RISE
POLIT CASE COMPETITION

KØBENHAVNS KOMMUNE

Polit Case Competition

Rise Case 2021

København Kommune
The City of Copenhagen

ABOUT THE CITY OF COPENHAGEN

The City of Copenhagen (Københavns Kommune) is the largest Danish municipality with more than 600,000 citizens, 300,000 private jobs and 35,000 workplaces.

Copenhagen constitutes a central part of the Danish economy and 40 percent of the output in Denmark is produced in the capital region. The economic growth in the capital is crucial for growth throughout Denmark as new jobs and growth in Copenhagen spill over to the rest of the country.

The Finance Administration (Økonomiforvaltningen) is one of the seven administrations in the City of Copenhagen. The Finance Administration is responsible for the overall coordination of the city's affairs including the municipal budget. Furthermore, the Finance Administration is the Lord Mayor's department and a job in the Finance Administration thus entails working close to the political decision-making processes.

The Finance Administration collaborates with the other administrations of the City of Copenhagen to support the City Council in developing the city in a socially, economically, and environmentally sustainable way to improve the well-being and prosperity of its citizens. The City of Copenhagen corporates with other political bodies such as ministries, other municipalities, and the Capital Region of Denmark, as well as organizations such as Greater Copenhagen, C40 (a network of the world's megacities committed to addressing climate change) and Wonderful Copenhagen.

Working at the Finance Administration provides opportunities to work with many areas, such as:

- Budget, accounts, and financial management including managing a budget of more than 45 bn DKK
- Economic growth, productivity and strategic analyses of Copenhagen's economy and possibilities of growth
- Labor market, commuting, agglomeration, and promoting regional collaboration within the Capital Region of Denmark and across Øresund in the Greater Copenhagen region
- Green growth, sustainability, and achievement of Copenhagen's ambitious climate goal of carbon neutrality in 2025
- Urban development, traffic planning, and development of big infrastructure projects
- Register-based analyses of demographic development, social conditions, housing, and employment
- Tourism, business life, internationalization, and attracting foreign businesses, investments and highly skilled labor

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INTRO TO THE CASE

The City of Copenhagen strives to ensure the well-being of its inhabitants whilst protecting the environment. Heavy traffic in Copenhagen causes congestion, and road traffic is at the same time a large source of air pollution and CO_2 emissions.

As congestion is a nuisance to the citizens and visitors of Copenhagen, the City Council has requested the Finance Administration to provide an analysis of the effects of tolling in central Copenhagen. The purpose of the analysis is to inform the City Council of the predicted effects on the traffic flow along with the anticipated socio-economic consequences of implementing tolling. Furthermore, the City Council has requested the Finance Administration to consider the advantages and disadvantages of tolling and whether there are better solutions to combat traffic congestion.

Congestion pricing, such as tolling, is used as a tool to reduce the inconvenience of traffic in large cities worldwide. The implementation of congestion pricing in Copenhagen would be highly compatible with the City of Copenhagen's ambition of green mobility and Copenhagen's brand as a city pioneering green initiatives.

Photo by Ursula Bach

TRAFFIC IN THE CITY OF COPENHAGEN

The City of Copenhagen has a well-developed road network for both car and bike traffic. This volume has been closely monitored by the City of Copenhagen over time and is reported in figure 1. To complement the road network, the City of Copenhagen has made large investments in public transportation and in bicycle infrastructure over the past decades. The public transportation network consists of numerous bus lines, an urban metro and the suburban S-train which connects the inner city with the urban area of Copenhagen. The number of daily users distributed on the modes of public transportation is reported in figure 2.

The City of Copenhagen is conducting an annual survey asking the citizens of Copenhagen about their transportation habits to. These results can be seen in figure 3. Lastly, the traffic in Copenhagen will inevitably be affected by the number of registered cars. The number of registered cars for private driving purposes is monitored by the City of Copenhagen and are reported in figure 4.

Figure 1: Volume of traffic

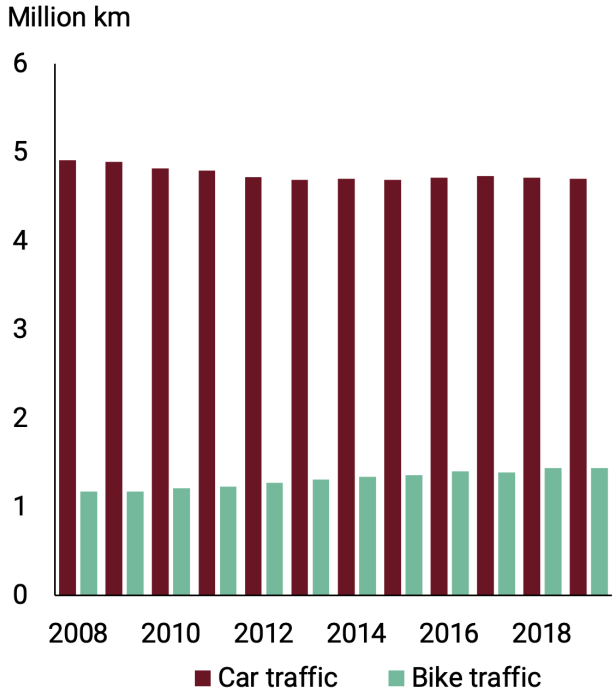
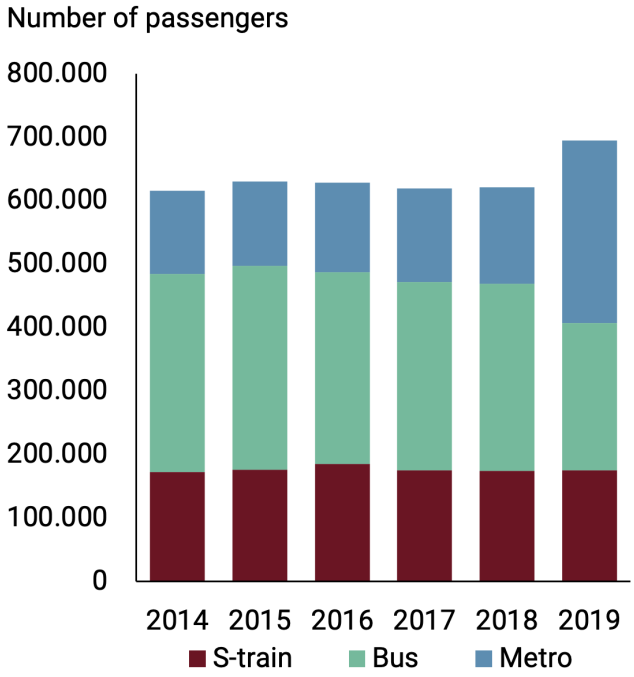


Figure 2: Daily passengers



Note: The Metro Cityring opened in September 2019 and comparison over time must thus be made with caution.

Figure 3: Modal split, trips to, from and within the City of Copenhagen

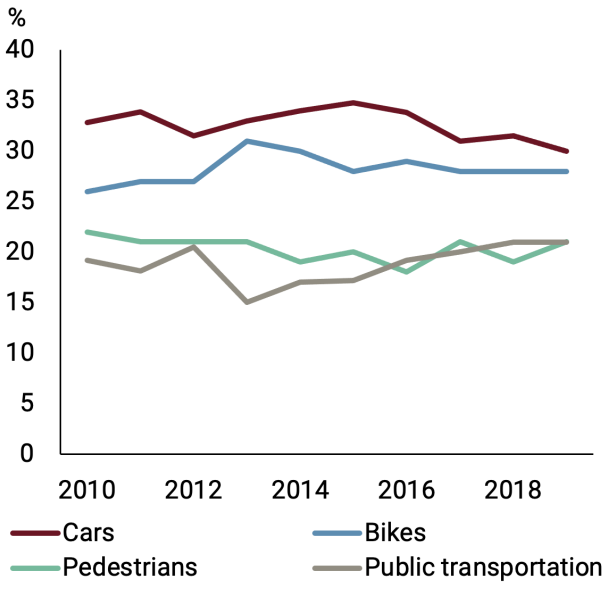
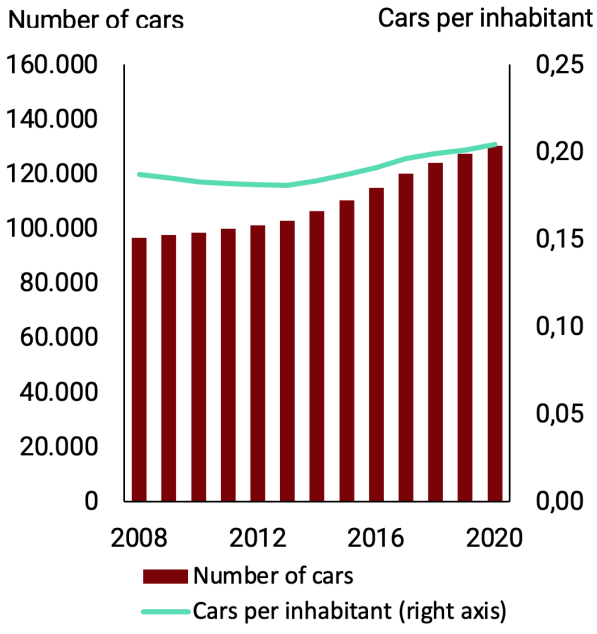


Figure 4: The car stock in the City of Copenhagen



THEORY OF TOLLING

In essence, traffic congestion is a consequence of the nature of supply and demand. The supply side is the capacity of roads, which is time-consuming and costly to build and thus fixed in the short run. On the contrary, the demand, which is the utilization of roads, fluctuates greatly depending on the time of the day, week and month.

Tolling is one tool for alleviating traffic congestion. The utilization of roads is associated with an externality since each driver does not consider the nuisance and the individual contribution to congestion that adversely affects other people. An efficient tolling scheme will thus internalize the externalities caused by each road user. Thereby, equating the road users' private costs with the social costs of using the roads. In other words, congestion pricing is intended to link road users' choices with the actual costs they impose on the transport system. An efficient tolling scheme encourages road users to use the roads more efficiently by restoring a sustainable equilibrium of the volume of traffic.

TOLLING MODEL

In response to the City Council's request, the Finance Administration examines an electronic tolling model in which vehicles must pay a fee when passing a gantry to a fee zone. The fee zone of 4.65 km^2 includes the area within the Lakes and the Harbor of Copenhagen encircling the inner city, see figure 5. This part of the city has a has a large number of citizens and workplaces and a variety of popular attractions implying a large number of daily visitors. Therefore, the car traffic in this area will inevitably affect many people. In addition, the inner city has a well-functioning public transport system as well as good conditions for biking, which should make it easy to switch to alternative modes of transportation.

The congestion fee will require vehicle owners to pay DKK 25 per passage in and out of the fee zone on weekdays between 7:00 to 19:00. There is no charge on weekends and public holidays and the fee is levied for cars entering and exiting the zone. It has been decided that the tolling scheme will rely on existing and well-proven technology to minimize developing costs and avoid overrun budgets. Inspired by electronic tolling schemes from other metropolises, vehicles are identified using automatic number plate recognition each time they pass one of the gantries encircling the fee zone.

To highlight some of the socio-economic consequences of a tolling scheme, a cost-benefit analysis has been conducted. The costs and benefits are split into variable and fixed measurements. The variable measures depend on the reduction in cars as a result of the tolling scheme. The results are presented in table 1.

Figure 5: Illustration of the proposed fee zone

Source: Google Maps

TABLE 1: ANNUAL SOCIO-ECONOMIC CONSEQUENCES

Costs

Annual system operating costs*	**1.35 bn DKK**
Estimated utility loss from route switching to avoid the fee zone	**25 DKK per vehicle**
Toll fee for vehicle owners	**25 DKK per vehicle**

Benefits

Less congestion	**50 DKK per vehicle**
Fewer accidents involving vehicles	**30 DKK per vehicle**
Less noise pollution	**20 DKK per vehicle**
Less air pollution	**12.5 DKK per vehicle**
Revenue from vehicle owners	**25 DKK per vehicle**

** The net present value of the initial investment needed to establish the system is spread across the expected lifetime of the system. Hence, the total annual costs of the system, initial investment, constructing and operating, are included in the annual system operating costs.*

PERSPECTIVE: CONGESTION PRICING SCHEMES IN OTHER CITIES

Congestion pricing schemes have been introduced in cities around the world, where the scheme in each city has been established based on local problems, goals and social norms. Table 2 summarizes congestion schemes in the cities of Stockholm, London and Singapore. The case study includes a brief description of the congestion pricing scheme, operation, payment system and the effects on traffic.

TABLE 2: CASE STUDIES OF CONGESTION PRICING SCHEMES IN OTHER CITIES

	Stockholm	London	Singapore
Description of pricing scheme	The system launched in 2007. It uses automatic number plate recognition in a 35 km^2 zone. A variable fee is charged when vehicles pass a gantry, which encircles the fee zone.	The system launched in 2003. It uses a flat fee road pricing scheme which uses automatic number plate recognition in a 21 km^2 zone. Vehicles are registered automatically by cameras.	The system launched in 1998. It registers cars automatically by an In-vehicle Unit. The variable fee is designed to respond to real-time congestion and is charged every time a vehicle passes a gantry.
Primary goals	Reduce congestion, improve air quality and time reliability for car users.	Reduce congestion, improve air quality, improve time reliability and secure funding for public transportation.	Reduce congestion and improve time reliability for car users.
Payment system	Variable fee based on time of day. The fee per passage varies from 0-26 DKK.	Flat daily congestion fee of 96 DKK and an environmental fee depending on the type of vehicle.	Variable fee based on real-time congestion. The fee per passage varies from 0-19 DKK.
Hours in operation	6:30- 18:30 Monday - Friday No fee in July and on public holidays.	7:00 - 18:00 Monday - Friday No fee on public holidays.	7:00- 20:00 Monday - Saturday No fee on public holidays.
Effects on traffic	Traffic to and from the fee zone was reduced by 25% compared to before. The reduced congestion also meant that travel time reliability increased. Drivers switching from car to public transport implied that the number of passengers using public transportation increased by 4-5%.	Traffic entering the fee zone during charging hours has declined by 18%. Half of the decline can be attributed to drivers switching to public transportation, which increased by 8%. The remaining drivers switched to other routes, carpooling, walking or biking.	The scheme has reduced traffic volume into the fee zone by 10% compared to the previous system with a flat fee. In addition, there have been extensive public transit improvements, and the use of public transportation has increased by 15%.

CASE QUESTIONS

To give a well-founded response to the City Council on the predicted effects of a tolling scheme, you are expected to thoroughly cover the following aspects:

1 Assess the traffic flow in the City of Copenhagen

To give the City Council the necessary background information, you must provide an overview of the traffic flow in the City of Copenhagen. You can base this part of the analysis on the data provided. It is important that the assessment covers all modes of transportation, e.g. biking, public transportation and car traffic. Your assessment may include a historical perspective and a forecast of the future traffic flow without considering the effects of a tolling scheme.

2 Examine the impact on the car traffic from introducing a tolling scheme

The City Council requires an estimate of the effect of a tolling scheme on the traffic flow of cars. Based on the introduction of such a scheme, you should argue for the reduction in the car traffic to and from the fee zone. Your analysis may take its departure point in the case studies provided in table 2. In your answer, you are required to provide an estimate of the reduction both in relative terms, i.e., percentage decline in traffic, and in absolute terms, i.e., the decline in the total number of cars to and from the fee zone. You may also discuss the consequences of expanding the fee zone to the municipal border and discuss how exemption of certain types of vehicles will affect your conclusions. Will this change the assumptions on which you base your estimate on the relative reduction upon? You may find the provided data useful.

3 Discuss the socio-economic consequences of a tolling scheme

A tolling scheme is bound to have consequences for the current road users, but it could have positive effects on the surroundings. Based on your findings in question 2, you should come up with an estimate of the socio-economic consequences of the tolling scheme. Moreover, you may consider whether there are other socio-economic consequences of implementing a tolling scheme than the ones listed in table 1. Naturally, this answer will depend on the exact format of the scheme, and you are encouraged to consider how qualitative effects of schemes exempting car-sharing, taxis, freight transport, etc. affect your conclusion.

Some City Council members have raised concerns that a tolling scheme may not be the most efficient method to reduce congestion in the City of Copenhagen. Indeed, there exist numerous tools to reduce congestion. To enrich the discussion in the City Council, you may include an assessment of other possible tools to reduce congestion, e.g. a kilometer-based roadpricing scheme and discuss the pros and cons of the different methods of reducing congestion.

Based on your findings, you should come up with an assessment on the tolling scheme to the City Council. Your assessment should include strong and concise arguments and be presented in a precise manner.

FORMALITIES

Final remarks

- Hand-in is Sunday, March 14 at 18.00 at the latest, where each team must upload a presentation in PDF (16:9 format) on Innoflow. No other formats will be allowed. Your pdf must be named by your team name.
- The presentation must have a maximum of 7 slides, including front-page and your assessment.
- The slides must be in English and readable on their own. Remember that the judges' initial screening of your solution is based on the slides only.
- Based on the slides, nine teams are selected in a semifinal to present their solution to representatives from the City of Copenhagen on Thursday, March 18. Due to COVID-19, these presentations will take place online. The presentation must be in English and should last approximately 15 minutes.
- The nine teams will be contacted on Monday, March 15.
- Three of the semifinalist teams are selected to present in a final taking place right after the semifinals.

To succeed in our case competition, you must:

- Prepare your findings with a clear storyline. It should not necessarily follow the order of the questions.
- Present your answers top-down, by starting with the conclusion and subsequently supporting your conclusion with your analysis and rationale.
- Ensure that your slides are readable, well-structured and to-the-point. You should try to reduce "wordiness" and include storytelling illustrations and graphs.

RISE

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