eticas

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Adversarial audit of ride-hailing platforms

Compliance with competition, labor and consumer law in Spain

CONTENT

INTRODUCTION

Ride-hailing apps have revolutionized the transportation industry in cities around the world by making it easier and more convenient for people to get around. In Spain, ride-hailing apps act as mediators between passengers and license holders for rental vehicle services (VTC) without direct exploitation of such licenses. VTC licenses were originally designed for chauffeurs, limousines, official transportation, or pre-booked trips. However, the growth of Uber, Cabify and Bolt has stretched the boundaries of the VTC regulatory framework to accommodate their business model.

With the emergence of digital services, it is crucial to see how new technologies incorporate established protections and regulations. There is no doubt that digitalisation is transforming many sectors of the economy, and algorithms are among the most important technological drivers of this process enabling companies to be more innovative and efficient. However, algorithms can be used in ways that reduce competition and harm both workers and consumers. As algorithmic systems become more sophisticated, they are often less transparent and it is more difficult to identify when they cause harm.

Together with Elite Taxi, we decided to start an adversarial audit of ride-hailing app focusing on three main concerns:

1. The **competition** implications of using similar algorithms to set up ride prices, as these algorithms could be harming consumer choice even in the absence of an established cartel to set up prices.
2. The **labor** compliance of ride-hailing apps, and in particular the extent to which app processes incorporate labor regulations and protections, specifically in relation to sick leave and payment/tip transparency.
3. Potential geographic discrimination in **consumer** prices emerging from the logic of the algorithms used to set prices, which could disproportionately harm less affluent neighborhoods and remote areas in ways that traditional taxis do not.

COMPETITION LAW

Contrary to established, traditional taxis that use a combination of time and distance to calculate prices transparently, ride-hailing apps use “surge pricing” to set fares. Surge pricing uses complex, opaque algorithms to adjust fares based on supply and demand by applying a “surge multiplier” to standard rates. Dynamic surge pricing is calculated in real time and it is specific to different areas within a city. Uber, Cabify and Bolt all report using surge or dynamic pricing to set their fares.

Recent studies have shown that pricing algorithms tend to systematically collude with one another (Calvano et al., 2020). This implies a risk of price-fixing, or an agreement between businesses to set the prices for their goods or services at a specific level, as a

result of algorithmic processes without direct coordination between companies. Price-fixing can prevent, restrict or distort competition.

Competition law encourages companies to ensure that consumers have true choice, as the National Commission for Markets and Competition (CNMC) points out in its guide "The benefits of competition for consumers". However, competition is not an end in itself, but an instrument at the service of society, as consumers benefit from more affordable, better quality products that are better suited to their needs. It also indirectly benefits businesses and the public sector by supporting economic growth, employment and innovation. On the flipside, restrictions on competition benefit few powerful actors and harm all others (Eticas, 2022).

The first part of this report explores whether the algorithms of the three main ride-hailing platforms in Spain are fixing prices either proactively or passively. To test for algorithmic price collusion between Uber, Cabify and Bolt, we collaborated with Elite Taxi to collect data from 8 routes in Madrid and 7 routes in Andalusia by sending automated requests every 10 minutes in the period between 11 October 2021 and 11 January 2022.[1]

To detect any possible correlation between the fares of the three service providers, we conducted a linear regression analysis for each route. Below, the Pearson correlation coefficient (r), ranging between -1 and 1, indicates the linear dependency (either positive or negative) between two variables (Table 1), whereas the coefficient of determination (R2) indicates the proportion of the variation in the dependent variable that is predictable from the independent variable, and is usually expressed with a number between 0 and 1. The Pearson correlation coefficient is interpreted as follows:

Strength of association	Positive	Negative
Strong	0.5 to 1.0	-0.5 to -1.0
Moderate	0.3 to 0.5	-0.3 to -0.5
Weak	0.1 to 0.3	-0.1 to -0.3
None	0	0

Table 1. Interpretation of the Pearson correlation coefficient (r)

Based on these observations, we found a moderate positive and statistically significant correlation of prices for all monitored routes in Andalusia between Uber and Cabify, and a strong positive and statistically significant correlation of prices for 5 out of 8 trips in Madrid between Uber and Bolt (Table 2). The instances of strong and moderate correlation of prices are highlighted in green in the table below.

[1] The full data is available in Table 5 in the Appendix.

	Uber-Cabify			Uber-Bolt			Cabify-Bolt		
	r	R^2	ø	r	R^2	ø	r	R^2	ø
Paseo de las Acacias, Madrid, - Hospital Quirón Salud, Pozuelo de Alarcón	0,26	0,07	2,53	**0,59**	0,34	5,51	0,26	0,07	6,57
Atocha - Paseo de la Castellana, 259, Madrid	0,19	0,04	1,26	**0,57**	0,33	7,30	0,26	0,07	8,60
Atocha - Calle Orense, 6, Madrid	0,36	0,13	2,34	**0,65**	0,42	1,91	0,36	0,13	5,09
Atocha - Calle Serrano, Madrid	**0,44**	0,19	1,70	**0,66**	0,44	1,42	**0,44**	0,20	3,10
Calle Velázquez - Paseo de la Castellana, 81, Madrid	0,25	0,06	1,50	**0,56**	0,31	1,29	0,28	0,08	2,56
Aeropuerto de Barajas T4 - Avenida Bruselas, Madrid	0,11	0,01	0,24	0,26	0,07	1,54	0,04	0,00	1,60
Aeropuerto de Barajas T4 - Calle María de Molina, Madrid	0,14	0,02	3,77	0,30	0,09	2,62	0,15	0,02	2,72
Aeropuerto de Barajas T4 - Plaza Castilla, Madrid	0,12	0,01	0,93	0,28	0,08	2,16	0,15	0,02	0,92
Aeropuerto de Málaga - Puerto Banús	**0,41**	0,17	4,18	0,03	0,00	8,96	0,16	0,03	4,70
Aeropuerto de Málaga - Málaga	**0,46**	0,21	0,92	0,08	0,01	1,72	0,12	0,01	1,07
Aeropuerto de Málaga - Marbella	**0,42**	0,18	7,51	0,07	0,01	8,27	0,14	0,02	4,43
Aeropuerto de Málaga - Nerja	**0,42**	0,17	9,44	0,02	0,00	10,38	0,15	0,02	2,13
Estación de Autobús de Marbella - Puerto Banús	**0,42**	0,17	0,79	0,16	0,03	1,52	0,14	0,02	0,86
Hotel Marriotts Marbella Palacio - Hipercor Puerto Banús	**0,40**	0,16	3,11	0,03	0,00	3,25	0,01	0,00	1,09
Bulevar San Pedro de Alcántara - Hotel Puente Romano, Marbella	**0,41**	0,17	1,09	0,11	0,01	1,19	0,12	0,01	0,86

Table 2. Pearson correlation coefficient, coefficient of determination and standard deviation for the binomials Uber-Cabify, Uber-Bolt, and Cabify-Bolt.

This indicates that the pricing algorithms of Uber, Cabify and Bolt are colluding in some of the most important routes in Andalusia and Madrid. This, in turn, is a possible breach of Law 15/2007 for the Defense of Competition (LDC) in Spain which prohibits direct and indirect price collusion. Even though there is no explicit agreement between ride-hailing companies, there is a scope to suggest indirect price-fixing by algorithmic means. This may be due to:

- Ride-hailing platforms using the same or similar algorithms with the effect of price convergence.
- Ride-hailing platforms using self-learning algorithms which "learn" to fulfill their objective through the formation of an implicit cartel.

In either case, algorithmic price collusion harms competition and the proper functioning of the economy by constricting consumer choice and creating an uneven playing field for other actors in the market such as traditional taxis and potential new entrants.

LABOR LAW

The platform economy first surged in popularity based on the promise of flexibility for workers and customers alike. Uber's initial business model was premised on the ability to connect independent drivers in their own vehicles to users. In Spain, however, Uber, Cabify and Bolt operate as intermediaries through VTC licenses owned by holdings and exploited by hired drivers who earn a fixed income and incentives according to their performance.

With this, VTC drivers for ride-hailing apps in Spain not only lack the flexibility promised by the platform economy, but also face new challenges due to the introduction of algorithmic decision-making to traditional labor processes. The operation of ride-hailing platforms as intermediaries between VTC holdings and passengers in Spain has created an opaque decision-making structure involving both algorithms and human agents. This structure determines, among other issues, the allocation of shifts and trips for drivers as well as their payment, and as such, it has important implications for labor rights. In order to examine the labor compliance of ride-hailing apps, we conducted interviews with VTC drivers and a VTC fleet manager. The interviewees remain anonymous, but their insights are outlined below.

Based on our conversations with VTC drivers, we identified at least two levels to the decision-making structure with partial overlap and without a clear focal point of accountability:

- At the first level, ride-hailing apps' algorithms connect vehicles with passengers, process payments, calculate drivers' scores, determine whether a driver is allowed to log into the platform, and send warnings to human agents from the VTC license holding companies among others.
- At the second level, VTC license holding companies set the general rules and frameworks for operation such as when and how long drivers work, and whether and how they can receive tips, while fleet managers enforce the rules and carry out the organization of the work, including assigning work slots and determining punishments.

Absence from work

One area of concern in the platform economy is the algorithmic limitations to future job opportunities and earning potential due to absence from work. In a 2020 legal action against Uber in the Netherlands, drivers brought forward evidence that Uber collected

performance-related metrics including late arrivals and ride cancellations.[2] In 2021, a case in the Court of Bologna found that Deliveroo's algorithm used this type of data, in particular absences from work shifts for any reason, to lower delivery workers' score, thereby limiting their opportunities to secure job assignments in the future.[3] The Court of Bologna ruled that Deliveroo engaged in discrimination against workers in cases of absences due to legally protected reasons such as illness, need to care for a minor or a disabled person and the right to strike. Importantly, the decision also confirmed that algorithms are subject to judicial review in cases of non-compliance with labor protections.

Our interviews revealed that ride-hailing platforms in Spain insufficiently accommodate lawful forms of absence from work as a result of the opaque decision-making structure distributed between algorithms and human agents outlined above. VTC drivers consistently report feeling pressured to work more and longer shifts despite legal provisions for rest during work hours and days off. For example, one driver expressed concern that workers cannot decline "a single minute of the assigned working hours" as this can result in sanctions, pay cuts and even dismissal. A VTC fleet manager similarly shared that if workers fail to meet the minimum requirements for earnings from completed trips, they may be assigned to worse cars or less lucrative areas, creating a "vicious cycle" and further constraining the ability to achieve targets and secure profitable job assignments.

These punishments can be determined and enforced by the managers in VTC license holding companies, the drivers explained. Screenshots of the Cabify application for VTC fleet managers obtained by Eticas corroborate this, as the app allows managers to deactivate drivers' profiles from the platform.

However, algorithms can sanction drivers, too. Excessive or unjustified ride cancellations during an ongoing shift can result in severe penalties. One driver noted that, in cases of excessive cancellations, passenger complaints and low customer satisfaction scores, an algorithm can lock out workers from connecting to the app for a period of time (for example, a day) or indefinitely as a penalty, thereby directly limiting drivers' opportunity to work.

Despite the potentially severe sanctions, decision-making algorithms in ride-hailing apps do not specify what constitutes excessive and unjustified ride cancellation. In the Uber app, for example, drivers have a list of options to select from as a reason for declining the ride (Figure 1). The app does not specify whether all options, such as for example "I have accepted the trip by mistake" or "I have taken the wrong way", are considered justified reasons.

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2 https://www.adcu.org.uk/news-posts/uber-drivers-take-unprecedented-international-legal-action-to-demand-their-data.

3

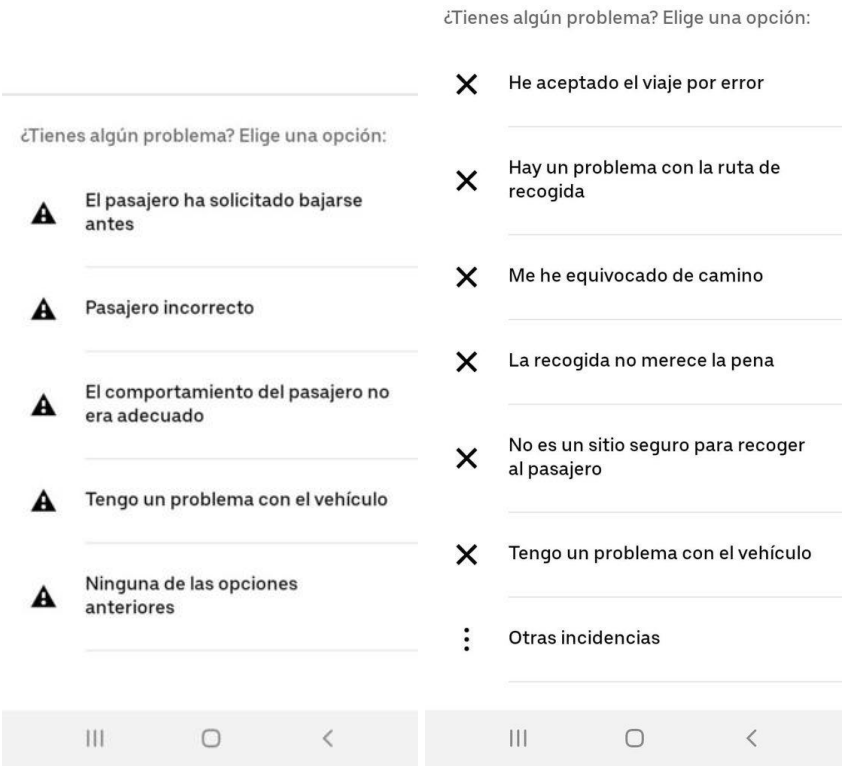

Figure 1. Canceling a trip in the Uber app
Screenshots provided by VTC drivers

The issue of unjustified ride cancellations as grounds for punishment raises further doubts in the case of the Cabify app, which does not collect information about the reason for declining a trip (Figure 2). To exacerbate this problem, Cabify only allows a maximum of two cancellations in a 24-hour period, VTC drivers shared.

Figure 2. Canceling a trip in the Cabify app
Screenshot provided by VTC drivers

It remains unclear whether and how ride cancellation or absences from work shifts, even for legally protected and justified reasons, affect drivers' ability to work. Our fieldwork found evidence that an internal ranking score for drivers appears to be connected to a

monthly reward system, but it is not specified whether the same ranking is also used to determine sanctions.

Screenshots of Cabify's application for fleet managers obtained by Eticas show an internal ranking score for workers ("DO") which is distinct from the drivers' public score based on customer reviews which is visible on the user app. The internal ranking system, which appears to be algorithmically-determined, identifies drivers who are currently offline and have not made any earnings for the day, and assigns them a score of 0. However, drivers who have been online for approximately the same amount of time and have earned similar amounts are assigned different ranking scores. This suggests that the ranking algorithm takes into account factors beyond the number of hours worked, trips made and amount of money earned. The monthly frequency of performance evaluations, on the other hand, may indicate that, beyond ride cancellations, absences from work shifts for justified and unjustified reasons also factor in this score.

Overall, ride-hailing apps and VTC companies do not provide sufficient transparency about procedures which protect workers from sanctions limiting future job opportunities and earning potential in cases of lawful reasons for absence. This, combined with strong disincentives for any absences or ride cancellations, raises concerns about the platforms' compliance with labor law.

Payment transparency

Another area of concern for labor rights in the platform economy is payment transparency. Delivery apps such as Instacart in the United States have attracted attention for their opaque, algorithmically-determined payment structures with inconsistent and unreliable commission rates for job assignments.[4]

Our interviews reveal that ride-hailing apps in Spain similarly lack transparency in the payment structure, especially in the case of performance incentives and tips. While each platform and VTC operator has different rules regarding tips in particular, drivers generally report difficulties with receiving them for several reasons. Some VTC operators and ride-hailing platforms, such as Cabify, forbid drivers from receiving tips in cash. This rule not only limits the opportunities to receive gratuity, but breaking it can also result in sanctions for drivers. In cases when users tip through the app, platforms provide little information regarding when and what proportion of tips is paid out to workers.

During our interviews, VTC drivers were generally skeptical about receiving tips from ride-hailing platforms. One driver remarked that they are still waiting to receive their tips from Uber, while another noted that they never received any tips from Cabify. This perception may be due to lack of transparency in the way payments are processed. A VTC fleet manager explained in an interview that tips made through ride-hailing apps are usually added directly to payroll along with the fixed wage and other monetary rewards for the workers, making the exact amount received in tips unclear. However, the fleet

[4] https://themarkup.org/2021/10/12/why-are-some-instacart-workers-calling-for-an-app-boycott

manager shared that, to their knowledge, some VTC companies do not distribute tips to drivers at all.

The screenshots of Cabify's application for fleet managers (obtained separately) reveal that the tip amount received through the user app is clearly visible for each ride. However, the payment slips issued to workers only contain a single category without a breakdown of different income streams, such as wages earned, performance bonuses and tips. At best, this could point to the lack of transparency in the payment structures of ride-hailing platforms and VTC companies. At worst, however, it can imply that workers are not fairly compensated for their work.

In the cases of both absence from work and payment transparency, our interviews reveal concerning findings about ride-hailing platforms' compliance with labor rights. This has significant social repercussions, as the VTC sector employs over 20.000 in the Community of Madrid alone, usually members of vulnerable groups with little bargaining power such as older unemployed people who have difficulties returning to the job market and migrants.[5]

Despite this, Spanish law offers little legal protections to ride-hailing drivers. This due to the classification of VTC drivers as contract workers rather than employees on the one hand[6] and the lack of regulation for VTC operations on the national level on the other hand.

While there have been efforts within autonomous communities to address this gap, such initiatives have had limited success with respect to effective labor protections. In the Community of Madrid, for example, the collective agreement between Aseval and Unauto, the employers' associations in the VTC sector, and the main VTC driver unions, UGT, CC OO and SLT[7] reaffirmed existing legal provisions such as the right to two consecutive days of rest, but it also allowed workers to voluntarily waive this right. Similarly, the agreement denotes four to six unjustified service cancellations in a month as a "serious offense" for drivers, but it fails to specify what constitutes justified and unjustified rejection.[8] This clearly suggests that the legal protection for platform workers in mobility services, mostly comprising members of vulnerable groups, is highly insufficient.

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5 https://www.elconfidencial.com/juridico/2022-06-14/jornadas-interminables-uber-cabify_3439310/

6 In 2020, the Spanish Supreme Court ruled that platform workers should be classified as employees, and not contract workers in a case against Glovo, a food delivery app. However, this decision has not been enforced in practice. https://www.reuters.com/article/uk-spain-glovo-ruling-idUKKCN26E2NR

7 https://aseval-madrid.com/sindicatos-y-patronales-de-las-vtc-firman-una-subida-salarial-del-12-en-el-primer-convenio-laboral-estatutario/

8 https://noticias.juridicas.com/base_datos/CCAA/719289-convenio-colectivo-del-sector-de-transporte-de-pasajeros-de-la-comunidad-de.html#c5

CONSUMER LAW

Ride-hailing apps use surge pricing algorithms to determine ride fares based on supply and demand in a given area and time. For example, higher demand for transportation services during rush hour may cause trip prices to go up in busy areas. Conversely, the low supply of cars in remote and less busy areas may drive fares up. This means that geographic price discrimination occurs, where platforms charge different rates for the same service in different locations.

Previous studies have revealed that surge pricing algorithms can discriminate neighborhoods based not only on geographic location, but on demographic makeup due to variance in supply and demand in areas with different population characteristics. Pandey and Caliskan, 2021 found that neighborhoods with large non-white populations, higher poverty levels, younger residents and high education levels are associated with higher fares on ride-hailing apps. Similarly, Uber has been shown to charge higher prices for trips to more expensive hotels (Chang et al., 2021).

To probe this issue further, we investigated whether ride-hailing apps discriminate based on the socioeconomic characteristics of neighborhoods by algorithmic means. We used median income, or (add definition from article), as an indicator of the socioeconomic makeup of neighborhoods. Based on 2018 data from (website name), we selected four low-income neighborhoods, two medium-income neighborhoods, and four high-income neighborhoods in Madrid and Malaga (Table 3). The low-income neighborhoods in both Madrid and Malaga represent the bottom 1% in their respective autonomous communities, Andalusia and the Community of Madrid. The selected medium-income neighborhoods sit at the top 24-41%, while high-income neighborhoods are in the top 1-6% of their communities. We also considered relative proximity to one another and relative distance from the city center in our selection of neighborhoods in order to control for the higher supply and demand of transportation services in busy areas.

	Low-income neighborhoods (EUR)	Medium-income neighborhoods (EUR)	High-income neighborhoods (EUR)
Madrid	5.250-6.650	19.950	33.600-36.750
Málaga	5.250-6.650	14.350	25.550-28.350

Table 3. Socioeconomic characteristics of selected neighborhoods

We then collected trip fares for 20 routes using the Uber app: two routes in each neighborhood with approximate length of 2 km and 4 km respectively.[9] We collected the fares for four Uber services:

- UberX Saver, the platform's most affordable service;
- UberX, the standard service offered by Uber;

[9] The full data is available in Table 6 in the Appendix.

- Comfort, a premium service for "comfortable cars with top rated drivers";
- Van, a premium service for large groups.

The first indication of possible geographic price discrimination based on socioeconomic characteristics is that UberX Saver, Uber's most affordable service, tends to be unavailable in low-income neighborhoods. This is especially evident in the case of Málaga where UberX Saver is unavailable for two out of four routes in low-income neighborhoods, compared to only one out of four routes in high-income neighborhoods. In Madrid, UberX Saver is more widely available, with the exception of one route in a low-income neighborhood.

To explore correlations between trip fares and median income for further indications of geographic price discrimination, we calculated the price per kilometer for each trip in both cities and conducted a linear regression analysis (Table 4). Below, the Pearson correlation coefficient (r) indicates the linear dependency (either positive or negative) between two variables, whereas the coefficient of determination (R^2) indicates the proportion of the variation in the dependent variable that is predictable from the independent variable.

	UberX Saver[10]		UberX		Comfort		Van	
	r	R^2	r	R^2	r	R^2	r	R^2
All routes	0.32	0.10	-0.17	0.03	-0.26	0.07	-0.22	0.05
Routes in Madrid	0.15	0.02	-0.14	0.02	-0.16	0.02	-0.15	0.02
Routes in Málaga	0.53	0.28	-0.20	0.04	-0.36	0.13	-0.31	0.10

Table 4. Price per kilometer and median income: Pearson correlation coefficient and coefficient of determination

Our findings demonstrate that trip fares correlate with median neighborhood income. In particular, we observe a weak to moderate negative correlation between price per kilometer and median income for the UberX, Comfort and Van services (Figure 3). In other words, prices in Uber tend to be lower in more affluent neighborhoods.

[10] Excluding routes where UberX Saver is unavailable.

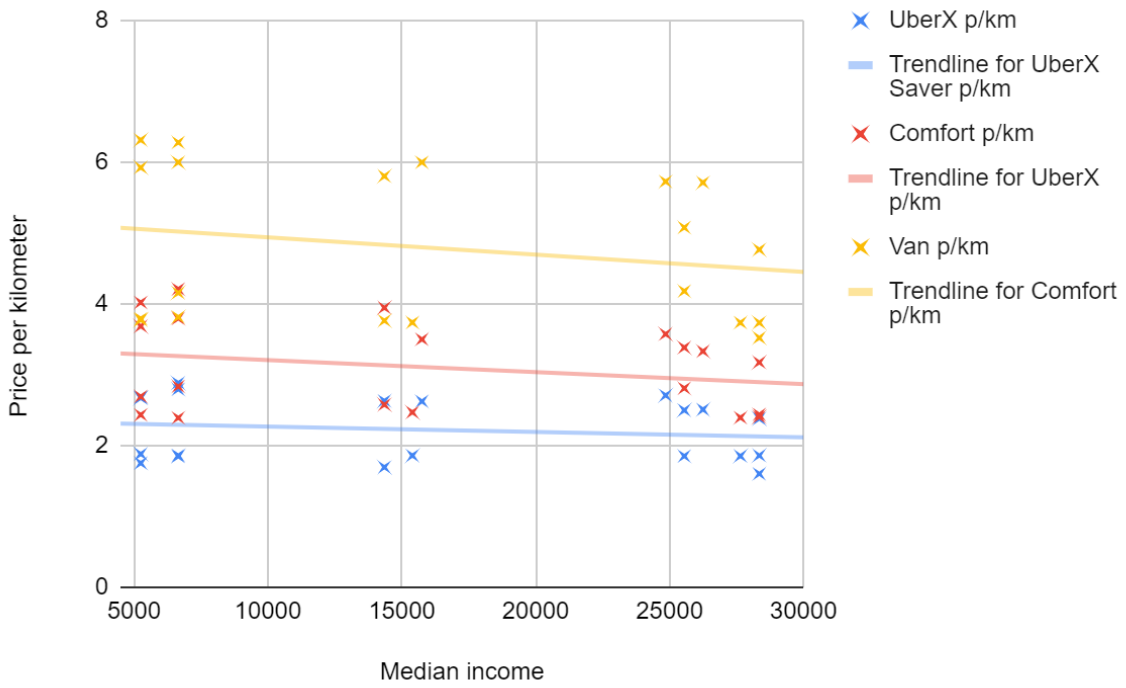

Figure 3. Trendline for the relationship between price/km and median income for UberX, Comfort and Van in all trips

This is the case for all of Uber's services included in this analysis except for one. In the case of UberX Saver, we note a moderate positive correlation, where prices rise with income level. As mentioned above, this service tends to be unavailable in low-income neighborhoods to begin with. However, the absence of UberX Saver quotes for certain routes in less affluent neighborhoods does not fully explain the variation, which may be an indication that the relative importance of different factors in surge pricing (e.g. length of trip, supply, demand, and location) varies across Uber services.

However, the correlation is complicated by the difference between short and longer trips. In short trips, there is a strong negative association between fares and income level, where the price per kilometer is significantly higher in low-income neighborhoods (Figure 4). In longer trips, however, the correlation is weak, but positive i.e. prices rise with income level. This further reflects the complex surge pricing algorithm where the interplay between supply of cars and user demand, as well as other factors such as length of travel, can create seemingly contradictory trends in pricing.

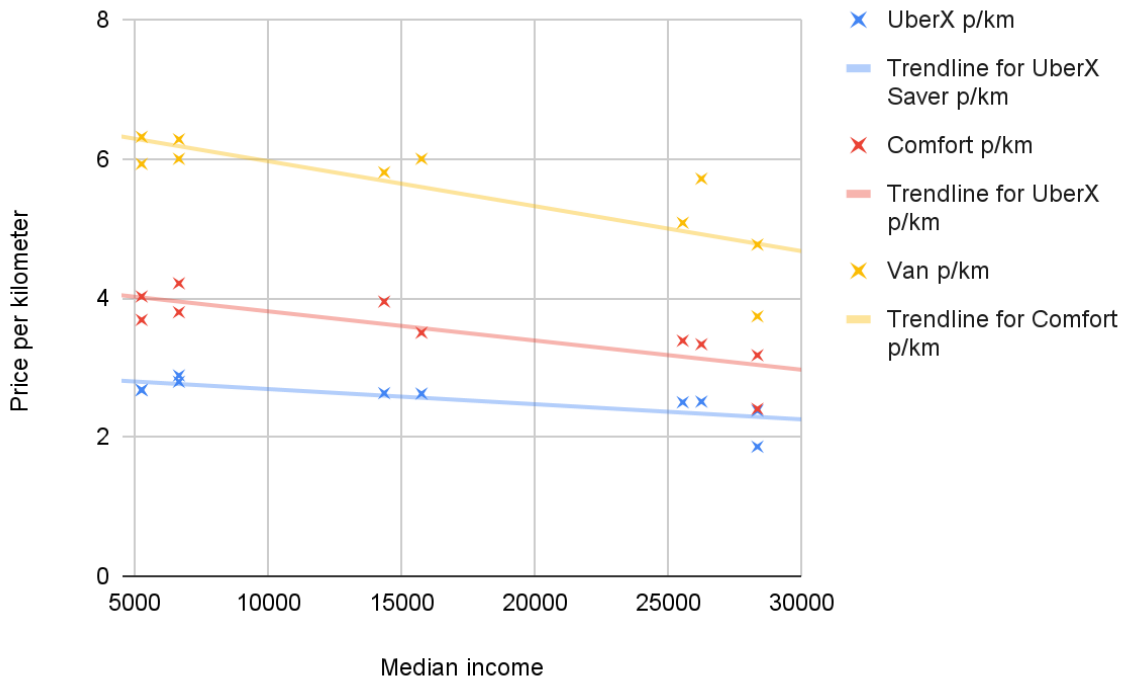

Figure 4. Trendline for the relationship between price/km and median income for UberX, Comfort and Van services in short trips

Our analysis also reveals differences between cities. While the direction of association is consistent i.e. prices are lower in more affluent neighborhoods in both Madrid and Málaga for all services except UberX Saver, the strength of the correlation varies. In Málaga, the relationship between trip fares and median income is stronger across all Uber services. This, in turn, suggests that the relative importance of different factors in surge pricing varies not only across Uber services, but also across cities.

Overall, our analysis finds indications that Uber's pricing algorithm discriminates based on the socioeconomic characteristics of neighborhoods. In particular, we observe that lower income levels are associated with higher trip fares under some conditions, making transportation and mobility services more inaccessible to disadvantaged groups.

This raises doubts about Uber's compliance with the General Consumer and User Protection Act in Spain, which prohibits any form of discrimination based on place of residence. While the Act allows for "differences in access conditions directly justified by objective criteria", the opaque nature of the pricing algorithms used by ride-hailing platforms precludes any formal assessment of objectivity. However, the high degree of variability in the criteria used to calculate trip fares revealed in our analysis calls into question the objectivity of Uber's pricing algorithm and and by extension, the company's compliance with consumer protection laws.

CONCLUSION

This report outlined the findings of Eticas' adversarial audit of ride-hailing platforms in Spain with view to compliance with competition, labor, and consumer law. The main conclusions of the audit are as follows:

- The pricing algorithms of Uber, Cabify and Bolt are colluding in some of the most important routes in Andalusia and Madrid, which suggests indirect price-fixing by algorithmic means in breach of the Law for the Defense of Competition.
- Algorithmic management in the ride-hailing platforms discriminates against platform workers for legally protected or otherwise unspecified and arbitrary reasons and as a result, deprives vulnerable groups from opportunities for future work and earning potential.
- Uber's pricing algorithm can discriminate based on the socioeconomic characteristics of neighborhoods and make mobility services less accessible in low-income areas, which may constitute an infringement of the General Consumer and User Protection Act.

While our findings raise doubts about ride-hailing platforms' compliance with applicable legislation in the areas of competition and consumer law, the lack of transparency in the algorithms used by mobility service providers makes it difficult to prove price collusion or consumer discrimination as a basis for legal action. However, given the concerning results of this audit, we urge the relevant authorities to explore this issue further. In regards to labor rights, we recommend that authorities implement stronger protections for gig workers with provisions for algorithmic transparency and robust mechanisms for enforcement.

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Bibliography

Appendix

			Uber		Cabify		Bolt	
	km	Min.	avg. price	std. dev.	avg. price	std. dev.	avg. price	std. dev.
Paseo de las Acacias, Madrid - Hospital Quirón Salud, Pozuelo de Alarcón	10,9	20	12,75	2,62	11,31	1,07	16,49	6,81
Atocha - Paseo de la Castellana, 259, Madrid	13,8	19	14,00	3,96	13,96	1,28	21,00	8,89
Atocha - Calle Orense, 6, Madrid	7,7	20	9,29	2,51	8,34	1,09	12,20	5,45
Atocha - Calle Serrano, Madrid	5,3	14	6,11	1,90	5,20	0,92	7,46	3,46
Calle Velázquez - Paseo de la Castellana, 81, Madrid	3,6	12	5,69	1,55	4,47	0,81	6,55	2,66
Aeropuerto de Barajas T4 - Avenida Bruselas, Madrid	8,9	10	14,80	1,79	15,01	0,24	10,95	1,60
Aeropuerto de Barajas T4 - Calle María de Molina, Madrid	13,8	20	19,09	3,81	16,01	1,45	17,84	2,75
Aeropuerto de Barajas T4 - Plaza Castilla, Madrid	13,3	14	17,44	3,80	15,34	0,93	15,47	2,25
Aeropuerto de Málaga a Puerto Banús	57,8	44	84,49	8,87	65,29	4,59	55,90	18,61
Aeropuerto de Málaga - Málaga	8,4	10	15,21	1,70	10,15	1,04	8,69	2,91
Aeropuerto de Málaga - Marbella	53,5	37	78,98	8,29	60,22	4,31	52,01	17,31
Aeropuerto de Málaga - Nerja	68,3	48	92,81	10,38	77,09	5,62	67,80	2,16
Estación de Autobús de Marbella - Puerto Banús	8,5	10	10,37	1,49	11,20	0,87	9.59	1,54
Hotel Marriott Marbella Palacio - Hipercor Puerto Banús	20,8	20	25,72	3,40	25,45	1,08	19,51	6,53
Bulevar San Pedro de Alcántara - Hotel Puente Romano, Marbella	7	14	8,68	1,20	9,48	0,87	7,84	0,84

Table 5. Trip length (km and minutes), average price and standard deviation for each service provider and trip

City	District	Median income (EUR)	Start point	End point	Approx length (km)	Approx time (min)	UberX Saver	UberX	Comfort	Van
Madrid	Villa-Vallecas	5250	Carr. Cañada Real, 90	Cam. Leña, 10	1.9	6	-	5.09	7	12
Madrid	Villa-Vallecas	5250	Av. Mediterráneo, 127	Ctra. Vertedero Municipal Valdemingómez, 155	3.8	9	6.25	7.15	9.25	14.41
Madrid	Vicálvaro	6650	C. de Boyer, 2	C. Dehesa Vieja, 8	2	4	5.06	5.77	7.59	12
Madrid	Vicálvaro	6650	Blvr. de José Prat, 29	Carr. de Vicálvaro a la Estación de O'donnell, 19	3.9	10	6.3	7.21	9.33	14.88
Madrid	Vicálvaro	19950	Av. de Miguel Delibes, 30	C. Vereda de la Cebolla	2	4	4.63	5.25	7	12
Madrid	Vicálvaro	19950	C. de Cerceda, 20	C. Pilar Bellosillo, 12	3.9	7	6.33	7.25	9.63	14.58
Madrid	Fuencarral-Pardo	33950	C. de Frómista, 1	C. de Cebreiro, 2	2.1	6	5	5.69	7.51	12.03
Madrid	Fuencarral-Pardo	33600	Distrito Telefónica Edificio Norte 1	C. de Navarrete, 9	3.9	6	6.31	7.23	9.34	14.57
Madrid	Barajas	36750	Av. de Logroño, 179	Parque Juan Carlos I	2.1	4	4.65	5.27	7	12
Madrid	Barajas	36750	Av. de Logroño, 179	Feria de Madrid	3.9	6	6.34	7.26	9.38	14.57
Málaga	Ronda I.-Campan	5250	CEIP María de la O	Lugar Cuidad de los Niños 1	1.9	5	-	5.08	7.64	11.26
Málaga	Ronda I.-Campan	5250	Calle pedagoga María Montessori N, 8	Arquitecto Francisco Peñalosa, 18	4.1	7	6.11	7.18	11.04	15.47

Málaga	Malaga-Norte	6650	C. Alcalde José Luis Estrada	Cam. de Los Alcabuceros, 6	2	7	-	5.59	8.42	12.56
Málaga	Malaga-Norte	6650	Finca La Pola	C. Ana Sólo de Zaldívar	3.9	11	6.2	7.26	11.06	16.22
Málaga	Ronda I.-Campan	14350	Av. de las Malagueñas	C. la Orotava, 38	1.9	4	-	5	7.5	11.03
Málaga	Ronda I.-Campan	14350	C. José María Jacquard, 18	Av. de José Ortega y Gasset, 201	4.2	7	6.06	7.12	10.83	15.81
Málaga	Málaga-Norte	25550	C. Bogor, 4	C. Julio Verne, 6	2	6	5	5	6.77	10.16
Málaga	Málaga-Norte	25550	C. Julio Verne, 6	C. Trombón, 22	4.1	13	-	7.59	11.52	17.14
Málaga	Málaga-Este	28350	C. de la Minilla, 3	C. Monte Miramar, 38	2.1	6	5	5	6.67	10.01
Málaga	Málaga-Este	28350	Camino de los Almendrales	C. las Espuelas, 12	4	8	5.46	6.41	9.76	14.09

Table 6. Price and length of selected trips for four Uber services

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