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Occupational Licensing Outcomes in the Face of Technological Change: Ridesharing in London and Dublin in **Grease or Grit?: International Case Studies of Occupational Licensing and Its Effects on Efficiency and Quality**

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Citation
Kleiner, Morris M. 2022. "Occupational Licensing Outcomes in the Face of Technological Change: Ridesharing in London and Dublin." In Grease or Grit?: International Case Studies of Occupational Licensing and Its Effects on Efficiency and Quality, Morris M. Kleiner and Maria Koumenta, eds. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, pp. 9-29. https://doi.org/10.17848/9780880996877.Ch2
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Grease or Grit?

International Case Studies of Occupational Licensing and Its Effects on Efficiency and Quality

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2022

W.E. Upjohn Institute for Employment Research
Kalamazoo, Michigan

Library of Congress Cataloging-in-Publication Data

Names: Kleiner, Morris M., editor. | W.E. Upjohn Institute for Employment Research.
Title: Grease or grit? : international case studies of occupational licensing and its effects on efficiency and quality / Morris M. Kleiner, Maria Koumenta, editor.
Description: Kalamazoo, Michigan : W.E. Upjohn Institute for Employment Research, 2022. | Includes bibliographical references and index. | Summary: “The book provides a comprehensive approach to whether a dominant governmental institution in the labor market-occupational licensing-greases, which enhances, or on the other hand results in grit, which diminishes the efficient workings of labor and service markets in parts of Europe and the United States. The detailed case studies in the book indicate that an increase in the availability of service providers or enhanced competition does not have negative effects on the quality of the services provided, prices, or survey measures of consumer satisfaction” — Provided by publisher.
Identifiers: LCCN 2022026785 (print) | LCCN 2022026786 (ebook) | ISBN 9780880996860 (paperback) | ISBN 9780880996877 (ebook)
Subjects: LCSH: Occupations—Licenses—United States. | Occupations—Licenses—Europe. | Labor market—United States. | Labor market—Europe.
Classification: LCC HD3630.U6 G74 2022 (print) | LCC HD3630.U6 (ebook) | DDC 331.120973—dc23/eng/20220728
LC record available at https://lccn.loc.gov/2022026785
LC ebook record available at https://lccn.loc.gov/2022026786

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Cover design by Carol A.S. Derks.
Index prepared by Diane Worden.
Printed in the United States of America.
Printed on recycled paper.

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Occupational Licensing Outcomes in the Face of Technological Change

Ridesharing in London and Dublin

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Two rapidly growing trends in the labor market are the expansion of occupational regulations imposed by the government and the growth of the on-demand or contingent workforce (Katz and Krueger 2016; Kleiner and Krueger 2010, 2013). The taxi industry and its drivers historically have been heavily regulated by governments in most developed countries. These regulations typically involve granting exclusive rights to provide cab services to firms and setting standards for its drivers. Usually, the services include quality controls (such as vehicle age and appearance), the imposition of entry restrictions for drivers (such as topographical knowledge tests), and the control of fares (Beesley 1973). The justification for these licenses has been public safety and consumer protections. From an occupational licensing perspective, the most common barrier to entry for individuals looking for work in the sector is the requirement that drivers be licensed by local governments. Ideally, a study seeking to address these questions would examine indicators of service quality before and after the removal of entry requirements to the occupation. However, since such deregulatory shocks are rare, an alternative approach is to focus on the differences in entry requirements for prospective drivers across jurisdictions. The recent increase in the number of ridesharing services, which compete with traditional taxi services, offers an opportunity to examine how differences in regulation affect quality outcomes.

Ridesharing services refer to rides provided by drivers for remuneration by passengers who order and pay for this service via a smartphone app, and these contractors are among the fastest growing markets of on-demand workers (Katz and Krueger 2019). Drivers use their own private vehicles, set their own hours, and in most jurisdictions have been considered private contractors who link onto the app.

This chapter uses data from Uber Technologies to examine how differences in regulations to become a ridesharing driver affect quality outcomes in London and Dublin. A key question is whether more relaxed regulation requirements to become a driver are associated with inferior services or quality. As the restrictiveness of the regulatory regime increases, does quality improve enough to justify this potentially costly regulatory intervention? How does the variation in regulations on ridesharing affect consumer satisfaction and measures of ride safety? The analysis shows how fares vary with the intensity of licensing requirements and compares the quality of rides in London, where entry to the occupation is more relaxed relative to heavily regulated "fully licensed" taxi drivers, and Dublin, where ridesharing drivers are subject to the same stringent requirements as those of "fully licensed" taxi drivers (Kleiner 2006).[1] The results of ridesharing in London and Dublin are measures of consumer satisfaction of a ride on a scale of one through five. Measures of vehicle hard starts and hard stops are measured in both percent and the number of hard starts per ride. Finally, prices are in dollars per standardized ride in both cities. Specifically, I use data from Uber Technologies to measure the influence of more relaxed regulations on consumer satisfaction with the service, measures of safety of the vehicle, and prices of rides. These outcomes should provide new evidence on how regulation affects service for ridesharing when there are major technological changes within an occupation.

OVERVIEW OF THE RIDESHARING INDUSTRY

Ridesharing became popular in 2010, as the use of smartphones became widespread, but there is limited research on the outcomes of these services. Most countries regulate the taxi industry by setting entry restrictions for drivers, operators, pick-up procedures, and vehicles (Schaller 2007). The theoretical rationale for taxi regulation is developed from the experience good problem: goods for which quality cannot be determined by the consumer until after the good has been consumed, giving rise to “moral hazard” (e.g., the provider overcharging, operating a substandard car, or taking a longer route, all because there are few consequences of providing lower-quality services). Regulation in the form of minimum standards setting is assumed to solve this imperfect information problem (Shleifer 2010). Proponents argue that regulation is vital to ensure customers do not experience longer trips and higher fares by using unscrupulous providers or have their safety compromised by dangerous driving or criminal behavior. Further, while they accept that price and supply controls might result in higher fares, this enables dense markets to cross-subsidize low-density ones while peak traffic cross-subsidizes off-peak service availability (Dempsey 1996). Without regulation, service to low-density and off-peak trips may decline or be unavailable. Critics of this approach argue that unregulated market entry and fares for taxi providers will shift the supply curve upward, resulting in lower fares, shorter waiting times, improved availability (especially in underserved markets), and greater entrepreneurial opportunities (especially for minorities and immigrants) (Cevero 1985).

From an empirical perspective, research has looked at the effect of regulatory changes on service availability and prices as they apply to the taxi service market in general and from a producer perspective. The removal of quantity controls on taxis in many U.S. cities, for example, caused supply to increase by an average of 19–23 percent (Dempsey 1996; Schaller 2007; Teal and Berglund 1987). Dempsey (1996) finds that in cities that abolished quantity and fare restrictions, prices in both cruising and dispatch markets rose by an average of 29 percent per year, but despite a slight initial surge in supply, service availability fell to pre-deregulation levels. More recent work by Rojeck and Masior (2016) analyzes the deregulation of entry to the taxi driver occupation in Poland that took effect in 2013. The reform included giving authorities the right to control pricing practices, as well as dropping the requirement of a preparatory course and exam in cities with populations over 100,000. This provided an ideal context for which to compare the effects of the reform between cities, but also before and after reform comparisons of the regulations relative to prices. The study finds that in those cities where barriers to entry were relaxed, prices after the reform fell for the first time, while the supply of taxis rose as measured by the number of licenses issued. Using quality indicators such as license withdrawals, complaints filed against taxi drivers, and frequency of malpractice, the authors find mixed results on quality.

In contrast to these previous studies, this chapter analyzes the regulation of drivers. In practice, entry to the occupations in different jurisdictions is covered by a wide spectrum of regulatory policies, and it is this variation in restrictiveness that is the focus of the chapter, specifically the levels of regulation rather than the existence of licensing.

Background on the Company and Cities Examined

Uber Technologies is headquartered in San Francisco, with operations in 633 cities worldwide. Its platforms can be accessed via its websites and mobile apps. Uber began its rides in San Francisco in 2010 and in New York City the following year. The technology company's business model was to match people needing rides with people who were willing to provide those rides for a price. Uber expanded outside the United States in 2013, and London became one of its largest and most successful operations, with about 40,000 drivers and more than 3.5 million customers. At different times the firm has had up to 80 percent of the total ridesharing market in London, the U.K., and the United States; the Dublin estimates have been harder to obtain (DMR Statistics 2017; *Financial Times* 2017). However, those numbers on market share have declined recently as more competitive substitutes have entered the ridesharing market.

The creation of an app and accompanying software facilitated the company's matching process and allowed valuable data to be collected that can compare indicators of quality for different levels of stringency in entry requirements for taxi drivers. The drivers pay a fee—a percentage of the ride—to Uber for using the matching process (Hall et al. 2019). Under this business model, ridesharing drivers pay a portion of their fares to the ridesharing platform operator (in this case Uber), a commission-based compensation model used by many internet-mediated service providers. To Uber drivers, this commission is known as the Uber fee. By contrast, traditional taxi drivers in most cities make a fixed payment independent of their earnings, usually a weekly or daily medallion lease, but keep the fare dollar net of expenses.

London and Dublin have both similarities and differences in how taxi and ridesharing services operate. For some historical background, London's taxi service market has traditionally been served by two types of providers, namely the "black cab/hackney" drivers and "minicab" drivers. Black cab drivers have traditionally had a legal monopoly through taxi regulations to be the only service that can be called on the street through hailing a taxi or from a cab phone. In contrast, minicabs must be prebooked and are not allowed to be fitted with a taxi meter. The prebooking takes place via taxi service companies.

Prior to the COVID-19 pandemic, Uber was one of the most popular ways to book rides in London. At that point the city accounted for about 5 percent of Uber's global active user base of 65 million, and nearly a third of its active user base of 11 million in Europe. There were about 40,000 licensed Uber drivers in London who serviced about 3.5 million users. There is fierce opposition to Uber from the Licensed Taxi Drivers' Association, a union representing London's black cab drivers, whose drivers take several years to train for their job, in part by memorizing London's streets, a practice called the Knowledge. In contrast, the governmental entry requirements that exist for Uber drivers in London are the same as those that apply to the minicab drivers. These lower requirements have made entry into the ridesharing business as a supplier of these services much easier than traditional black cabs. Uber drivers use technology through the app in the car to find locations in London. The relatively high cost of training for drivers using the fully licensed black cab model has helped make Uber popular among prospective drivers in London. A four-mile trip in the middle of the week costs at least $24.00 in a black cab compared to about $11.00 with Uber (*Wall Street Journal* 2017). Uber was under threat of losing its license to operate in London but held on despite opposition by black cab operators (Satariano 2018). In 2021, Uber contractors came under U.K. labor laws with substantially greater wages and hours benefits (Satariano 2021).

Similarly, Dublin is also a capital city and is the largest city in Ireland. It is, however, much smaller than London, with a population of almost 2 million. The taxi sector in Ireland has traditionally been highly regulated, involving firm restrictions on the number of new vehicle licenses (i.e., licenses linked to the vehicle, not the driver) issued by the state (Barrett 2003). As the industry regulator, the National Transport Authority also has the power to control the number of licensed taxi drivers by setting the pass rate, exam fees, and other licensing requirements. Ireland's rapid economic growth in the 1990s and a booming tourist market increased demand for taxi services, but because of caps on the number of vehicle licenses that the state regulators were issuing, it resulted in increased customer discontent with the sector and its regulators (Barrett 2010). In 2000, the Irish High Court increased the size of the taxi sector by gradually raising the cap on vehicle licenses.

Uber's method of operation is different in Dublin. Irish law requires that anyone carrying passengers for pay must have a full taxi license. Consequently, Irish regulatory policy requires Uber drivers in Dublin to meet the same requirements as a fully licensed taxi driver. As a result, Uber drivers in Dublin are typically traditional taxi drivers who have also signed up to the Uber platform to work to attract additional customers either during or after work hours. One potential barrier to entry is that drivers must be licensed by local authorities, as is the case in both cities, and that the precise requirements vary across jurisdictions.

DRIVER LICENSING IN DUBLIN AND LONDON

The entry test for taxi drivers in Dublin is designed to verify that new drivers are familiar with good practice and have a solid working knowledge of the county in which they plan to operate.[2] The detailed and in-depth test consists of 90 questions in two sections:

1) The Industry Knowledge Module consists of 54 questions relating to industry regulations, vehicle knowledge, map reading, fares and charges, and customer service (including disability awareness and equality and diversity, business acumen and health and safety), as set out in the module's manual.
2) The Area Knowledge Module consists of 36 questions related to the administrative county in which one expects to be licensed. This aspect of the taxi licensing process is focused on examining driver familiarity with the area so that passengers' trips are provided in an efficient and safe manner.

Overall, the process of getting a license in Dublin is significantly more expensive compared to London because of the in-depth knowledge requirements. In addition to the tests, the driver also must produce a tax clearance certificate and undergo a criminal record and a medical check. The cost of the licensing process is approximately $448 and includes $109 toward the standard driver entry test, $303 toward the commercial driver license fee, and $36 toward the criminal records check fee.[3] The licenses need to be renewed every five years. These requirements typically apply to all taxi drivers in the city, including those that offer ridesharing services through the Uber platform.

The number of available vehicle licenses in Dublin is restricted, which has resulted in a decline in the number of active taxi driver licenses (from more than 47,000 in 2009 to less than 27,000 in 2016). The greatest number of restrictions occurred before 2013, and the number of licensed vehicles remained roughly constant after 2013. In London, the number of licensed taxi vehicles remained roughly constant during this time.[4]

The regulations for Uber drivers in London are the same as the driver of a "private hire" vehicle.[5] Specifically, the driver must be at least 21 years old, hold a full U.K. or European Member State driver's permit for at least three years, and, as of 2016, pass an English language test.[6] In addition, Uber drivers in London are required to undergo a criminal record check and a medical examination, as well as take a topographical knowledge test. The London exam differs substantially from the one in Dublin. It consists of five modules that assess the ability of prospective candidates to read maps and plan routes, as well as their general understanding of London's topography.

Table 2.1 compares the requirements to enter the market in London and Dublin. There is considerable variation between the two cities in terms of the barriers Uber ridesharing drivers face. These differences let us examine how variations in the stringency of regulation impact selected indicators of quality. Uber drivers are subject to licensing in both jurisdictions, since at least some requirements to enter the occupation are in operation, and these are legally binding. Consequently, Uber ridesharing drivers in London and Dublin are subject to what is referred to as occupational licensing in the academic literature on regulation (see, for example, Kleiner 2006, 2015; Koumenta and Pagliero 2016).

Table 2.1 Summary and Overview of Licensing Requirements for Uber Drivers in Dublin and London

	Dublin	London
Educational requirements	Area knowledge test Industry knowledge test Driving permit	Topographical knowledge test (based on map reading) Driving permit
Other entry requirements	Private hire license (issued by the National Transport Authority) Criminal records check Medical check Tax clearance certificate Minimum age of 18 years	Private hire license (issued by Transport for London) Criminal records check Medical check Minimum driving experience of at least three years English language test (where applicable) Minimum age of 21 years
Cost of driver licensing (approx.)	$448	$1,014
Renewal	Every five years	Every three years

DATA USED FOR THE ANALYSIS

Uber Technologies supplied the proprietary data, which can be used for research purposes. Unlike survey data, which may be collected with less care—an inaccurate response leaves virtually no economic consequences to the firm—this information is unique in that it is what the company uses for decision making and is collected and compiled with greater care. In all the analyses, trip-level data were used from November 2013 (Uber expanded to London in July 2012) through December 2016. The data were provided as part of the company's regular compilation of administrative information without any knowledge about how the data might be used for analysis or public policy purposes. Unfortunately, no data on tips are available, and since many times tips are given in cash, this may undervalue the cost of the ride to consumers. To provide a balanced sample for the two cities, the analysis uses the universe of 162,386 rides from Dublin. For London, Uber provided a random sample of 260,081, or 0.5 percent of all rides.[7] Appendix A contains the definitions of the variables in the data set.[8]

To evaluate the influence of regulation, I collected information from Uber on the following indicators. First, I obtained data on the quality of ridesharing through driver-quality ratings for the most widely used Uber service, UberX. After completing a trip, riders rate the driver on a scale of one star (lowest quality) to five stars (highest quality). The value is treated as a "measure of process" or satisfaction since it reflects the customer experience from the ride. Second, consumer safety is an important dimension of service quality. Uber made available two measures of safety: hard accelerations and hard braking on individual trips. Both have been shown to be some of the most predictive factors for car crashes and accidents (*Claims Journal* 2015). The values are obtained when drivers, who use the Uber app, have a passenger in the vehicle and have the app turned on. Uber drivers in London could usually take longer for the same distance or generally go on longer trips than in Dublin. Including a city dummy variable allows a measurement of the differences of quality of service that is not associated with differences in transit time or distance. For example, the quality of a ride could deteriorate because of heavy traffic but not because of differences in regulatory intensity. To account for these issues, the analysis controls include 37 dummy variables for year and month (as one variable); 6 dummies indicating day of the week (Sunday–Saturday); and 23 dummy variables for hour of travel. If heavy traffic occurs regularly at a given time during a day, these time fixed effects would pick this up. In addition to the time fixed effects, we control for location-specific effects. For instance, if a statistically identical driver in Dublin on a trip of identical duration and distance brakes more frequently using a busy road than in London on a four-lane highway, the behavior results from the characteristics of the road chosen for the specific trip, not from differences in regulatory intensity. To account for this, the analysis uses a set of 1,023 dummy variables clustering pickup and drop-off location by longitude and latitude (see Horton 2016).[9]

APPROACHES USED IN THE ANALYSIS

Table 2.2 shows the means and observations for the key variables for the two cities, Dublin and London. The means for trip duration and trip distance are similar, so one can make meaningful comparisons between them. Also, the observations are similar for both cities. As shown in the table, it is interesting, however, to find that London has a shorter estimated time of arrival at the client's pickup location, despite being a busier city with more traffic.[10] A likely reason for this is

Table 2.2 Means and Number of Observations for the Key Variables in the Analysis for Dublin and London

Variable	City	*N*	Mean
Trip duration (in seconds)	London	471,877	1,219.9190
	Dublin	456,834	959.8389
Trip distance (in miles)	London	471,877	4.6594
	Dublin	456,834	4.3947
Trip fare (in US$)	London	471,877	17.8833
	Dublin	456,834	17.6381
Surge multiplier	London	471,877	1.0755
	Dublin	456,834	1.0001
Estimated time of arrival (in seconds)	London	471,877	204.3132
	Dublin	456,834	252.1905
Driver experience (no. of trips)	London	471,877	1927.8160
	Dublin	456,834	397.9217
Rider experience (no. of trips)	London	471,877	94.5536
	Dublin	456,834	60.4299
Rating (1–5 stars)	London	314,255	4.6961
	Dublin	303,318	4.7169
Fraction of hard brakes	London	240,890	0.0823
	Dublin	215,462	0.0960
Fraction of hard acceleration	London	183,678	0.0560
	Dublin	164,016	0.0607
Fraction of hard brake over 0.2	London	240,890	0.1243
	Dublin	215,462	0.1727
Fraction of hard acceleration over 0.2	London	183,678	0.0676
	Dublin	164,016	0.0851

NOTE: *N* = number of observations.
SOURCE: Uber Technologies.

that since London has more drivers, they may be closer to the rider than drivers in Dublin. Both riders and drivers are also more experienced on the Uber app platform in London, indicating that it is an important control variable in the regression analysis, as Londoners are more likely to use the service.

Indicators of the relationship of population to driver parameters are presented in Table 2.3, such as the population to Uber driver ratio for both cities. The table shows the city's total population in 2016, and it is divided by the total number of Uber drivers in the period 2013–2016 (controlling for attrition) for each city. The ratio of the population to Uber drivers in Dublin is more than twice that of Uber drivers in London. This is in line with expectations given the more stringent entry regime in Dublin.

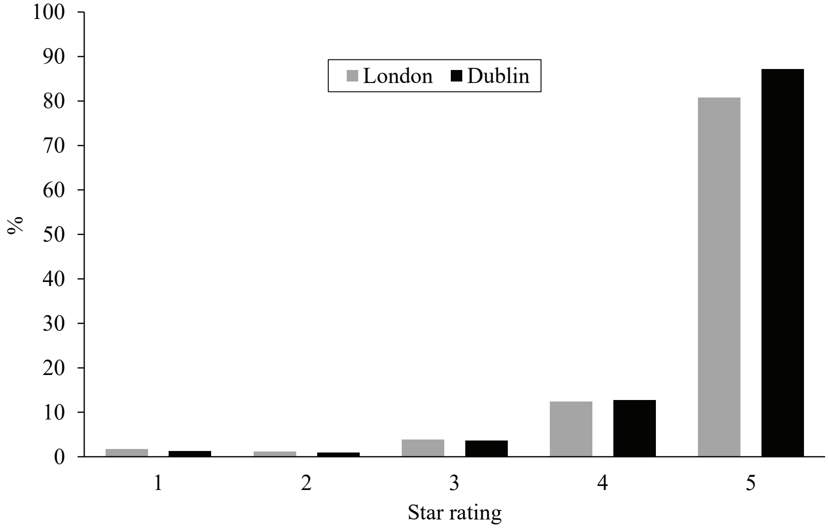
Table 2.3 Estimates of Driver to Population Ratio

	London	Dublin
Total number of licensed drivers who use the Uber app (2013–2016)	61,892	1,609
Population (2016, in millions)	8.79	1.331
Proportion of population to driver	142	827

SOURCE: For London: United Nations, World Population Prospects link, https://www.macrotrends.net/cities/22860/london/population (accessed May 9, 2022). For Dublin, Eurostat, https://www.macrotrends.net/cities/22860/london/population (accessed May 9, 2022). The value for drivers was obtained from Uber Technologies.

Lastly, Figure 2.1 shows how customer satisfaction with the rides compares in both cities. The figure includes data for all rated personal transportation trips completed in Dublin and London between November 2013 and December 2016. It presents the overall skewness of the ratings system toward five-star ratings, with the distribution of driver-quality ratings being relatively consistent across the two cities. As Figure 2.1 shows, quality ratings are highly right skewed, with nearly 81 percent of trips receiving a five-star rating using both Dublin and London. In contrast, less than 2 percent of trips receive one star. There seems to be no substantial difference in how customers rate their experience in Dublin and London. These results could indicate that the more intense training that ridesharing drivers are subjected to in Dublin does not translate to better customer evaluations, as one would expect.

Figure 2.1 Ratings Distribution on UberX Trips in Dublin and London (November 2013–December 2016)

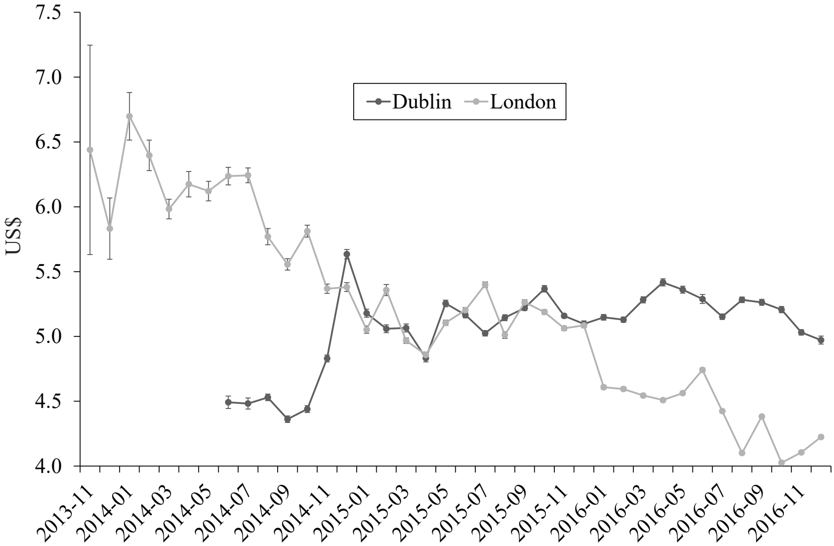


SOURCE: Uber Technologies.

Figure 2.2 shows the average per-mile fare in the two cities to relate to how the price of Uber ridesharing compares between the two cities. Between November 2013 and December 2016, the average base price (in U.S. dollars) was $5.58 per mile in Dublin, with a range of $3.00 to $10.00. In contrast, the average base price was $3.31 in London. The price range was $2.47 to $4.00 based on time and location. When surge pricing is considered, which is a measure of spot price based on supply and demand, the values in Dublin increase to a mean of $8.08, with a range of $4.16 to $25.00. The equivalent mean London prices are $5.81, with a range of $3.90 to $9.80. Using both methods of measuring base prices with and without the surge component used by Uber, the prices are higher in Dublin.

Figure 2.2 also shows the price effect analysis for the period 2013–2016. Initially, the London fare was higher, but fares in both cities converged in 2015, and then the London fares were lower throughout 2016 and stayed lower throughout the year. However, in the latest period, London prices were rising slightly; in contrast, Dublin fares have

Figure 2.2 Average Uber Fare (in US$) per Mile in Dublin and London (2013–2016)



NOTE: The error bars are the 95 percent confidence intervals for the prices in both London and Dublin. The point estimate values are the averages of the fares per mile in the two cities.
SOURCE: Uber Technologies.

remained relatively stable (with some minor fluctuations). One explanation for the lower prices in London relates to the relatively higher supply of drivers compared to Dublin, and it is likely to be an outcome of the less stringent regulatory framework.

Measures of quality take various forms in different industries. In ridesharing, it is customer satisfaction and safety. If more relaxed occupational regulation has an influence on the quality of the ride, it is through these two outcomes. Where the ride takes place, however, is also an important determinant of both customer satisfaction and safety. Higher levels of congestion could be associated with greater customer frustration and an increased chance of a crash. Therefore, where the ride takes place within the city is a key variable in the analysis of the role for regulation in ridesharing. Uber hired MIT professor John Horton to develop the methodology for analysis—a grid based on the longitude and latitude of the place of the ride. Location dummies were generated by the algorithmic program package called TripMatchR. The program generates a map with numbers of observations in the form of a matrix, and then forms rectangular groups that have approximately the same total number of observations to generate the location of the ride. More specifically the TripMatchR algorithmically implements a geography-based clustering approach that partitions trip locales into “regions” or “clusters” by partitioning the trips into iso-counts. The approach has been used in other academic analysis of quality and demand for ride-sharing to control of location and time of ride (Hall et al. 2019; Hall, Horton, and Knoepel 2017).

Based on the estimates from the statistical model the results are consistent with the baseline graph that satisfaction is about 3 percentage points higher in the relatively more highly regulated Dublin than in London. The probabilities of getting a three-star and a five-star rating are according to Figure 2.1, about 4 percent for three-star ratings and about 81 percent for five-star ratings. If, for example, higher regulation reduces three-star ratings by 3 percentage points and increases the five-star ratings by 3 percentage points, the overall distribution would not change in any meaningful manner, since the five-star ratings occur with very high probability. However, when trip location is considered, the results suggest that London and Dublin have no significant difference on customer satisfaction.

The demand for taxi services is highly responsive to price and perceived safety of the ride. Any brake or acceleration on a trip with a force greater than 3.06 meters per second squared is considered a hard brake or hard acceleration, which is consistent with transportation industry standards (*Claims Journal* 2015). Both sets of telematics metrics are used because the distribution of the percentage of hard brakes or hard accelerations on trips could influence the proportion of trips that are identified as “safe” trips, using the 20 percent hard brakes or hard accelerations threshold. For example, the proportion of trips with greater than 20 percent hard brakes may differ significantly if hard-braking events tend to occur in relatively high or relatively low proportions on individual trips versus if hard-braking events tend to be relatively evenly distributed across trips. Importantly, hard braking has been shown to be one of the most important factors for predicting future crashes (*Claims Journal* 2015). Braking and acceleration events and the rates of braking and acceleration on individual trips are identified through the Uber app on a driver's smartphone. The estimates show that there is no difference between Dublin and London in the fraction of hard accelerations when the location of the trip is controlled for in the analysis. Moreover, the fractions of all rides where 20 percent or more of the accelerations are hard are not significantly lower in Dublin than in London when controlling for relevant factors.

The results show a higher probability of hard braking in Dublin, even controlling for base fare, trip distance (miles), trip duration (seconds), gender, driver experience (trips a driver conducted in their lifetime for Uber), rider experience (number of Uber trips of the rider who issued the rating), and time fixed effects. However, once the location effects are included in the model, there is no statistically significant difference between the two cities; that is, safety is not higher in the more regulated Dublin. Overall, the results suggest that the rides are no smoother in Dublin, where the intensity of regulation is higher than in London.

The key coefficients for each of the outcome variables by city discussed earlier that include customer satisfaction, hard accelerations, and hard braking are shown in Table 2.4. The estimates in the table present the influence of an observation in Dublin relative to London on measures of satisfaction, or corelates of safety such as hard accelerations or hard braking. The results for hard accelerations and braking are normalized by the fraction of all accelerations or braking during the trip. The coefficient values shown include controls such as trip distance, driver experience and their human capital, and the location of the trip.

Table 2.4 Coefficient Estimates and Standard Errors for Customer Satisfaction, Hard Accelerations, and Hard Braking for London versus Dublin (where Dublin is 1)

Outcome measure	Coefficient and standard errors
Customer satisfaction	−0.06
	(0.05)
Fraction of hard accelerations per trip	0.05
	(0.05)
Fraction of hard braking per trip	0.04
	(0.04)

SOURCE: Uber Technologies.

The results show no difference in these outcome measures if a trip was taken in London or Dublin.

CONCLUSIONS AND POTENTIAL PUBLIC POLICES

This chapter examines how variations in regulatory requirements affect quality outcomes. Specifically, the approach exploits how the differences in the stringency of becoming a licensed driver offering ridesharing services in London and Dublin affect one measure of perceived quality (customer satisfaction) and two safety measures (hard accelerations and hard braking) obtained from Uber using the drivers' app with controls for area of the city, time of the day, day of week, and week of the year. Each of these locales has different levels of stringency for obtaining an occupational license, with barriers to entry being higher in Dublin. The analysis further describes and explores service availability and prices as value-added measures of quality. The approach allows for the examination of the role of regulation when one area (London) provides a more relaxed form of occupational regulation relative to another one (Dublin).

The results suggest that Uber service availability as measured by the Uber driver to population ratio is higher in London and prices are lower. These findings are not surprising since one would expect higher supply of Uber ridesharing services to be associated with lower prices, given Uber's market-driven approach toward ridesharing. Further, customer ratings are only slightly higher in the more stringently regulated Dublin and, when controlling for location of the ride, the difference is not statistically significant, which suggests that higher barriers do not seem to be correlated with customer satisfaction.

The results for safety measures show a higher percentage of trips with hard braking in Dublin, and this relationship ceases to be statistically significant when there are controls for location of the trip. In the empirical analysis across different specifications and statistical models regarding hard accelerations, the results also show that users have no higher-rated rides in Dublin, where the regulations are more stringent when controls for the location of the trip are considered. Based on these two safety indicators, there seems to be no justification for the considerably higher hurdles that ridesharing drivers must pass to legally operate in Dublin.

Overall, we find little evidence for greater regulatory constraints (at least of the type observed in these two jurisdictions) on ridesharing drivers. Further, the technological context for taxi and ridesharing driving is considerably different from when the regulatory provisions for taxi drivers were initially developed and physical maps were used for navigation. GPS technology, for example, provides drivers with detailed route information as well as information on traffic congestion, enabling them to conduct more efficient trips. The same technology is available to customers, so information asymmetry is lower. Consequently, it is questionable whether regulations with detailed topographical knowledge are as relevant as they used to be. Technologies that allow customers to rate their trips and the driver can mitigate problems associated with experience goods by ensuring that service standards are maintained. The broad conclusion from the assessment in this chapter is that the regulations of the taxi and ridesharing driving occupations should be changed to allow easier entry into the occupation. The relaxation of occupational licensing in this sector could lead to lower prices without any evidence that it would reduce customer satisfaction or the safety of the ride.

Notes

1. Uber has agreed to provide the data it collects through its app to address the research questions in this study. There were no incentives for Uber to provide data that might skew the data or results, since they were unaware of the approach or methods prior to providing the data.
2. These requirements are set out in the Taxi Regulation Act 2013 and the Taxi Regulation (Small Public Service Vehicle) Regulations 2015 (see www.irishstatutebook.ie for all legal texts).
3. Author's own calculations based on information from the National Transport Authority available at https://www.nationaltransport.ie/taxi-and-bus-licensing/taxi/spsv-driver-licensing/apply-for-an-spsv-driver-licence-2/ (accessed June 22, 2022).
4. See data tables link here: https://www.gov.uk/government/statistics/taxi-and-private-hire-vehicles-statistics-england-2015, Table 'Taxi0101' (accessed June 22, 2022).
5. Private-hire vehicles are only permitted to pick up prearranged bookings and are not permitted to pick people up from the curb side. Taxis (also known as London black cabs) are licensed to pick people up from the curb side, i.e., hailing a cab.

6. https://tfl.gov.uk/info-for/taxis-and-private-hire/licensing/private-hire-driver-licence (accessed June 22, 2022).
7. From all Uber data, observations from London and Dublin were selected if they have rating and telematics information (some observations do not have both). The random sample for London was obtained using the simple random sampling method with replacement by repeating the following steps 10 times: 1) generate random numbers and assign them to each observation; 2) select a subset of these observations for the final sample according to the population ratio between London and Dublin.
8. The specific data are available on the time and dates of pickups and drop-offs from Uber. The data used had at least 1,000 pickups and drop-offs for every time and day and several thousand for peak periods.
9. The algorithm developed by Horton uses Python as its engine to generate a map with number of observations in a form of matrix, and then forms rectangular groups that have approximately the same total number of observations in the matrix using the TripMatchR program (Horton 2016).
10. There was one outlier in Dublin, likely due to a coding error, which increases the standard errors, and deleting it has little impact on the other variables.

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Appendix 2A

Table 2A.1 Variable Descriptions of the Data from Uber

Variable	Description
City	Indicator for city, 0 = London and 1 = Dublin
Trip duration	Time spent for the driver to provide service from the departure location to destination, in seconds
Trip distance	Distance travelled for providing the service from the departure location to destination, in miles
Client fare	Amount charged for the given service, in US$
Driver experience	Number of trips that the driver provided on the Uber platform until the time he/she provided the current service
Gender	Gender of the driver, 0 = Female and 1 = Male
Surge pricing	An algorithmic technique that Uber used when there is a demand-supply imbalance to determine fares. Usually, the company raises the price of its offering if there is an increase in demand.
Rider experience	Number of trips that the rider received on the Uber platform until the time he/she provided the current service
Month	Thirty-seven dummy variables for each month between November 2013 and December 2016.
Day of week	Six dummy variables for day of the week, i.e., for Monday through Sunday.
Hour	Twenty-three dummy variables for hour of the day.
Begin trip cluster	Dummy variables generated by R package (TripMatchR) developed by Dr. John Horton of MIT that generates 1,023 Boolean variables that indicate geographical clusters for the pickup and drop-off locations. see Horton (2016).
End trip cluster	Boolean variables that indicate geographical clusters for the pickup and drop-off locations. see Horton (2016).