effect.

High-frequency location data also illuminates disparities in infrastructure and enforcement. Aggarwal et al. (2025) link 19.3 million GPS pings from 222,838 Lyft drivers in Florida to official speeding citations, finding that minority drivers are 24–33% more likely to be cited and pay 23–34% more in fines conditional on the same speed, location, and road conditions. Because accident and reoffense rates do not differ by driver race, the higher citation rate likely reflects taste-based discrimination rather than differences in actual driving behavior. Platform telematics also enables infrastructure measurement at scale. Currier et al. (2023) use smartphone accelerometer data from millions of Uber rides to measure road roughness across the U.S., finding that roads in predominantly black neighborhoods cost drivers roughly $318 per year more in vehicle wear (for 3,000 miles of annual local driving) even within the same municipal jurisdiction.

These studies illustrate the broader value of ride-hailing as a research environment. The combination of large-scale administrative data, algorithmic assignment, and credible sources of identification allows researchers to test behavioral and structural models with unusual precision. At the same time, ride-hailing's role as a laboratory raises both opportunities and challenges. The ability to conduct this research depends on data access that is at once a remarkable opportunity and a structural constraint on scientific independence, limiting reproducibility. As algorithmic management and the gig economy expand across sectors, including delivery, freelancing, and healthcare, app-mediated platforms will offer increasingly rich settings for empirical research. This is only the beginning of what can be learned from using these marketplaces as a laboratory.

7 Conclusion

Ride-hailing is now an ingrained part of urban transportation, and its rapid growth attests to the benefits it provides to travelers. However, it has not come without costs, and there remain unresolved policy questions to help manage the trade-offs associated with ride-hailing. This essay examined unresolved policy questions and research priorities across four domains: externalities and market interactions, taxation, transit integration, and labor market policy. Beyond these policy questions, I examined how ride-hailing provides an empirical laboratory for studying economic questions beyond transportation.

These questions are essential for designing good urban policy. Ride-hailing has evolved from a disruptive innovation to an ordinary form of infrastructure, and may yet become a dominant mode of urban travel as autonomous vehicles continue to improve. The policy frameworks established now will shape the governance of a larger AV-based mobility system, making it critical to refine these frameworks before path dependence makes reform difficult.

References

Aggarwal, Pradhi, Alec Brandon, Ariel Goldszmidt, Justin Holz, John A. List, Ian Muir, Gregory Sun, and Thomas Yu (2025) "High-Frequency Location Data Show That Race Affects Citations and Fines for Speeding," *Science*, 387 (6741), 1397–1401, 10.1126/science.adp5357.

Agrawal, David R. and Weihua Zhao (2023) "Taxing Uber," *Journal of Public Economics*, 221, 104862, 10.1016/j.jpubeco.2023.104862.

Anderson, Michael L. and Lucas W. Davis (2023) "Uber and Traffic Fatalities," *The Review of Economics and Statistics*, 1–30, 10.1162/rest_a_01385.

Arnott, Richard (1996) "Taxi Travel Should Be Subsidized," *Journal of Urban Economics*, 40 (3), 316–333, 10.1006/juec.1996.0036.

Barrios, John M., Yael V. Hochberg, and Hanyi Yi (2022) "The Cost of Convenience: Ridehailing and Traffic Fatalities," *Journal of Operations Management*, 69 (5), 823–855, 10.1002/joom.1221.

Baum-Snow, Nathaniel (2007) "Did Highways Cause Suburbanization?" *The Quarterly Journal of Economics*, 122 (2), 775–805, 10.1162/qjec.122.2.775.

Beekman, Daniel (2024) "Seattle's New Minimum Pay Standard for Uber, Lyft Drivers Takes Effect," *Seattle Times*, https://perma.cc/6GDJ-8MHZ.

Bellan, Rebecca (2025) "Waymo's Robotaxi Expansion Accelerates with 3 New Cities," *TechCrunch*, https://techcrunch.com/2025/11/03/waymos-robotaxi-expansion-accelerates-with-3-new-cities, Announces expansion to Detroit, Las Vegas, and San Diego.

Bodoh-Creed, Aaron L., Brent R. Hickman, John A. List, Ian Muir, and Gregory K. Sun (2023) "Stress Testing Structural Models of Unobserved Heterogeneity: Robust Inference on Optimal Nonlinear Pricing," NBER Working Paper 31647, National Bureau of Economic Research, 10.3386/w31647.

Brown, Anne and Whitney LaValle (2020) "Hailing a Change: Comparing Taxi and Ridehail Service Quality in Los Angeles," *Transportation*, 48 (2), 1007–1031, 10.1007/s11116-020-10086-z.

Brustein, Joshua (2018) "New York Sets Nation's First Minimum Wage for Uber, Lyft Drivers," *Bloomberg*, https://perma.cc/Y47S-J8BU, https://research.ebsco.com/linkprocessor/plink?id=52dabbcb-b2a8-316b-b233-35649f25059c.

Buchholz, Nicholas, Laura Doval, Jakub Kastl, Filip Matejka, and Tobias Salz (2025) "Personalized Pricing and the Value of Time: Evidence from Auctioned Cab Rides," *Econometrica*, 93 (3), 929–958, 10.3982/ecta18838.

Cairncross, John, Jonathan D. Hall, and Craig Palsson (2026) "VancUber: The Long-Run Effect of Ride-Hailing on Public Transportation, Congestion, and Traffic Fatalities," *Canadian Journal of Economics*.

Castillo, Juan Camilo (2025) "Who Benefits from Surge Pricing?" *Econometrica*, 93 (5), 1811–1854, 10.3982/ecta19106.

Chen, M. Keith, Judith A. Chevalier, Peter E. Rossi, and Emily Oehlsen (2019) "The Value of Flexible Work: Evidence from Uber Drivers," *Journal of Political Economy*, 127 (6), 2735–2794, 10.1086/702171.

Christensen, Peter, Gustavo Nino, and Adam Osman (2023) "The Demand for Mobility: Evidence from an Experiment with Uber Riders,"Technical report, National Bureau of Economic Research, 10.3386/w31330.

City of Chicago (2024) "Transportation Network Providers – Trips," https://data.cityofchicago.org/Transportation/Transportation-Network-Providers-Trips-2023-2024-/n26f-ihde, All trips reported by Transportation Network Providers to the City of Chicago. Fares rounded to nearest $2.50; times rounded to nearest 15 minutes.

Coase, Ronald H. (1937) "The Nature of the Firm," *Economica*, 4 (16), 386–405, 10.1111/j.1468-0335.1937.tb00002.x.

Cohen, Maxime C., Michael D. Fiszer, and Baek Jung Kim (2022) "Frustration-Based Promotions: Field Experiments in Ride-Sharing," *Management Science*, 68 (4), 2432–2464, 10.1287/mnsc.2021.3991.

Cohen, Peter, Robert Hahn, Jonathan Hall, Steven Levitt, and Robert Metcalfe (2016) "Using Big Data to Estimate Consumer Surplus: The Case of Uber," Working Paper 22627, National Bureau of Economic Research, 10.3386/w22627.

Cook, Cody, Rebecca Diamond, Jonathan V Hall, John A List, and Paul Oyer (2020) "The Gender Earnings Gap in the Gig Economy: Evidence from over a Million Rideshare Drivers," *The Review of Economic Studies*, 88 (5), 2210–2238, 10.1093/restud/rdaa081.

Cramer, Judd and Alan B. Krueger (2016) "Disruptive Change in the Taxi Business: The Case of Uber," *American Economic Review*, 106 (5), 177–182, 10.1257/aer.p20161002.

Currier, Lindsey, Edward Glaeser, and Gabriel Kreindler (2023) "Infrastructure Inequality: Who Pays the Cost of Road Roughness?" NBER Working Paper 31981, National Bureau of Economic Research, 10.3386/w31981.

Dao, Ngoc and Riley Wilson (2025) "Alternative Insurance: Gig Work and Social Insurance Participation," working paper.

Diao, Mi, Hui Kong, and Jinhua Zhao (2021) "Impacts of Transportation Network Companies on Urban Mobility," *Nature Sustainability*, 4 (6), 494–500, 10.1038/s41893-020-00678-z.

DiDi Global Inc. (2025) "DiDi Announces Fourth Quarter and Full Year 2024 Results," Investor Relations Press Release, March, https://perma.cc/5AEU-ME38.

Draaisma, Muriel and Naama Weingarten (2025) "New Law That Aims to Protect Ontario Gig Workers Falls Short, Critics Say," *CBC News*, https://perma.cc/S8FW-G6RK.

Farrell, Diana and Fiona Greig (2016) "Paychecks, Paydays, and the Online Platform Economy: Big Data on Income Volatility," *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, 109, 1–40, https://www.jstor.org/stable/26816593.

Federal Transit Administration (2025) "2022-2024 NTD Annual Data – Metrics," National Transit Database, https://data.transportation.gov/Public-Transit/2022-2024-NTD-Annual-Data-Metrics/ekg5-frzt.

Ge, Yanbo, Christopher R. Knittel, Don MacKenzie, and Stephen Zoepf (2020) "Racial Discrimination in Transportation Network Companies," *Journal of Public Economics*, 190, 104205, 10.1016/j.jpubeco.2020.104205.

Goldszmidt, Ariel, John A List, Robert D Metcalfe, Ian Muir, V. Kerry Smith, and Jenny Wang (2020) "The Value of Time in the United States: Estimates from Nationwide Natural Field Experiments," Working Paper 28208, National Bureau of Economic Research, 10.3386/w28208.

Gonzalez-Navarro, Marco, Harrison Wheeler, Jonathan D. Hall, and Rik Williams (2025) "Uber versus Trains? Worldwide Evidence from Transit Expansions," working paper.

Gorback, Caitlin (2024) "Ridesharing and the Redistribution of Economic Activity," working paper, 10.2139/ssrn.4956559.

Guo, Yue, Xiaotong Li, and Xiaohua Zeng (2019) "Platform Competition in the Sharing Economy: Understanding How Ride-Hailing Services Influence New Car Purchases," *Journal of Management Information Systems*, 36 (4), 1043–1070, 10.1080/07421222.2019.1661087.

Hall, Jonathan D., Craig Palsson, and Joseph Price (2018) "Is Uber a Substitute or Complement for Public Transit?" *Journal of Urban Economics*, 108, 36–50, 10.1016/j.jue.2018.09.003.

Hall, Jonathan V., John J. Horton, and Daniel T. Knoepfle (2023) "Ride-Sharing Markets Re-Equilibrate," NBER Working Paper 30883, National Bureau of Economic Research, 10.3386/w30883.

Hall, Jonathan V. and Alan B. Krueger (2017) "An Analysis of the Labor Market for Uber's Driver-Partners in the United States," *ILR Review*, 71 (3), 705–732, 10.1177/0019793917717222.

Halperin, Basil, Benjamin Ho, John A List, and Ian Muir (2021) "Toward an Understanding of the Economics of Apologies: Evidence from a Large-Scale Natural Field Experiment," *The Economic Journal*, 132 (641), 273–298, 10.1093/ej/ueab062.

Hazan, Joël, Nikolaus Lang, Augustin K. Wegscheider, and Benjamin Fassenot (2019) "On-Demand Transit Can Unlock Urban Mobility,"Technical report, Boston Consulting Group, https://perma.cc/4V28-4PTZ.

Heblich, Stephan, Stephen J Redding, and Daniel M Sturm (2020) "The Making of the Modern Metropolis: Evidence from London," *The Quarterly Journal of Economics*, 135 (4), 2059–2133, 10.1093/qje/qjaa014.

Henao, Alejandro and Wesley E. Marshall (2019) "The Impact of Ride Hailing on Parking (and Vice Versa)," *Journal of Transport and Land Use*, 12 (1), 127–147, 10.5198/jtlu.2019.1392.

Ho, Chinh Q., David A. Hensher, Corinne Mulley, and Yale Z. Wong (2018) "Potential Uptake and Willingness-To-Pay for Mobility As a Service (MaaS): A Stated Choice Study," *Transportation Research Part A: Policy and Practice*, 117, 302–318, 10.1016/j.tra.2018.08.025.

Holmstrom, Bengt and Paul Milgrom (1991) "Multitask Principal–Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design," *The Journal of Law, Economics, and Organization*, 7 (Special Issue), 24–52, 10.1093/jleo/7.special_issue.24.

Hussain, Suhauna and Johana Bhuiyan (2020) "Prop. 22 Passed, a Major Win for Uber, Lyft, Doordash. What Happens Next?" *Los Angeles Times*, https://web.archive.org/web/20240217080936/https://www.latimes.com/business/technology/story/2020-11-04/prop-22-passed-what-happens-next.

Itani, Alaa, Willem Klumpenhouwer, Amer Shalaby, and Brendon Hemily (2024) "Guiding Principles for Integrating On-Demand Transit into Conventional Transit Networks: A Review of Literature and Practice," *Transport Policy*, 147, 183–197, 10.1016/j.tranpol.2024.01.007.

Johnston, Katie and Diti Kohli (2024) "Six Things to Know about the State's Deal with Uber and Lyft," *Boston Globe*, https://web.archive.org/web/20241008140835/https://www.bostonglobe.com/2024/06/30/business/uber-lyft-drivers-pay-massachusetts/.

Jullien, Bruno, Alessandro Pavan, and Marc Rysman (2021) "Two-sided markets, pricing, and network effects," in Ho, Kate, Ali Hortaçsu, and Alessandro Lizzeri eds. *Handbook of Industrial Organization*, 4 of Handbook of Industrial Organization, 485–592: Elsevier, https://doi.org/10.1016/bs.hesind.2021.11.007.

Keane, Michael P (2011) "Labor Supply and Taxes: A Survey," *Journal of Economic Literature*, 49 (4), 961–1075, 10.1257/jel.49.4.961.

Khosrowshahi, Dara, Logan Zimmer, and Logan Green (2019) "Open Forum: Uber and Lyft Are Ready to Do Our Part for Drivers," *San Francisco Chronicle*, https://web.archive.org/web/20250913130414/https://www.sfchronicle.com/opinion/openforum/article/Open-Forum-Uber-Lyft-ready-to-do-our-part-for-13969843.php, Opinion piece.

Knittel, Christopher, Donald MacKenzie, Michiko Namazu, Bora Ozaltun, Dan Svirsky, and Stephen Zoepf (2024) "Using Information to Curb Racial Discrimination," Working Paper 33118, National Bureau of Economic Research, 10.3386/w33118.

Koustas, Dmitri K. (2018) "Consumption Insurance and Multiple Jobs: Evidence from Rideshare Drivers," https://perma.cc/B27R-QAYX, Working Paper, University of Chicago.

——— (2019) "What Do Big Data Tell Us About Why People Take Gig Economy Jobs?" *AEA Papers and Proceedings*, 109, 367–371, 10.1257/pandp.20191041.

Koustas, Dmitri, James Parrott, and Michael Reich (2020) "New York City's Gig Driver Pay Standard: Effects on Drivers, Passengers, and the Companies," report, Center for New York City Affairs, The New School, https://perma.cc/8EW5-PFUQ.

Leccese, Mario (2024) "Taxing Ride-sharing: Which Neighborhoods Pay More?" *Journal of Regional Science*, 64 (4), 1393–1413, 10.1111/jors.12704.

Lehe, Lewis J., Saipraneeth Devunuri, Javier Rondan, Ayush Pandey, and Daniel Vignon (2025) "Taxation of Ridehailing in the United States," *Transport Policy*, 162, 336–352, 10.1016/j.tranpol.2024.12.009.

LeRoy, Stephen F. and Jon Sonstelie (1983) "Paradise Lost and Regained: Transportation Innovation, Income, and Residential Location," *Journal of Urban Economics*, 13 (1), 67–89, 10.1016/0094-1190(83)90046-3.

Levine, Sarah M. (2025) "Gig-Economy Myths and Missteps," *The Yale Law Journal Forum*, 134, https://perma.cc/Z2T9-UEWG, Published January 31, 2025.

List, John A, Ian Muir, Devin Pope, and Gregory Sun (2023) "Left-Digit Bias at Lyft," *Review of Economic Studies*, 90 (6), 3186–3237, 10.1093/restud/rdad014.

Liu, Yi, Yao Li, and Jindong Pang (2025) "JUE insight: Do ride-sharing services cause urban air pollution?" *Journal of Urban Economics*, 149, 103799, 10.1016/j.jue.2025.103799, Forthcoming.

Lung, Natalie (2025a) "NYC Sets Smaller Driver Pay Bump after Uber, Lyft Pushback," *Bloomberg*, https://perma.cc/Z4QN-QRXE, https://research.ebsco.com/linkprocessor/plink?id=499d7362-6d1c-331f-8e18-0a794fbe1a3d.

——— (2025b) "Uber, Lyft Risk Losing Customers as Fares Jump 7.2%, Report Says," *Los Angeles Times*, https://perma.cc/B5RD-DCRD.

Lyft, Inc. (2025) "Lyft Reports Record Q4 and Full-Year 2024 Results," Press Release, U.S. Securities and Exchange Commission Exhibit 99.1, February, https://perma.cc/P2G5-UR5Z, Accessed October 31, 2025.

Mas, Alexandre and Amanda Pallais (2017) "Valuing Alternative Work Arrangements," *American Economic Review*, 107 (12), 3722–3759, 10.1257/aer.20161500.

Metzger, Hannah (2025) "Buckle Up: Is Waymo Ready for Denver's Winter Roads and Angry Drivers?" *Westword*, https://perma.cc/Z82U-XXPT.

Ming, Liu, Tunay Tunca, Yi Xu, and Weiming Zhu (2025) "Market Formation, Pricing, and Value Generation in Ride-Hailing Services," *Manufacturing & Service Operations Management*, 27 (5), 1551–1570, 10.1287/msom.2022.0502.

Norris, Jordan J. and Heyu Xiong (2023) "Ride-Sharing and the Geography of Consumption Industries," *The Economic Journal*, 133 (654), 2449–2482, 10.1093/ej/uead028.

Obi (2025) "The Road Ahead: Pricing Insights on Waymo, Uber and Lyft,"Technical report, Obi, https://perma.cc/B35K-N5MQ.

Ostrovsky, Michael and Frank Yang (2024) "Effective and Equitable Congestion Pricing: New York City and Beyond," November, https://perma.cc/CLR6-Z3QE.

Pang, Jindong and Shulin Shen (2022) "Do Ridesharing Services Cause Traffic Congestion?" *Canadian Journal of Economics/Revue canadienne d'économique*, 56 (2), 520–552, 10.1111/caje.12630.

Papanikolaou, Anestis and Socrates Basbas (2020) "Analytical Models for Comparing Demand Responsive Transport with Bus Services in Low Demand Interurban Areas," *Transportation Letters*, 13 (4), 255–262, 10.1080/19427867.2020.1716474.

Rayle, Lisa, Danielle Dai, Nelson Chan, Robert Cervero, and Susan Shaheen (2016) "Just a Better Taxi? A Survey-Based Comparison of Taxis, Transit, and Ridesourcing Services in San Francisco," *Transport Policy*, 45, 168–178, 10.1016/j.tranpol.2015.10.004.

Rosemain, Mathieu (2023) "French Uber drivers to earn more than $8 per ride after union deal," *Reuters*, https://perma.cc/FS2C-MGL5.

Rosenberg, Eli (2020) "New Trump Administration Rule Could Make It Harder for Gig and Contract Workers to Have Rights as Employees," *Washington Post*, https://perma.cc/Z4GC-S4PE.

Roth, Jonathan, Pedro H.C. Sant'Anna, Alyssa Bilinski, and John Poe (2023) "What's Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature," *Journal of Econometrics*, 235 (2), 2218–2244, 10.1016/j.jeconom.2023.03.008.

Russon, Mary-Ann (2021) "Uber Drivers Are Workers, Not Self-Employed, Supreme Court Rules," *BBC News*, https://web.archive.org/web/20210219104526/https://www.bbc.com/news/business-56123668.

Sagel, Stefan, Irina Timp, Nikki Volmer, and Tessa van der Stel (2025) "Uber Case: External Entrepreneurship Is Fully Relevant When Defining a Working Relationship," February, https://perma.cc/U2VP-AL99.

Shoup, Donald (2011) *The High Cost of Free Parking*, New York: Routledge, updated edition.

Tarduno, Matthew (2025) "Elasticities and Tax Incidence in Urban Ridesharing Markets: Evidence from Chicago," *Journal of Urban Economics*, 150, 103809, 10.1016/j.jue.2025.103809.

Traffic Mobility Review Board (2023) "Congestion Pricing in New York: A Toll Structure Recommendation from the Traffic Mobility Review Board,"Technical report, Metropolitan Transportation Authority, https://perma.cc/A6WJ-P7N6.

Uber Technologies Inc. (2023) "Important Changes for Couriers in NYC," https://web.archive.org/web/20250914/https://www.uber.com/blog/important-changes-for-couriers-in-nyc/.

——— (2025a) "Coming Soon: Planner and a New Offline Zones Heatmap," https://web.archive.org/web/20251006/https://www.uber.com/blog/planner-offline-zones-heatmap/.

——— (2025b) "Introducing Planner Netherlands," https://web.archive.org/web/20250814/https://www.uber.com/en-NL/blog/introducing-planner-netherlands/.

Uber Technologies, Inc. (2025c) "Uber Announces Results for Fourth Quarter and Full Year 2024," Press Release, U.S. Securities and Exchange Commission Exhibit 99.1, February, https://perma.cc/XL24-9P87, Filed February 5, 2025. Accessed October 31, 2025.

U.S. Department of Transportation (2024) "2022 National Household Travel Survey," https://nhts.ornl.gov, Mode shares: https://web.archive.org/web/20250927014327/https://nhts.ornl.gov/person-trips. Trip distances: Average Trip Distance (TRPMILES) by Mode (TRPTRANS) using Data Explorer.

Verhoef, Erik T. (2002) "Second-Best Congestion Pricing in General Static Transportation Networks with Elastic Demands," *Regional Science and Urban Economics*, 32 (3), 281–310, 10.1016/s0166-0462(00)00064-8.

Vignon, Daniel A., Yafeng Yin, and Jintao Ke (2021) "Regulating Ridesourcing Services with Product Differentiation and Congestion Externality," *Transportation Research Part C: Emerging Technologies*, 127, 103088, 10.1016/j.trc.2021.103088.

Vignon, Daniel, Yafeng Yin, and Jintao Ke (2023) "Regulating the Ride-Hailing Market in the Age of Uberization," *Transportation Research Part E: Logistics and Transportation Review*, 169, 102969, 10.1016/j.tre.2022.102969.

Ward, Jacob W., Jeremy J. Michalek, Inês L. Azevedo, Constantine Samaras, and Pedro Ferreira (2019) "Effects of On-Demand Ridesourcing on Vehicle Ownership, Fuel Consumption, Vehicle Miles Traveled, and Emissions per Capita in U.S. States," *Transportation Research Part C: Emerging Technologies*, 108, 289–301, 10.1016/j.trc.2019.07.026.

Ward, Jacob W., Jeremy J. Michalek, Constantine Samaras, Inês L. Azevedo, Alejandro Henao, Clement Rames, and Tom Wenzel (2021) "The Impact of Uber and Lyft on Vehicle Ownership, Fuel Economy, and Transit across U.S. Cities," *iScience*, 24 (1), 101933, 10.1016/j.isci.2020.101933.

Washington State Legislature (2022) "RCW 49.46.300: Minimum Compensation for Transportation Network Company Drivers," https://perma.cc/L6NM-JGX8, Enacted by Engrossed Substitute House Bill 2076 (2022).

Waymo (2023) "Dear Waymo Community: Reflections from This Year Together," December, https://perma.cc/YQ6D-W3E4.

——— (2024) "That's a Wrap! Waymo's 2024 Year in Review," December, https://perma.cc/2UZP-DXXP.

——— (2025a) "Next Stop for Waymo One: Washington, D.C.," March, https://perma.cc/EP6L-EPXP.

——— (2025b) "Scaling Our Fleet through U.S. Manufacturing," May, https://perma.cc/9S69-GW37.

——— (2025c) "Safe, Routine, Ready: Autonomous Driving in Five New Cities," November, https://waymo.com/blog/2025/11/safe-routine-ready-autonomous-driving-in-new-cities, Announces expansion to Miami, Dallas, Houston, San Antonio, and Orlando.

——— (2025d) "Hello London! Your Waymo Ride Is Arriving," October, https://perma.cc/8U7L-8VZA.

——— (2025e) "Bringing Fully Autonomous Rides to Nashville, in Partnership with Lyft," September, https://perma.cc/V4CP-FXDN.

Weigl, Dustin, Josh Sperling, Alejandro Henao, Andrew Duvall, and Stanley Young (2022) "Sustainability, Scalability, and Resiliency of the Town of Innisfil Mobility-on-Demand Experiment: Preliminary Results, Analyses, and Lessons Learned," in *International Conference on Transportation and Development 2022*, 239–250: American Society of Civil Engineers, 10.1061/9780784484340.022.

Williamson, Oliver E. (1985) *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, New York: Free Press.

Zha, Liteng, Yafeng Yin, and Hai Yang (2016) "Economic Analysis of Ride-Sourcing Markets," *Transportation Research Part C: Emerging Technologies*, 71, 249–266, 10.1016/j.trc.2016.07.010.

Zhang, Kenan and Yu (Marco) Nie (2022) "Mitigating Traffic Congestion Induced by Transportation Network Companies: A Policy Analysis," *Transportation Research Part A: Policy and Practice*, 159, 96–118, 10.1016/j.tra.2022.01.017.