

## **Effectiveness of Clean Taxi Priority Incentive at Amsterdam Central Station**

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### **Abstract**

The municipality of Amsterdam wants to have an emission free taxi sector by 2025. In order to reach that goal, the city has taken a number of measures which favour clean taxis above conventional taxis. One of these measures is an innovative priority privilege scheme at the Amsterdam Central Station taxi stand, which should lead to shorter waiting times and more trips for clean taxis. The municipality wants to know if the measure is effective. In this study, we present an analysis of visiting behaviour of clean and regular (diesel) taxis in order to assess the effectiveness of the privilege scheme to attract more clean taxis. As such it aims to contribute to a better understanding of the effect of the priority measure at the Amsterdam Central Station and to provide input for policy makers to introduce incentive schemes to stimulate clean taxis in cities. Analysed data covers a timespan from one year, starting October 2015 when the privilege scheme started with a call rate of 1 clean taxi to each 4 taxis called for a ride. The analysis shows the number of arriving clean taxis to shift from 1:6 to 1:4 during the observation period. Based on this analysis the municipality decided to modify the preference ratio beginning 2017. This study contributes to a better understanding of the effect of the privilege measures and provides input for policy makers introducing incentives to stimulate clean taxis in cities.

*Keywords: electric taxis, public policy, policy measures, incentives*

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### **1 Introduction**

At present about 300 clean<sup>1</sup> taxis run in Amsterdam, less than 10% of the total number of taxis in the city, which mostly run on diesel [1].

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<sup>1</sup> The municipality of Amsterdam has defined clean as Full Electric Vehicles (FEV), PlugIn Electric Vehicles (PHEV) acquired before July 1, 2016 and Compressed Natural Gas Vehicles (CNGV) for the period until 2021.

The diesel taxis emit a disproportionately large amount of hazardous emissions in many short journeys which mainly take place in the centre of the city. Use of clean taxis is therefore highly desirable for improving air quality. In a voluntary agreement for Clean Taxis for Amsterdam [2], the municipality has agreed with the official taxi organizations in Amsterdam that all taxis be fully emission free by 2025. In order to reach that goal the city of Amsterdam has committed itself to facilitating clean taxis in the city, especially the

electric ones, with a number of measures and incentives like subsidies, fast charging facilities and privileges. One of the privilege incentives is the priority privilege for clean taxis at the Amsterdam Central Station taxi stand. Since October 2015, one in four taxis which picks up passengers should be clean (either electric, plug in electric or (natural or bio) gas). By January 2017 this clean to non clean ratio will be one in three and by 2018 passengers should only be picked up by clean taxis. While waiting, the electric taxis can use the fast chargers at this particular taxi stand, another facilitating factor installed by the municipality.

Important questions for the municipality relate to whether the priority measure works effectively to nudge the taxi sector towards zero emission trips. The city cooperates with the Amsterdam University of Applied Sciences (AUAS) in the three year research project “Urban Smart Measures and Incentives for the Enhancement of the quality of Life” (U-SMILE) to analyse the effect of the policy measure. Based on recorded data, AUAS will determine effects on increased number of electric taxis, decrease of the number of conventional taxis, charging behaviour at the taxi stand and the reaction of taxi drivers.

This paper presents research findings regarding the effectiveness of the priority privilege measure for clean taxis at the taxi stand at Amsterdam Central Station based on numerical analysis of available data.

## 2 Priority privilege description

Only taxis belonging to official taxi organizations are allowed to enter the taxi stand. At the entrance, the drivers pass number is scanned and date and time stamp added. In case access to the taxi stand is allowed, the licence plate is scanned and the software determines if the taxi is to be regarded as clean or not. The taxi then parks and waits until called to pick up passengers from one of the four pick up lots. The calling software ensures that 1 in 4 taxis is clean.

## 3 Results

In the period from October 2015 to September 2016, on average 690 times per day taxis enter the taxi stand, see Figure 1. This number of taxis per day is fairly constant, there is only a minor seasonal effect. Peaks have been traced back to events in the city or holidays, an example being the peak at January 1<sup>st</sup>. Software maintenance

and updates are the cause of lacking data at some days, an example being March 24 and 25.

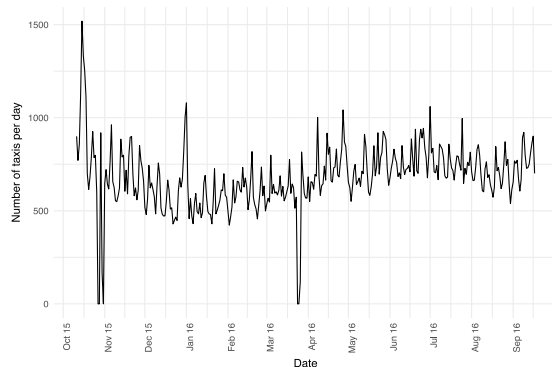


Figure 1 Number of taxis per day entering the taxi stand at Amsterdam Central Station in the period October 2015 – October 2016..

The data allows depiction of interesting taxi statistics. Figure 2 shows the average arrival pattern during 24 hours. This figure shows the busiest moment of the day is at three o'clock in the afternoon with a maximum of about 50 taxis, whereas in the middle of the night less than 10 taxis arrive per hour.

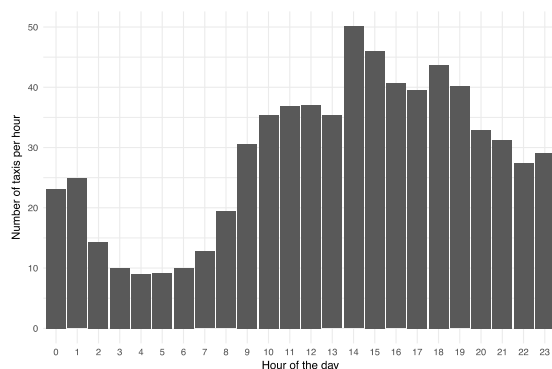


Figure 2 Number of taxis per hour arriving at the taxi stand.

The number of arriving taxis varies strongly per day of the week, see Figure 3. Friday is the busiest day, peaking at 900 taxis per day, Tuesday is the most quiet day. The difference between a busy and a quiet day can be as much as about 500 taxis.

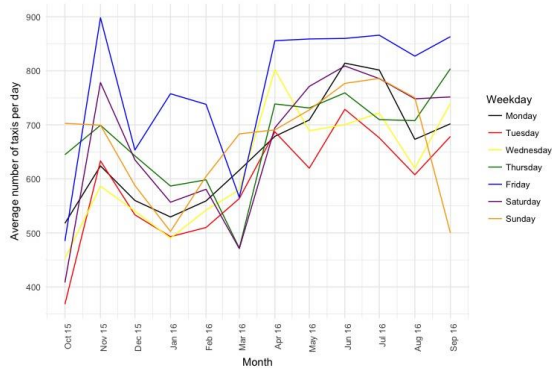


Figure 3. Number of taxis per day

The dataset comprises of 260 different clean taxis, most of them visiting the taxi stand on average once per day, see Figure 4. On average, about 40 taxis visit the taxi stand more than once, there is one taxi with an average of five visits per day.

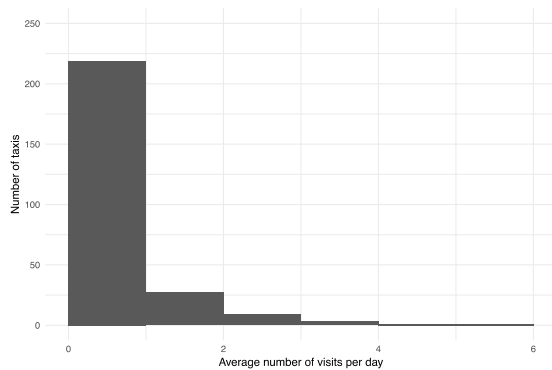


Figure 4. Average number of visits per day by a clean taxi

During the observation period of one year, clean taxis entered the taxi stand on average 125 times per day. At the start of the privilege measure, about 100 taxis enter, at the end of the observation period this number has increased to about 150, see Figure 5. It shows how there is a significant growth on the absolute number of electric taxis entering the taxi stand.

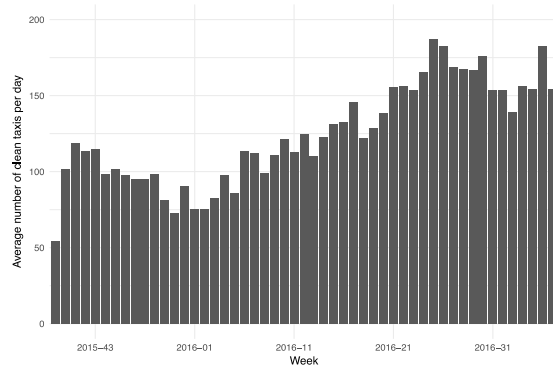


Figure 5 Number of clean taxis per day arriving at the taxi stand.

As the number of arriving taxis per day is fairly constant over the observation period, see Figure 1, it can be concluded that the share of clean taxis at the taxi stand increases. This is shown in Figure 6: in the beginning of the observation period around 1 in 6 arriving taxis is clean, by the end of the period this had shifted to 1 in 4 arriving taxis. Based on these conclusions the municipality decided to change the ratio from 4:1 to 3:1.

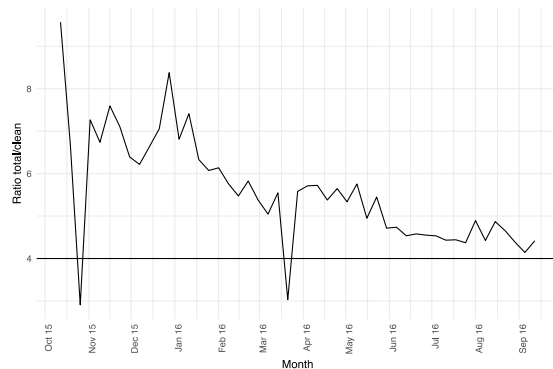


Figure 6 The ratio total clean arriving taxis declined from 6:1 to 4:1 in the one year observation period after introduction of the priority measure in October 2015 at the Amsterdam Central Station taxi stand.

## 4 Conclusions and further work

This work shows that the share of clean taxis versus diesel taxis has changed significantly one year after activation of the priority incentive for clean taxis at the Amsterdam Central Station taxi stand.

Apparently this privilege, for clean taxis, possibly in combination with other privileges like subsidy and charging infra facilities, has provided an incentive to clean taxis to visit the taxi stand and discourages visits of non-clean taxis.

After one year, the priority incentive had lost its preferential power due to the shifting share of clean taxis. As such, reducing the 1:4 to 1:3 clean:total ratio was recommended and implemented by the municipality of Amsterdam in January 2017.

The incentive provided by the municipality then provides a powerful example of how cities may stimulate a shift towards clean taxis through the instrument of a regulated taxi stand with a preferential system for electric taxis. Given that electric taxis tend to have a higher total cost of ownership versus regular taxis, such a preferential system may provide an attractive supplementing argument, or more importantly a large amount of increased revenues for taxi drivers to switch to electric. As such the incentive has shown its potential to provide an extra argument to switch to electric vehicles which may also be used in other taxi stands in Amsterdam as well as other cities and countries.

Further work includes continuous monitoring of the taxi stand to see the effects of the priority incentive on the share of clean taxis versus non clean taxis.

Interviews with taxi drivers will be carried out in parallel with the taxi stand monitoring in order to establish how taxi drivers evaluate the incentive and changes within the incentive scheme.

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## References

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