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What priorities in environment and transport policies in urban areas?

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Covid-19 is a diseconomy of density and crowding and this has affected commuting transport routines. Telework and crowding in public transport (PT) may have a longer time impact, requiring a reduction of PT frequencies and a smaller budget. To address road congestion and reduce GHG emissions, the main strategies will no longer be a modal shift to PT but road pricing and electric vehicles including steps and bicycles.

Urban areas will keep growing

Despite the mixed messages on the costs and benefits of bigger cities, cities will keep growing. The costs of big cities are for many people much clearer than the benefits. Since decennia we are experiencing heavy road congestion, we have become more sensitive to conventional air pollution, cities also become literally hotter in the summer and living in a city apartment without garden was the worst place to stay in Covid-19 lockdown.

The main benefit of urbanization is the higher productivity that is associated to agglomeration. The existence of agglomeration benefits has been empirically demonstrated and works via sharing local public goods, better matching on the job market for skilled workers and informal learning (Proost & Thisse, 2019). The importance of the different mechanisms is still a topic of research. Most important is to understand the causality: it is the higher productivity that attracts more workers that want to live in the city or commute to the city, and this drives the demand and higher price of housing as well as the commuting and not the other way around.

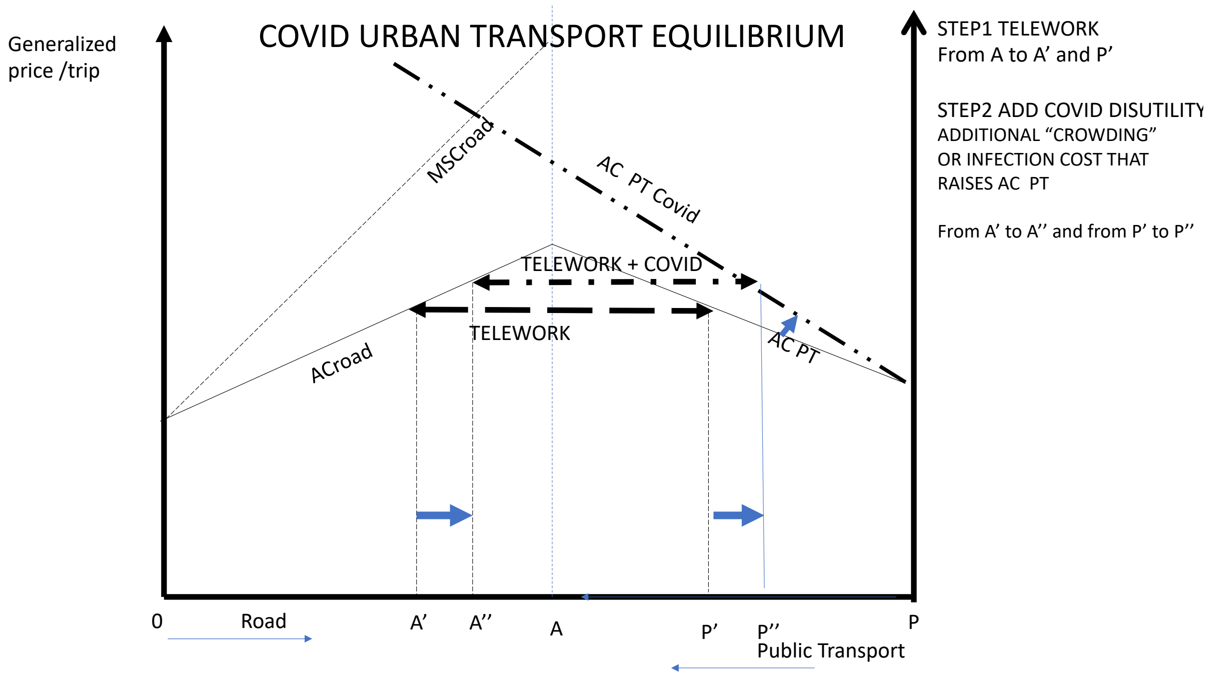
In the follow-up of the Covid-19 lockdown, some proclaim that this concentration and interaction in cities is much less needed because of the better telework options. Working 2 or 3 days at home avoids tenuous daily commutes and liberates some space in the city but also requires more workspace at home. The relation between telework and telecommuting and productivity or GDP is ∩-shaped, whereas telecommuting raises income inequality (Behrens, Kichko & Thisse, 2021).

Given that the urban areas and commuting are here to stay, how do policy makers deal with the environment and transport problems?

Dealing with road congestion and air pollution

COVID-19 and telework have given us a good illustration of the possible shifts in commuter transport (De Borger & Proost, 2021). The next graph presents total commuting trips on the horizontal axis before Covid-19. The horizontal distance from the left origin represents the trips by car. The distance from the right axis represents the trips by public transport. The vertical axis represents the generalized travel cost: the sum of the money cost, time and discomfort. The Average generalized Cost (AC) is increasing for road as more cars slow down the traffic, it is also increasing for public transport as for a given frequency, more users mean more crowding discomfort in the vehicles and at the stops. Traffic congestion means that the marginal social cost is increasing more strongly than the AC of road use. Also the marginal social cost of PT use is increasing more strongly than the AC. As long as there is no road pricing implemented, most urban areas use a second-best pricing policy whereby PT is offered almost for free for commuters. The initial equilibrium A is such a 2nd best equilibrium. Introduce now telework: total commuting trips decreases e.g. by 50% so with distance A'P'. Covid-19 brings in a second shock: PT users experience a higher discomfort from crowding in PT vehicles. This implies that the AC of PT rotates upwards and that the market share of PT decreases.

Figure 1



This has important consequences for PT when both telework and fear of infection do not disappear. First more telework means less road congestion and this decreases the need for second best PT policies as there are cheap fares and high frequencies. Second the aversion to crowding in PT means that PT becomes a less interesting alternative. This points to the need to reconsider the subsidies and frequencies of PT in urban areas in the long term, independently of the short-term increase in deficit because of the decrease in ridership.

Car use is an important source of conventional air pollution (NOx, ozone, particulates). European emission norms for gasoline and diesel vehicles became much stricter over the last 20 years but the monitoring and enforcement, particularly for diesel cars were largely insufficient: diesel gate has shown that effective emissions were a factor 5 to 10 higher than the norms. Cities have been obliged to restrict the entry of mainly older diesel cars to improve air pollution. This became possible with the use of number plate recognition cameras ("ANPR").

The most popular congestion policies have been better and cheaper Public Transport (PT) as well as adding extra lanes to the motorways. Cheaper and better PT is only feasible in densely populated areas as there are strong economies of density. Many commuters have de facto free PT but it has been difficult to attract car users. PT is cheap for the users but not for society as it are the peak trips that determine the

PT capacity (personnel and equipment) that are needed. Even in the presence of road congestion, peak pricing of PT can be efficient (Börjesson, Fung, Proost, 2017).

Adding lanes is a policy that has been intensively used on many motorways in Flanders and on the Brussels Ring. This has not solved congestion, and this has confirmed strong empirical evidence that, also in Europe, adding extra lanes does, in the longer term, not decrease congestion because extra capacity attracts extra traffic (Garcia-Lopez, Pasidis, Viladecans-Marsal, 2021)

One policy that has attracted more attention is the use of e-bikes and shared e-steps in urban areas. The use of these types of vehicles is booming because it allows users to combine easily different modes of transport within urban areas and can be an alternative for short trips in urban areas. This may replace as well PT as car trips. All it requires for safe operation are additional bike lanes or strict speed limits so that they can share the road with cars.

Smart ANPR cameras can also be used to implement road pricing in urban areas. A study for the Brussels Region (Smartmove, 2020) found a good benefit/cost ratio with distributional effects that can be mitigated but, as long as the other Regions do not share in the toll revenues, they will oppose this important policy change. For an urban area road pricing may even improve the matching of skills in the urban areas as those that are really needed can arrive at the right moment.

A few years ago, also Flanders studied the implementation of road pricing on its territory. Despite positive study results, politicians did not implement it as it was seen as a simple tax increase even if the reform was revenue neutral and relatively balanced in terms of redistribution (Heyndrickx, Vanheukelom, Proost, 2021). There are so many dimensions of diversity in the population that it is difficult to adjust tax policies to compensate everybody. One option to more finely compensate car users is to use tradable peak driving rights. Driving rights are allocated proportionally to driving in the past. But as the political process to implement driving rights takes time, there will be costly strategic behaviour before the system is implemented. The costs can be compensated by a long enough validity period of the initial allocation of driving rights. The allocation has best a once and for all character De Borger, Glazer, Proost, 2021).

Dealing with climate change

Climate change requires mitigation (reduction of emissions) as well as adaptation to climate damage. In terms of incentives, adaptation is easier to defend than mitigation because the benefits of adaptation are local and in the short term. Reducing emissions faces a prisoner’s dilemma: climate change is the result of worldwide emissions. In addition, the benefits of emission reductions come only with a delay of 30 to 50 years.

It is therefore remarkable to see city politicians aiming for zero emissions by 2030 - 2040. This can work for the small inexpensive steps of emission reduction but when ambitions grow, one ends up with high costs of emission reduction.

The two main sources of Greenhouse Gas emissions (GHG) in urban areas are the use of fossil fuels for the heating of buildings and in cars and trucks. As all sources of emissions generate the same climate damage, one can as well start reducing emissions where it is cheapest. From a macro-economic perspective, efforts should be higher in the heating sector than in the transport sector. The same litre of fuel is taxed more heavily through excises when it is used in a car (250 euro/ton CO2) than in heating applications (almost 0 euro/ ton CO2) (Metaforum, 2020).

The promotion of electric cars is an effective policy to reduce emissions in the EU because the GHG emissions of electricity are capped by the ETS system. But urban governments forget that part of the saved micro-economic costs consist of saved excise taxes. Other costs of the promotion of electric cars are their very low variable costs which may give rise to additional congestion (Wangsness, Proost, Rodseth, 2020). This may be compensated by two additional benefits. First, electric cars generate almost no conventional air pollution (ozone, particulates, NOx). Second, battery electric cars, can be used for additional storage and balancing services in electricity production systems that rely heavily on solar and wind powered electricity production systems like in Belgium. 1 to 2 million electric cars can supply half of the maximum peak load in Belgium. This requires peak-load pricing of electricity that incentivizes the coordinated charging and discharging of electric vehicles.

Reducing the GHG emissions of heating requires better insulation of buildings as well as a switch away of gasoil and natural gas to electricity via heat-pumps or district heating in urban areas. At present, these changes are implemented via regulations for renovation and new buildings. As housing is not very standardized in Belgium, these regulations are costly and also costly to monitor. The inclusion of the heating fuels in the ETS system will increase consumer prices for fuels and this may help in the transition to electricity if also residential electricity is priced more correctly. The problem with residential electricity prices is not the GHG emission as electricity producer prices pay for the GHG emissions via the permit prices in ETS, but rather that they contain too large margins for historic green energy support and are not differentiated in function of the availability of renewable energy.

Adapting urban areas to climate change will require drastic changes. The formation of urban heating islands can raise temperatures in the city by up to 3°C and the heating is due to the increased absorption and trapping of solar radiation in built-up urban areas (Zho, Rybski and Kropp, 2017). To the solar radiation one needs to add the heat dissipated by cooling (airco) and transport activities. The additional heating in urban areas is a positive function of the logarithm of city size and is increasing in the city density. Smaller cities are a possible answer, as well as less dense cities with more green areas. But also the choice of building material matters: more bright and more reflective building surfaces absorb less solar emissions. Solar radiation absorption and heat radiation is an externality that is difficult to internalize. Solving efficiently agglomeration, congestion and climate externalities in an urban area remains a challenging research topic.

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