Is Flat Fare Fair? Equity Impact of Fare Scheme Change

Isak Rubensson · Oded Cats · Yusak Susilo

Abstract Fare schemes can range from flat (uniform) fare to fully usage-based charges. Public Transport Administrations consider changes in fare schemes driven by potentially competing goals – competitiveness and equity while ensuring financial stability (i.e. income inflow). We find that in the case of Stockholm, contrary to arguments made in the process leading to the scheme change, the more distance-based the fare scheme is, the more it benefits lower income travellers.

Keywords: Fare Scheme · Public transport · Distribution

1 Introduction

Transport equity attracts growing interest both in the literature and in the policy arena. Based on the framework of Walzer (1983) theory of justice Martens (2012) develops a theoretical foundation for transport as a special good in need of exception from pure market economy. Instead, the transport good, accessibility, he argues should be subject of principle of just distribution. Also in public debate there is a concern for distributional justice with regard to transport, where changes in public policy and regulations regarding transport issues often are contested with
arguments of just distribution and fairness. In fact, in many countries and cities policy makers are often expected by laws, rules or guidelines to investigate and present distributional effects and degree of progressiveness of their policies.

A pressing policy matter for most large cities is to be able to improve fare box recovery through changes in fare scheme, while galvanizing public support. Studies on the equity effects of such changes are emerging lately (see e.g. Bureau (2011), Farber et al. (2014) and Nahmias-Biran et al. (2014)). A common topic of policy debate is the choice between distance-based or flat fare schemes. Distance based fares benefits those who travel short distances, whereas flat fare schemes benefits those who travel long distance trips. In public debate it is often said that flat fares are fairer for low income travellers and that distance based fares benefits those who are more affluent. This is arguably less based in empirical knowledge than in a sort of heuristic reasoning: generally usage-based fees and fares are viewed as being beneficial to those who can afford to pay. Artificially fixed fees and fares, on the other hand, usually are seen as benefitting those with less income. But this heuristic might be wrong. In fact, as stated by Bureau and Glachant (2011) place of residence is most important for how average level of fares paid impact a group of travellers. Also work place patterns and location of other destinations and the resulting travel patterns impact the amount of fares paid. It is still not fully understood how differences in these patterns on a group level impact the equity of different fare schemes as a whole. Where rich people live and where they work determines if distance-based or flat fares generally benefits them more than poor people. Two lines of reasoning dominate this policy debate, originating in principles of urban economics:

1. Wealthy people can afford to pay for and want to buy accessibility and therefore live centrally and travel shorter
2. Wealthy people have higher rate of return for specialization, getting higher wages when prepared to travel longer for a job more suited for them where their productivity increases, therefore they are travelling longer

If the first storyline holds then a distance based fare should be regressive and beneficial for wealthy people. In contrast, if the second holds then a flat fare would be regressive and beneficial for wealthy people. The two principles can also to a degree simultaneously be valid, further underscoring the need to investigate the progressivity of fare schemes from a geographical standpoint.

In this study a method for investigating the equity of different fare schemes is presented. The model is tested and discussed for the case study of Stockholm Public Transport as a comparison between the earlier three zone fare system (with fares increasing with the number of zones travelled) and a flat fare system (introduced in January 2017) as well as a comparison with a potential fare scheme system based on a fare proportional to number of km travelled. The model investigates geographical
and income distribution of fare change impacts as well as computing a Suits index of progressivity to gauge the overall level of regressive-/progressiveness of the proposed fare schemes.

2 Assessment Approach

Impacts of proposed fare scheme changes are dependent on residential patterns, workplace and destination patterns and the resulting travel patterns. We are interested in analysing how the effects of such proposed changes are distributed geographically and socioeconomically with regard to income.

Our analysis is based on average weighted fares administered on travellers from some small zonal area. Calculating weighted fares gives a measure of how, on average, fares payed by travellers in the zone change with a changed fare scheme. Assuming a fare $f_{ij}$ between origin zone $i$ and destination $j$ and having a demand (number of trips) between those two zones of $d_{ij}$, then the average weighted fare $\bar{f}_i$ for that origin zone is

$$\bar{f}_i = \frac{1}{\sum_j d_{ij}} \sum_j d_{ij} f_{ij}.$$  

(1)

Average weighted fares can then be studied for geographical patterns of impact as well as segmented using socioeconomic statistics, such as average income.

3 Experiments and results

3.1 Case study description

Stockholm, the capital of Sweden, recently changed its fare scheme with three main objectives: create a simple intuitive scheme, increase patronage and, balance the economy side of the operation (SLL 2016).

In this study, data from the Swedish National Transport Model and from the Statistics Sweden (SCB) have been used to assess the redistribution impacts of a change from zonal fares (three zones having increasing fares proportional to number of zones travelled) to flat fares in the County of Stockholm. The Stockholm Public Transport Administration (SL) reformed the fare scheme, switching from a zonal fare scheme (Figure 1) to a flat fare scheme in January 2017 for single journey tickets and carnet tickets. In the public debate, the discussion between distribution fairness and usage fairness have been heated for many years with right leaning political parties arguing the usage point of view and left leaning the distributional point of view. Figure 1 show the zones that were in place before January 2017. Note that Zone A includes the metro network in its entirety and Zone C extends beyond the county limits to include key commuter train end stations.
3.2 Results

We investigate three different fare schemes: (i) the initial one is a zone structure with one inner city zone and two circular outer zones, i.e. ‘before’ case, as depicted in Figure 1; (ii) a flat fare scheme where all trips have the same fare, and; (iii) distance based scheme where fares are set with a price per km travelled. In Table 1 the fare levels for the different schemes are presented. The fees were set so that the total income from ticket sales remains unchanged for the current demand distribution.
Table 1 Studied fare schemes

<table>
<thead>
<tr>
<th></th>
<th>Flat fare</th>
<th>Zone Fares</th>
<th>Km-fares</th>
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<tbody>
<tr>
<td>Unit fare</td>
<td>28.8 SEK</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fare/km</td>
<td></td>
<td>-</td>
<td>2.35 SEK</td>
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<tr>
<td>Fare 1 zone</td>
<td></td>
<td>25 SEK</td>
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<tr>
<td>Fare 2 zones</td>
<td></td>
<td>37.70 SEK</td>
<td>-</td>
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<tr>
<td>Fare 3 zones</td>
<td></td>
<td>50.00 SEK</td>
<td>-</td>
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The geographical distributional effects of switching from zone fares to flat fare are shown in Figure 2. The central part of the county where the city of Stockholm is situated experienced an increase in average fare (in green) while areas outside of the city center see decreases in weighted fare trips (in different shades of red).

Figure 3 presents the geographical distribution of weighted fare change when changing from zonal fares to a fare per km travelled. It can be observed that the general pattern is that central areas in the county see a reduction in weighted fares while areas outside the city see increases. A kilometre based fare will even more
than a three-zone based fare be advantageous for traveller residing in a central location.

Fig. 3 Geographical distribution of changes in weighted fares when changing from zonal to km-based fare

The socioeconomic impacts of fare scheme changes are shown in Figures 4 and 5 where each zone is plotted in terms of the change in weighted fare (y-axis), its population size (bubble size) and the average yearly income of the respective population (x-axis). The change from zonal to flat fare (Figure 4) does not seem to benefit low income zones, with most of them having no change or a small increase in the weighted fare differences. For high income zones, three groups can be visually inspected: one group sees substantially lower weighted fares (toward decreases of 15 SEK per trip); for another group there are no changes or somewhat increased weighted fares and; the third group’s experience is somewhere in between. From a distributional fairness point of view, the change from zonal to flat fares seems hence to be a change in the wrong direction.
Figure 4 demonstrates that the change from a zonal fare to a km-based fare has potentially a strong effect on fares for a segment of high income zones that see a rise in weighed fares while the other zones seem mostly unaffected. This could be argued as a more distributional fair adjustment where the bulk of increase in fares is on zones with high average income.
4 Concluding remarks

A method to investigate the progressiveness of fare scheme changes and to determine how residential patterns and travel patterns of different income groups informs the result of the fare scheme change is proposed. We find that for the Stockholm case a distance based fare scheme is more progressive than a flat fare scheme (indeed going from a zonal fare scheme to a flat fare scheme is a regressive policy change while increasing the distance based component of the fare scheme will increase the progressiveness of the fare scheme). We further note that geographically there is redistribution between the centre and the periphery when changing between distance based and flat fares, the former benefitting the centre and the latter the periphery.

This is an ongoing work and it is in the present instant performed for a given demand distribution (i.e. not having demand, modal share or travel frequencies change as a consequence of fares change). Our intention is to develop this further including trip choice and mode choice as part of this study effort. We also intend to compute a comprehensive statistic on the overall progressiveness of the different fare schemes using the Suits index (Suits 1977).

The policy relevance of this study is high. As stated in the introduction, most countries and cities (including Stockholm) put legal requirements and regulations on
policy makers to account for equity effects of policies and in many instances these methods are lacking. Consequently, the effects are often described merely in qualitative terms, limiting their rigour and comparability power and reducing their influence in the decision making process. Also, one of the added benefits of this proposed method is that it uses data materials (demand and fare matrices, statistics on income and population) that policy makers often have readily available from their forecast models.

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References


