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Why experience changes attitudes to congestion pricing: The case of Gothenburg

Maria Börjesson, Jonas Eliasson *, Carl Hamilton

Centre for Transport Studies, KTH Royal Institute of Technology, Sweden

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ABSTRACT

Many cities have seen public support for congestion charges increase substantially after charges have been introduced. Several alternative explanations of this phenomenon have been suggested, but so far little evidence has been available to assess the relative importance of these explanations. We study attitudes to congestion pricing in Gothenburg before and after congestion charges were introduced in January 2013. Attitudes to the charges did indeed become more positive after the introduction, just as in previous cities. Using a two-wave postal survey, we separate contributions to the attitude change from a number of sources: benefits and costs being different than anticipated, use of hypothecated revenues, reframing processes, and changes in related attitudes such as attitudes to environment, equity, taxation and pricing measures in general. We conclude that the dominant reason for the attitude change is status quo bias, rather than any substantial changes in beliefs or related attitudes, although some of these factors also contribute. Contrary to a common belief, nothing of the attitude change is due to benefits being larger than anticipated.

1. Introduction

The main obstacle for introducing congestion pricing is often public resistance. However, several cities have reported that public support for congestion pricing has increased substantially after congestion charges have been introduced. Examples include London (Schade and Baum, 2007), Stockholm (Eliasson, 2014; Eliasson and Jonsson, 2011), Trondheim, Bergen and Oslo (Tretvik, 2003), United States (Zmud (2008) quoted in Anas and Lindsey (2011)), and Milan (Ozer et al., 2012). There is also some evidence for the phenomenon in Singapore (Gopinath Menon and Kian-Keong, 2004). Several explanations for this phenomenon have been hypothesized, but so far there has been little conclusive evidence as to which of the potential explanations are the most important. The suggested explanations are not mutually exclusive, so they may all contribute to some extent. The purpose of this paper is to determine their relative importance in a specific case, namely the introduction of congestion pricing in January 2013 in Gothenburg, Sweden's second largest city. Just as in the cases cited above, public attitudes in Gothenburg did indeed become substantially more positive after the introduction.

Based on an extensive before/after survey of public attitudes, we estimate models where respondents' attitudes to congestion charges are explained by variables such as expected toll payments, value of time, socioeconomic factors, beliefs about effects, and attitudes to related issues such as environment, equity, taxation, government and pricing policies in general. By comparing models and variables before and after the introduction, the contribution of each variable to the attitude

* Corresponding author.

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change can be determined. As a side result, we can also identify which groups have changed their attitude. To our knowledge, this is the first survey of its kind.

In the public debate, the most common explanation of the increased public support after the introduction is that benefits turn out to be larger than anticipated. But several other mechanisms have been hypothesized, such as hypothecation of revenues, changes in related attitudes, reframing, and various forms of status quo bias. We test seven hypotheses that may explain the increased public support, which have all been suggested in the public debate or in the scientific literature:

(H1) *Larger benefits than expected*. The support for charges may increase after introduction because benefits such as reduced congestion and improved urban environment turn out to be larger than expected. This is by far the most common explanation, put forward for example in a prescient paper by Goodwin (2006).

(H2) *Smaller downsides than expected*. Several authors have pointed out that adverse effects tend to be exaggerated before the introduction. Resistance may decrease after introduction if problems such as increased public transport crowding and decreased inner-city retail turn out to be less serious than anticipated. In addition, adapting to the charges may seem more costly beforehand than it actually turns out to be (Eliasson, 2008, 2014; Henriksson, 2009).

(H3) *Benefits of accompanying measures*. Introduction of congestion charges is often accompanied by improvements in the transport system, for example in alternative modes or routes. These improvements are often paid for by (hypothecated) charge revenues, or at least marketed as part of a charges/infrastructure package. An increased satisfaction with for example the public transport system might spill over to an increased support for the charges. Several authors have argued that a "package approach" with accompanying measures is key for achieving acceptance for congestion pricing (Gopinath Menon and Kian-Keong, 2004; Jones, 1991).

(H4) *Changes in related attitudes*. Attitudes to congestion charges tend to be influenced by other attitudes and values, such as environmental concerns, concerns about social equity, trust in government, and acceptability of general pricing principles such as user pricing, polluter pricing and scarcity pricing (Eliasson and Jonsson, 2011; Frey, 2003; Hamilton et al., 2014; Raux and Souche, 2004). The debates and campaigns surrounding the introduction of congestion charges, and possibly the experience of them, may affect these other attitudes, which may then influence the attitude to congestion charges as a second-order effect. For example, it has been suggested that part of the increased support in Stockholm was caused by an increased acceptance of pricing policies in general (Börjesson et al., 2012).

(H5) *Reframing*. The strength with which various attitudes and values are associated with, and hence influence, the attitude to congestion charges may change over time, in particular if congestion charges are *reframed*, i.e. interpreted or marketed in a different way. For example, if congestion pricing is reframed from a fiscal policy to an environmental policy, it would be expected that the influence of self-interest and attitudes to taxation becomes relatively weaker compared to the influence of environmental concerns. How policies are framed often has a crucial effect on public support; Heberlein (2012) provides several examples.

(H6) *Loss aversion*. It is well established that losses are valued proportionally higher than gains in situations where there is a clear point of reference (Tversky and Kahneman, 1991). Hence, one might expect that increases in travel costs are valued higher before congestion pricing is introduced than afterwards, and improved travel times are valued higher after the introduction than before. Both phenomena would imply that car drivers would become more positive after the introduction than before. Note that this is different from benefits being larger (H1) or adverse effects smaller (H2) than expected; loss aversion refers to the phenomenon when effects are *valued* differently after a change, even when their *objective* size is correctly assessed.

(H7) *Status quo bias*. Status quo bias refers to situations when preferences for a policy are asymmetric – lower beforehand than afterwards. It may be caused by loss aversion, but can also be caused by cognitive dissonance (resistance tends to decrease if a change seems inescapable beforehand or irreversible afterwards) or resistance to changes as such, regardless of tangible losses or gains. Status quo bias of various kinds have been suggested to be a contributing factor to the increased support once congestion pricing is introduced (Brundell-Freij et al., 2009; Eliasson, 2014) or seems inevitable (Schade and Baum, 2007).

The paper proceeds as follows. Section 2 briefly summarises the story of the Gothenburg congestion charges, and Section 3 describes the survey data collection. The attitude to the congestion charges was measured as the stated voting intention in a referendum about the congestion charges, on a 5-grade scale from "most likely yes" to "most likely no". The survey also measured respondents' attitudes to a large number of potentially related issues, such as environment, social equity, taxes and the fairness of pricing in different contexts.

Section 4 describes the changes in attitudes and beliefs. We show that the attitude to the charges did indeed become more positive, and by describing the changes in beliefs and potentially related attitudes, we get a first indication of whether such changes may have contributed to the more positive attitude to the charges (mechanisms H1–H4).

In Section 5, we estimate econometric models where respondents' attitudes to congestion charges are explained by their beliefs about the effects, how they are affected by the charges (for example how much tolls they pay or expect to pay), and potentially related attitudes (e.g. environmental concerns). Using factor analysis, we first identify how a number of attitude questions in the survey can be combined into four more general attitude factors, and these are then included in the econometric models. Through the models, we can measure how much changes in attitudes and beliefs contribute to the change in the attitude to the charges, and hence test (H1)–(H4). By comparing models before and after the introduction of the charges,

we can test (H5)–(H7). If reframing contributes to the attitude change (H5), the association between the congestion charging attitude and one or several of the attitude factors should change. If loss aversion contributes to the change (H6), then toll payments or time savings should be valued differently before and after the introduction, and hence affect the congestion charge attitude differently. We attribute the remaining, "inexplicable" change in attitudes to the charges to status quo bias (H7); we develop our arguments for this interpretation further on. Section 'Acknowledgments' concludes.

In summary, we conclude that status quo bias (H7) is the main contributing factor to the increased support in Gothenburg, with minor contributions from (H2)–(H4). Contrary to what is often assumed, "larger benefits than expected" (H1) does not play any role for the change in support in Gothenburg. In fact, beliefs in positive effects decreased after the introduction, but support for the charges increased in spite of this. One reason why benefits were actually less than expected is probably that there was limited congestion in Gothenburg even before charges were introduced.

2. The Gothenburg congestion charges

The Gothenburg congestion charges have two purposes: revenue generation and congestion reduction. The background is that Stockholm, the capital of Sweden and the largest city in the country, introduced congestion charges in 2006. This decision was initially met with fierce public resistance, but public opinion started to shift in favour of the congestion charges soon after the introduction. In a referendum nine months after the introduction, a majority voted in favour of keeping the charges. After the referendum, the national government struck a deal with Stockholm that revenues from the congestion charges would be used to co-finance a major infrastructure package, where the charge revenue was leveraged with national funding. This was a paradigm shift in Swedish infrastructure funding: normally, investments in the national road and rail systems are funded by national grants.

The way in which Stockholm used revenues from congestion charges to, as it appeared, unlock substantial national funding served as a direct inspiration for Gothenburg politicians. Soon they were negotiating a similar package with the national government, where the plan was to introduce congestion pricing in Gothenburg and leverage the revenues with national funding to fund a large infrastructure package. Half of the package would be financed with national funds and half with regional funds, most of which would come from future congestion pricing revenues (a minor part was to be financed directly from the regional municipal budgets, which are funded by income taxation). The agreement was presented in 2009, preceded by virtually no public debate. All political parties in Gothenburg were in favour of the agreement. However, there was considerable public opposition, in particular against the congestion charges. This led to the formation of a new political party campaigning against the charges ("Vägvalet", a pun roughly meaning "crossroads" or "choose the road").

The Gothenburg congestion charges hence have the dual purpose to generate revenues for the infrastructure package and reduce road congestion. The deal prescribed that the system should generate around 1 billion SEK per year, a third more than the Stockholm revenues despite Gothenburg being less than half the size of Stockholm. The secondary design objective was to achieve as efficient congestion reduction as possible, given the revenue constraint. However, Gothenburg did not have a lot of road congestion; congestion was limited to a few junctions and the morning rush hour.

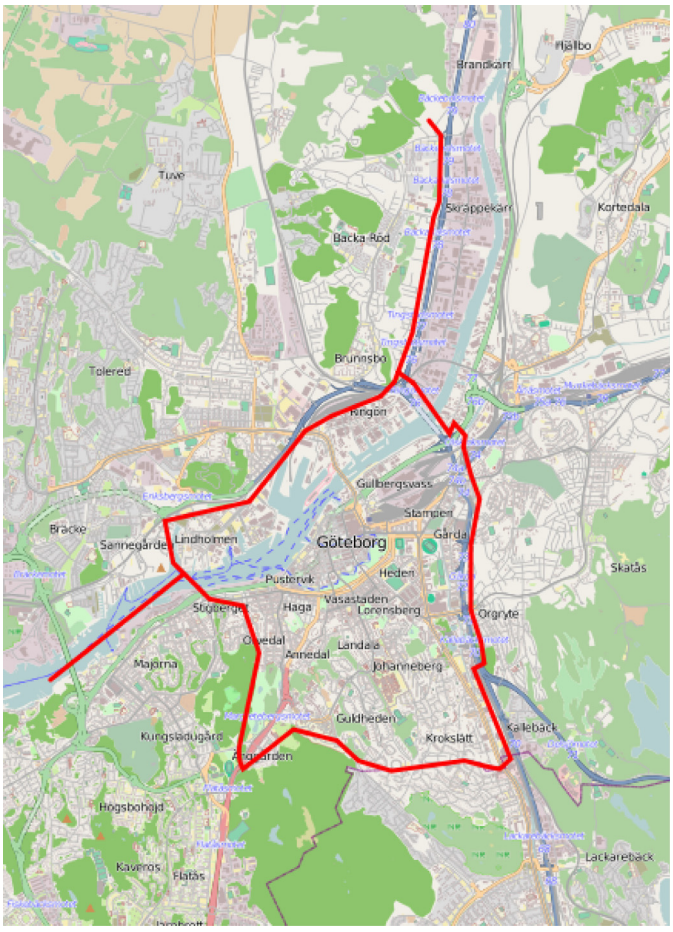
The scheme consists of a cordon with two additional tolling borders sprouting out from the cordon (Fig. 1). Charges are levied 6:00–18:30 on weekdays, and range from 8 SEK to 18 SEK depending on the time of day. Vehicles are charged when they cross a toll border in any direction, but only have to pay one charge during any one-hour period. Börjesson and Kristoffersson (2015) show that traffic across the toll cordon was reduced by 12%, and that average congestion indices on the relatively small number of congested links were reduced from 160% to 80%. Most of the affected links were not congested even before the charges, however.

Almost immediately, opponents to the charges argued that there ought to be a referendum about the charges, just as in Stockholm. In the autumn of 2013, it was decided to hold such a referendum in the autumn of 2014. The result of the referendum is discussed in Section 4.1.

3. Data collection

The analysis in this paper is based on two postal surveys conducted in Gothenburg before and after the introduction of congestion charges in January 2013. The first wave took place in November 2012 and the second wave in November 2013. The survey is an adaptation of a survey first developed and used in a Swedish-French-Finnish study (Hamilton et al., 2014; Souche et al., 2014). The surveys were sent to random samples of adult residents in relatively central parts of the Gothenburg region (the municipalities of Göteborg, Mölndal, Partille and Öckerö, and the postal areas Mölnlycke and Landvetter in Härryda municipality), resulting in 1582 (2012) and 1426 (2013) useable responses, with response rates of 40% and 38%, respectively. The samples are independent, i.e. this is not a panel study; disadvantages such as attrition, self-selection and anchoring were judged to be larger than the potential advantages of a panel study.

Respondents were asked "In a referendum about the congestion charges and the associated infrastructure package, how would you vote?" with answers on a five-grade scale from "Definitely yes" to "Definitely no" with "Don't know" as the middle option. The question was about the combination of congestion charges and infrastructure package, since they are intimately linked to each other; without congestion pricing, the infrastructure package is unlikely, and the other way around. At the time of the first wave (November 2012), a referendum was discussed but no decision had been made. At the time of



Time (weekdays)	Charge
06:00–06:29	8 kr
06:30–06:59	13 kr
07:00–07:59	18 kr
08:00–08:29	13 kr
08:30–14:59	8 kr
15:00–15:29	13 kr
15:30–16:59	18 kr
17:00–17:59	13 kr
18:00–18:29	8 kr
18:30–05:59	0 kr

Fig. 1. Gothenburg with toll borders in red, and charge levels per time period. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

the second wave (November 2013), it had recently been decided to hold a referendum in September 2014. Hence, the question was not a hypothetical issue.

In order to reduce strategic responses and reverse causality between the attitude to congestion charges and the other attitude questions, the survey was not presented as a survey about congestion charges, but a survey about attitudes to traffic and various social issues in general. Respondents were asked to what extent they agreed with statements such as "Taxes are too high" and "Much more resources should be spent on protecting the environment". Responses were on a 7-grade scale, from "completely disagree" (1) over "neutral" (4) to "completely agree" (7). Some of the statements concerned social and political issues that might be associated with congestion pricing, such as environment, taxation and social equity. Some of them concerned acceptability for pricing mechanisms in other contexts, such as differentiated air fares and taxing noise and emissions. The questions were formulated to avoid connections to congestion charges, to reduce the risk of reverse causality.

Respondents' support for congestion charges can be expected to be related to their valuation of travel time savings. As an indicator of the value of time, respondents were asked to imagine the following situation:

> *You commute daily by car. On the way, you have to cross a bridge across a river. One day the bridge closes for repairs for some time. There is another bridge, but the detour takes an additional 20 min. During the time the bridge is repaired, the road authority has arranged a ferry that can take cars across the river. What is the highest amount you would be prepared to pay for a one-way ferry ticket, to save 20 min on your journey to work?*

Such a question only gives a rough indication of respondents' valuation of travel time savings. Its purpose is only to enable us to explore the relation between respondents' values of time and their support for congestion charging. However, the resulting value of time distribution turned out to be close to what real value of time studies have found, e.g. Börjesson and Eliasson (2014).

Respondents' attitudes to congestion charges can also be expected to be related to perceived fairness of various possible allocation mechanisms. To measure this, the question continued:

Some people complain that it is unfair that the authority charges a price for the ferry tickets. When offering the ferry for free, it turns out that there is not room on the ferry for everyone who wants to use it. The authority now considers four different methods to choose who gets to travel with the ferry. To what extent do you consider these alternatives fair?

- ***Price**: Revert to the original policy of charging those who want to travel, and set the price so the ferry is just filled.*
- ***Queue**: Those who arrive first to the jetty and stand first in line get to go with the ferry.*
- ***Authority determines "need"**: Those who want to travel with the ferry have to show some evidence to support their need. The authority then provides ferry passes based on their judgment of the greatest need.*
- ***Lottery**: Tickets are allocated randomly, so that everybody has an equal chance of winning.*
- ***Rationing**: The number of ferry trips per person is limited to three trips per week.*

Respondents were asked to rate the fairness of each allocation mechanism on a 7-grade scale, from "Completely unfair" to "Completely fair".

4. Changes in attitudes and beliefs

This section describes how attitudes to the congestion charges, beliefs in their effects and other (potentially related) attitudes changed from immediately before the introduction of the charges to one year afterwards. In Section 4.1, we show that attitudes to the charges became more positive. In Sections 4.2 and 4.3, we describe changes in beliefs and potentially related attitudes, thereby getting a first indication of whether such changes may have contributed to the more positive attitude to the charges (H1–H4).

4.1. Changes in attitudes to the congestion charges

In our before/after survey, respondents were asked how they would vote in a referendum about the congestion charges and the associated infrastructure package.[1] Results are presented in Table 1.

Almost a year after the introduction, public opinion had become much more positive. Excluding "don't know", the share of positive respondents had increased from 33% to 50%. Moreover, the positive respondents had become more convinced while the negative respondents had become less convinced on average: the share of yes-voters that would "definitely" vote yes had increased from a third to a half, while the share of no-voters that would "definitely" vote no had decreased from three fifths to a half.

Our results can be compared with the repeated surveys carried out by the National Transport Administration. Those surveys are not directly comparable with ours for two reasons. First, the Transport Administration's surveys cover the larger Gothenburg region, whereas our survey only includes the city of Gothenburg. Second, the Transport Administration's surveys ask respondents about their attitude to the congestion charges only, whereas our survey asks about their opinion of the combination of charges and infrastructure package. Results are shown in Fig. 2. For our purposes, the important point is that the change over time in the two series of surveys is similar.

In September 2014, a referendum was held regarding the congestion charges, where 57% voted against the charges. This is at first difficult to reconcile with the figures above. However, as shown in Börjesson and Kristoffersson (2015), the referendum result is explained by an increasingly negative opinion to the railway tunnel for which the congestion charging revenues will be used. Around the time of the referendum, polls showed the perhaps unexpected situation that the voters in the municipality of Gothenburg, where the referendum was held, were positive to the congestion charges (57% positive), but negative to the railway tunnel (60% negative). This was a clear change from the time of our second survey (late autumn of 2013), when polls showed that only 48% of the voters in the municipality of Gothenburg were negative to the railway tunnel.

Hence, the negative outcome of the referendum was more an effect of the negative publicity surrounding the railway tunnel than resistance to congestion charges. After the referendum, the Gothenburg politicians decided to keep the congestion charges anyway, since the decision to build the railway tunnel remained (it was not formally a part of the referendum) and there was no other way to fund the tunnel.

4.2. Changes in beliefs about the effects

In the surveys, respondents were asked about their beliefs regarding the effects of the charges, before and after the introduction. The survey presented a number of variables, such as congestion and public transport crowding, and asked respondents how they thought the charges would influence (or had influenced, after the introduction) these variables, on a 7-grade scale from "Large decrease" to "Large increase". Results are presented in Table 2, showing the share of respondents that

[1] Note that the question deals with the combination of congestion charges and infrastructure package. However, it seems that the charging system was the truly divisive issue. The survey also asked respondents whether they would become more positive or negative if the infrastructure package was funded by increased municipal income tax instead. Around half of the no-voters would then become more positive.

Table 1
Stated voting in a referendum about the congestion charges and the infrastructure package, before and after introduction.

	Definitely yes (%)	Probably yes (%)	Don't know (%)	Probably no (%)	Definitely no (%)	Support excl. "Don't know" (%)
2012 (before)	10	19	14	24	34	33
2013 (after)	19	23	16	20	22	50
Change	*+9*	*+4*	*+2*	*−4*	*−12*	*+17*

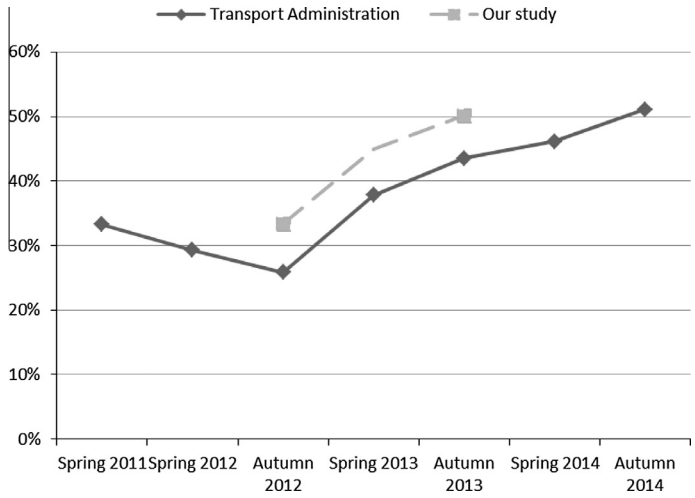


Fig. 2. Public support for the congestion pricing/infrastructure package; share of respondents who state that they would vote in favour of the package in a referendum, excluding "don't know/wouldn't vote" responses. Note that congestion charges were introduced in January 2013.

believed that charges would affect/had affected the variable in the expected way. (The rightmost column shows the *t*-statistic of the difference between the "agree" shares of 2012 and 2013.)

Before the introduction, 61% believed that car trips to and from the city centre would decrease, although only 47% thought that this would lead to less car queues. After the introduction, the number of people believing that car trips had decreased actually *decreased* significantly compared to before the introduction. On the other hand, the number believing in congestion reductions remained roughly the same. Turning to less tangible effects, 41% believed that the general quality of life would improve for residents within the cordon, while 17% believed that it would deteriorate. None of these numbers changed significantly. In summary, the share of respondents believing in positive effects did not increase – in fact, the belief in positive effects actually decreased somewhat. This contradicts (H1), that an increase in beliefs in positive effects is a contributing factor.

However, the share of respondents believing in *negative* effects decreased significantly compared to before the introduction. The share of people believing in increased public transport crowding sank from 79% to 61%, while the share believing in negative retail effects decreased from 54% to 42%. This lends some support to (H2), that decreased beliefs in negative effects is a contributing factor.

4.2.1. Reverse causality between attitudes and beliefs

However, the causality between respondents' attitudes to congestion charges and their beliefs in positive and negative effects may run in both directions. Expressing beliefs in positive or negative effects can to some extent be a way to rationalize one's attitude towards congestion charges. For example, self-interest may cause a negative attitude to congestion charges among car drivers, and these may then (probably subconsciously) rationalize this attitude by disbelieving any positive effects. Similarly, respondents who are negative to car traffic for environmental reasons may like the idea to increase the cost of driving, and may rationalize this through expressing beliefs in many other kinds of positive effects. This is a well-established psychological mechanism in many contexts. We will show two indications that it is at work in the present study as well.

Fig. 3 suggests that beliefs are indeed influenced by self-interest. The more car trips respondents make, the more they believe that congestion charges will affect inner-city retail negatively, and the less they believe that congestion will be reduced. The *y*-axis in the figure is the average response on a 4-grade scale from "No effect" (0) to "Large decrease" (3). Note that beliefs in the negative effect, reduced retail, decrease from 2012 to 2013 across all groups, while beliefs in the positive effect, reduced congestion, remain stable.

The relation between beliefs in congestion reduction and driving patterns might also be caused by drivers having better information about actual congestion reduction than non-drivers. However, if better information was the reason for the

Table 2
Beliefs in effects of the charges, before and after the introduction.

	Agree 2012 (%)	Agree 2013 (%)	*t*-Stat. of difference
The number of car trips to and from central Gothenburg will decrease/has decreased (*positive effect*)	61	53	3.8
Time spent in car queues will decrease/has decreased (*positive effect*)	47	45	0.7
Crowding in public transport will increase/has increased[a] (*negative effect*)	79	61	9.3
Retail within the cordon will decrease/has decreased[b] (*negative effect*)	54	42	5.3
The quality of life for residents within the cordon will/has…			
…increase(d) *(positive effect)*	41	37	0.2
…decrease(d) *(negative effect)*	17	18	1.6

[a] It was also possible to state that one thought there would be or had been a *positive* effect on transit crowding. Around 5% thought that public transport crowding would decrease or had decreased.
[b] It was also possible to state that one thought there would be or had been a *positive* effect on inner-city retail. Around 12% thought that retail in the charged areas would increase.

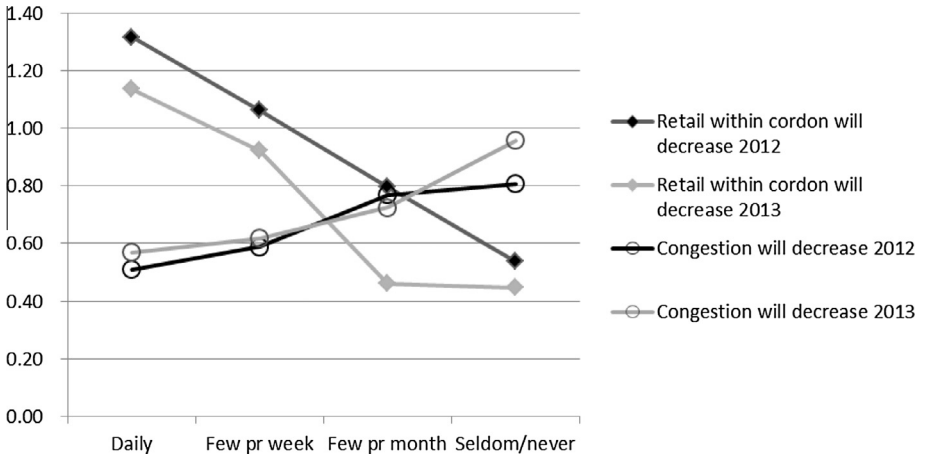


Fig. 3. Self-interest influences beliefs: Beliefs in effects of the charges, with respect to how often respondents drive across the cordon.

difference in beliefs between drivers and non-drivers, we would expect to observe some change in the beliefs among the drivers – either positive (if congestion was indeed reduced substantially) or negative (if there were no effects). The fact that we do not observe any such changes suggests that the difference in beliefs is driven by self-interest to a large extent.

Fig. 4 suggests that beliefs are also influenced by attitudes. The stronger environmental concerns respondents have, the more they believe in positive effects on congestion, and the less they believe in negative effects on inner-city retail. Since environmental concerns are strongly correlated with positive attitudes to congestion charges (which will be shown below, confirming several other studies), this suggests that respondents who are positive to congestion charges for environmental reasons are more prone to believe in other kinds of positive effects as well, and less prone to believe in downsides. Again, it is worth noting that beliefs in the negative effect decrease from 2012 to 2013 across all groups, while beliefs in the positive effect remain stable.

From the above, it would seem that beliefs are more strongly influenced by attitudes and self-interest the less knowledge respondents have. Few if any respondents actually have information of effects on inner-city retail, since no studies of such effects were published. Beliefs have to be based on hearsay and gut feeling, which likely makes them more prone be influenced by attitudes – one believes what one hopes to be true. Congestion effects, on the other hand, were measured and published, they are visible to the naked eye, and many have direct experience or hear from friends. The influence of attitudes and self-interest on beliefs about public transport crowding (not shown here) is even smaller. This is consistent with many results in social psychology where the effect of attitudes on beliefs gets stronger the less experience or knowledge people have (see Heberlein (2012) for a summary and discussion).

4.3. Changes in attitudes to related issues

The surveys measured attitudes to a number of issues, hypothesized to be related to the attitude to congestion charges, by presenting respondents with statements and asking whether they agreed or disagreed on a 7-grade scale from "completely disagree" (1) over "neutral" (4) to "completely agree" (7). Results for the two years are presented in Table 3, showing the mean response on the 7-grade scale. The table also shows the correlations with respondents' voting intentions in the

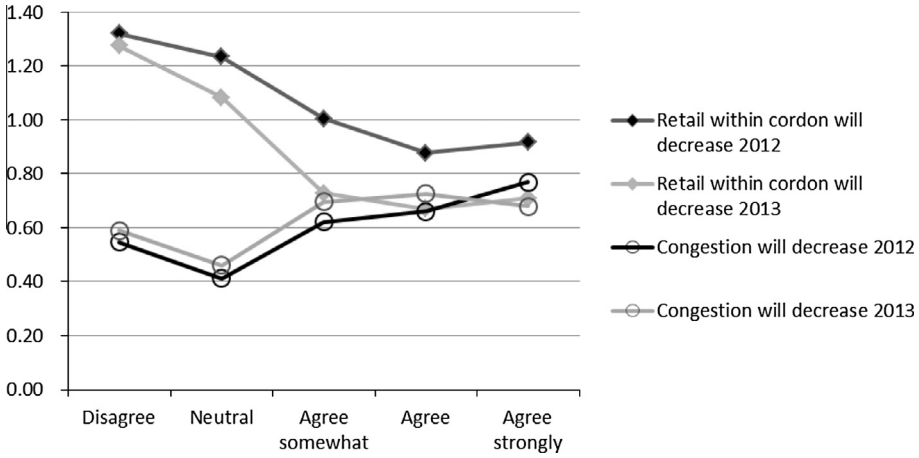


Fig. 4. Attitudes influence beliefs: Belief in effects of the charges, with respect to how respondents agree with "Much more resources should be spent on protecting the environment".

referendum. Positive correlations indicate that agreeing with the statements is correlated with being positive to congestion charges, and vice versa. Finally, the table shows the responses to the "ferry question", where different ways to allocate scarce space on a ferry were rated with respect to fairness (see Section 3).

Most attitudes are stable across the years. Only four changes are significantly different, marked with * in the table (*t*-statistics for the difference between years are in the next column). In 2013, fewer respondents agreed with the statements "Charges and taxes to own, park and drive a car are too high" and "Taxes are too high". In addition, more respondents regarded pricing the ferry as "fair". The correlation coefficients show that all these four attitude changes are associated with higher support for the charges.[2]

This lends some support to (H4), that the debate about congestion charges, and possibly experiencing them, affects related attitudes, which causes a second-order effect on the support for the charges. However, it should be emphasized that these attitude changes are not necessarily caused by the introduction of the charges. Several opinion polls noted an increase in voting support for the left/green political block during the measurement period, and higher support for taxation and high driving costs is perfectly consistent with this general political trend. It may hence be that during this time period, there was a general political trend to the left, and this happened to work in favour of the charges.

The fourth attitude change is that more respondents are satisfied with public transport. This is likely related to the public transport improvements and marketing campaigns shortly before and after the introduction of the charges. This change tends to increase the support for the charges, lending support to (H3), that introducing complementary measures increases support for the charges.

5. Determinants of congestion pricing attitudes

To explore the determinants of attitudes to the congestion charges, and to what extent different explanatory variables have influenced the change in these attitudes between the years, we estimate ordered logit models. The dependent variable is the response to the voting question described in Section 4, where respondents were asked how they would vote in a referendum about the congestion charges and the associated infrastructure package. Answers were indicated on a 5-grade scale, from "Definitely yes" to "Definitely no", where "Don't know" is the middle category.

The explanatory variables are of three types: socioeconomic variables, variables relating to self-interest (such as amount of tolls paid and the number of cars in the household) and attitudes to potentially related issues (such as environment and equity). In Section 5.1, we use factor analysis to identify four fundamental attitude factors from the responses to the statements concerning social and political issues described in Section 3. These attitude factors are then used in the subsequent estimation in Section 5.2. In Section 5.3, we use the estimated models to calculate the contribution of all explanatory variables to the change in congestion pricing attitudes.

5.1. Identification of attitude factors

As described in Section 3, the surveys contained a large number of attitude questions, relating to social equity, environmental concern, taxation, traffic problems, and pricing policies. The questions are formulated as statements, to which

[2] Note that two of the four attitudes which change significantly are negatively correlated with the support for congestion charges. For those, a decrease in the mean from 2012 to 2013 implies stronger support for the charges.

Table 3
Attitudes before and after the introduction, and correlation with the attitude to the charges (stated voting).

Attitude (1 = completely disagree, 4 = neutral, 7 = completely agree)	Mean 2012	Mean 2013	*t*-Stat. of difference	Corr. with support CC 2012	Corr. with support CC 2013
"Motor traffic is among the largest threats to the environment."	4.5	4.5	*0.5*	*0.42*	*0.37*
"It would be reasonable if the noisiest cars and motorcycles were subject to a special noise tax"	3.7	3.8	*1.1*	*0.26*	*0.30*
"Considerably more resources should be used to protect the environment."	5.3	5.4	*0.6*	*0.28*	*0.29*
"It is reasonable that airplane tickets cost more for departure during peak hours than during off-peak"	4.5	4.6	*1.2*	*0.21*	*0.23*
"Road congestion is one of Gothenburg's largest problems"	5.0	4.9	*1.1*	*0.24*	*0.19*
"I am satisfied with the public transport in Gothenburg."	3.5	4.0*	*2.3*	*0.22*	*0.17*
"The government should prioritise to reduce differences between low- and high-income groups"	5.3	5.5	*1.9*	*0.12*	*0.13*
"It would be reasonable if public transport fares were lower outside peak hours"	5.1	5.1	*0.2*	*−0.05*	*−0.05*
"Taxes are too high"	4.5	4.2*	*3.7*	*−0.38*	*−0.39*
"Charges and taxes to own, park and drive a car are too high"	4.9	4.7*	*3.4*	*−0.54*	*−0.55*
Fairness of ways to allocate space on the ferry: (1 = completely unfair; 4 = neutral; 7 = completely fair)					
Pricing	5.1	5.3*	*2.1*	*0.12*	*0.14*
Queuing	5.1	5.1	*0.4*	*−0.04*	*−0.05*
Government decision based on "need"	3.5	3.6	*1.4*	*0.12*	*0.18*
Lottery	2.0	2.0	*0.7*	*0.09*	*0.20*
Rationing	3.7	3.7	*0.2*	*0.13*	*0.11*

* Significant change between the years.

respondents were asked to what extent they agreed or disagreed on a 7-grade scale.[3] Factor analysis is used to reduce the dimensionality of the responses to these questions down to a smaller number of attitude factors. The factors are determined by identifying how the responses to the questions are correlated. Factor analysis is only justified as long as the factors are interpretable; in this case, the analysis resulted in four interpretable factors (described below), which can be thought of as latent fundamental attitudes. The same factors were obtained in the 2012 and 2013 samples when estimated separately. The factors are hence stable across years.

The factor analysis was performed using SPSS. We applied a principal component analysis (PCA) with VARIMAX rotation, resulting in four factors.[4] Table 4 shows the rotated factor loadings, measuring the correlation between the responses to each statement and the factors. Only factor loadings larger than 0.4 are displayed and used in the interpretation. A positive number in a column indicates that agreeing with the statement contributes positively to the corresponding factor, and a negative number that disagreeing with the statement contributes positively. The first factor, *Pricing Acceptance* (PRICE), combines statements expressing that pricing is a fair or reasonable way to allocate scarce resources or regulate externalities. The second factor, *Tax Resistance* (TAX), combines statements expressing that taxes and car-related costs are too high, and disagreement with the notion that car traffic is a big environmental problem. The third factor, *Equity Concerns* (EQUI), combines concerns for equity and considering governmental decisions to be a fair allocation mechanism. The fourth factor, *Environmental Concerns* (ENV), combines environmental concerns, support for measures that can be interpreted as traffic restraints (speed cameras, pricing the car ferry) and concerns for equity.

Based on the factor analysis, a factor index is computed for each respondent and factor. It is computed as the average of the responses to the statement included in each factor (the statements with non-zero elements in Table 4). For further descriptions of the factors indices see IBM (2012). The indices thus show to what extent the individuals agree with the statements included in each factor (on the 7-grade scale from "completely disagree" (1) over "neutral" (4) to "completely agree" (7). The indices can be interpreted as observations of latent variables reflecting fundamental values. The factor indices will be used in the subsequent estimation of determinants of attitudes to congestion pricing.

The bottom rows of Table 4 show average factor indices for each year. They remain broadly unchanged, which is natural since very few of the underlying attitudes change significantly (see Table 3). There is, however, a significant tendency of decreased tax resistance and increased equity concerns, which is consistent with the general left/green mentioned earlier.

A regression of respondents' characteristics on the attitude factors (available on request) show that the PRICE index is correlated with high education, high wage, high value of time and low age; the TAX index is correlated with high age, low public transport and bicycling trip frequency, low education and low wage; the EQUI index with high age, high public transport and bicycling trip frequency, low wage and high value of time; and the ENV index with high public transport and bicycling trip frequency, low wage and high value of time.

[3] In a few questions, the formulation was slightly different, as explained previously in the paper. This is indicated by a lack of quotes around the statement.
[4] The number of factors is determined by the number of factors with eigenvalues greater than one. The eigenvalue of a factor is the sum of the variance of all variables correlated with the factor.

Table 4
Attitude factors and their components; rotated factor loadings.

	PRICE	TAX	EQUI	ENV
"Considerably more resources should be used to protect the environment."				0.646
"Automatic speed cameras is a reasonable way to improve traffic safety"				0.657
"Road congestion is one of Gothenburg's largest problems"				0.564
"Motor traffic is among the largest threats to the environment."		−0.356		0.669
"Charges and taxes to own, park and drive a car are too high"		0.821		
"Taxes are too high"		0.878		
"It is reasonable that airplane tickets cost more for departure during peak hours than during off-peak"	0.777			
"It is reasonable that charter operators raise their prices when the Swedish weather is bad."	0.785			
"The government should prioritise reducing differences between low- and high-income groups."			0.468	0.465
Pricing the ferry is a fair allocation mechanism.	0.392			0.468
Letting a government agency decide who get to use the ferry is a fair allocation mechanism.			0.714	
Would become more positive to congestion charges if the charge was lower for low-income drivers			0.716	
Average factor index 2012	4.05	4.87	4.13	5.12
Average factor index 2013	4.16	4.67	4.24	5.18
t-Test for equality of means[a] 2012–2013	1.78	−3.42	2.43	1.35

[a] Not assuming equal variance across the years.

5.2. Estimation of explanatory factors of congestion pricing attitudes

Next, we estimate ordered logit models to identify how variables affect the attitude to the congestion charges. Estimations are done in Biogeme (Bierlaire, 2003, 2008).

5.2.1. Model formulation

Let y^* be an unobserved latent variable, parametrized through a variable vector X and a parameter vector β such that

$$Y^* = \beta X + \varepsilon.$$

The observed response $y = 1, \ldots, 5$ indicates whether the latent variable y^* falls within one of five intervals,

$$\begin{aligned}
&y = 1 \text{ if } y^* \leqslant \mu_1\\
&y = 2 \text{ if } \mu_1 \leqslant y^* \leqslant \mu_2\\
&y = 3 \text{ if } \mu_2 \leqslant y^* \leqslant \mu_3\\
&y = 4 \text{ if } \mu_2 \leqslant y^* \leqslant \mu_3\\
&y = 5 \text{ if } \mu_4 \leqslant y^*.
\end{aligned}$$

The parameters $\mu_1 - \mu_4$ are called threshold parameters. Assuming that the error term ε is logistically distributed, the probability of $y = i$ is

$$\begin{aligned}
&\Pr(y = i) = \frac{1}{1 + \exp(\mu_i - \beta X)} - \frac{1}{1 + \exp(\mu_{i-1} - \beta X)}, \quad i \in 2, 3, 4\\
&\Pr(y = 1) = 1 - \frac{1}{1 + \exp(\mu_1 - \beta X)},\\
&\Pr(y = 5) = \frac{1}{1 + \exp(\mu_4 - \beta X)}.
\end{aligned}$$

A more comprehensive description of ordered models can be found in Greene (2003).

5.2.2. Model results

Estimation results are presented in Table 5. Model includes socioeconomic variables, attitude factors (see Section 5.1), self-interest variables, public transport satisfaction and beliefs in positive and negative effects. Since public transport satisfaction and beliefs in effects may be influenced by the congestion charge attitude, rather than the other way around, Model 2 excludes these variables. This turns out not to change the parameters for the remaining variables.

Perhaps surprisingly, we find no evidence that variables affect congestion pricing attitudes differently in the two years. This was tested by estimating three models, one on the 2012 sample, one on the 2013 sample, and one model on the pooled sample with identical parameters in the two years, except for three year-specific constants (see below). A χ^2 test of parameter restriction was then used to test the null hypothesis that the parameters of the two year-specific models are identical. The null hypothesis would be rejected if the χ^2 statistic is has a small significance probability; .05 is a commonly used value. The significance probabilities turn out to be .14 for Model 1 and .25 for Model 2, so the null hypotheses was not rejected for either of the models. We conclude that the variables do in fact seem to affect the congestion pricing attitude in the same way in the two years. We also specifically tested whether the parameters for the four attitude factors were different between the

Table 5
Estimation results – determinants of stated voting intention in a referendum about congestion charges and the associated infrastructure package.

	Model 1		Model 2	
Number of estimated parameters	44		36	
Number of observations	3008		3008	
Final log-likelihood	−3860.66		−3974.20	
Adjusted rho-square	0.203		0.172	
	Parameter	*t*-Stat.	Parameter	*t*-Stat.
Toll payments				
Toll payer (dummy)	−0.0531	*−0.53*	−0.1389	*−1.41*
Toll payments per month	−0.0304	*−4.55*	−0.0325	*−5.22*
Car access				
Car in the household (dummy)	−0.35	*−3.29*	−0.351	*−3.33*
Cars in the household	−0.27	*−2.82*	−0.357	*−3.97*
Company car (dummy)	0.476	*2.7*	0.466	*2.99*
Value of travel time savings				
Slope 1 (0–3 €/h)	0.0142	*4.36*	0.0157	*5.12*
Slope 2 (3–15 €/h)	0.00574	*3.93*	0.00722	*5.06*
Slope 3 (15–18 €/h)	−0.0112	*−0.68*	−0.0131	*−1.01*
Non-car trip frequencies				
Bicycle frequency (trips/month)	0.0214	*3.22*	0.0198	*3.07*
Public transport frequency (trips/month)	0.0239	*4.23*	0.023	*4.29*
Attitude factors				
PRICE	0.114	*4.27*	0.13	*5.19*
TAX/CAR	−0.412	*−15.09*	−0.442	*−17.11*
EQUI	−0.016	*−0.48*	−0.0115	*−0.37*
RED/GREEN	0.52	*11.65*	0.612	*15.16*
Socioeconomics				
Income	1.37	*1.92*	0.919	*1.28*
Female (dummy)	−0.502	*0.112*	−0.356	*−3.63*
Highest education	0.189	*2.81*	0.151	*2.20*
>3 years university education (dummy)	−0.0893	*−0.92*	−0.052	*−0.54*
Beliefs in effects				
"The quality of life for residents within the cordon will increase/has decreased" (agree)	0.288	*7.56*		
"Retail within the cordon will decrease/has decreased" (agree)	−0.123	*−4.17*		
"Time spent in car queues will decrease/has decreased" (agree)	0.26	*6.95*		
Public transport satisfaction				
"I am generally satisfied with the public transport" (agree)	0.105	*5.01*		
Year-specific constants				
Male 2013	0.168	*−1.49*	0.158	*1.50*
Female 2013	0.961	*8.55*	1.02	*9.82*
Cars in the household Male 2013	0.419	*2.42*	0.449	*2.64*
General model parameters				
Constant	3.82	*4.36*	1.63	*1.96*
μ_1	0 (fixed)	–	0 (fixed)	–
μ_2	1.39	*27.95*	1.32	*27.95*
μ_3	2.29	*37.59*	2.18	*37.45*
μ_4	4.02	*47.44*	3.83	*47.13*

years (keeping the rest of the parameters constant across years). Again, the hypothesis that the parameters stayed constant across the two years was not rejected. This result rules out (H5).

Income is a categorical variable with five levels in the survey, but coded as a continuous variable using interval midpoints. *>3 years university education* is a dummy variable taking the value one if the respondent has a university education longer than 3 years. *Highest education* has three levels reflecting highest education (0 = High school, 1 = College, 2 = University education). Education, high income and being male all tend to increase support for the charges.

The dummy variables *Company car* and *Car in the household* take the value one if the respondent has a company car and at least one car in the household, respectively. *Cars in the household* is the additional number of cars in the household beyond the first, with limited at two additional cars. This variable is smaller for men in 2013, for whom the positive parameter for *Cars in the household Male 2013* should be added to obtain the net impact of this parameter. The support for the charges

Table 6
Simulation results.

	Definitely yes (%)	Probably yes (%)	Don't know (%)	Probably no (%)	Definitely no (%)	Support excl. "Don't know" (%)	Support index (%)
Actual support 2012	10	19	14	24	34	33	2.47
(A) Predicted support 2013, using only self-interest and socioeconomic variables	8	18	16	26	32	31	2.43
(B) Predicted support 2013, adding attitude factors	12	20	14	22	31	38	2.60
(C) Predicted support 2013, adding public transport satisfaction	13	20	14	22	31	38	2.62
(D) Predicted support 2013, adding beliefs about effects	14	21	14	21	30	40	2.68
Actual support 2013	19	23	16	20	22	50	2.97

decreases with the number of cars in the household. Access to a company car increases support, which is logical since company cars are exempt from the charges.[5]

Toll Payer is a dummy variable taking the value one if the respondents pay congestions charges at least once a month.[6] *Toll payments per month* is the number of car trips per month across the cordon above 3, on a 3 level scale: 0, 7 and 17. The *Value of travel time* ranges from 0 to 18 €/h on a seven level scale. This variable is implemented as a piecewise linear variable with kinks at 3 and 15 €/h. Higher value of time and lower toll payments increase the support for congestion pricing.

Public transport frequency and *Bicycle frequency* is the number of trips per month with these modes on a 4 level scale (0, 3, 10, 20). Higher public transport and bicycle trip frequencies increase the support for the charges, even though the models already control for toll payments and car ownership. Presumably, high cycling and public transport frequencies indicate that these modes are good substitutes for the car.

High indices on the attitude factors *PRICE* (accepting pricing policies in general) and *ENVI* (environmental concerns, support public interventions, equity concerns) tend to increase support for the charges. A high index on *TAX* (taxes in general and on cars in particular are too high, traffic is not a big environmental problem) has a strong negative effect on the attitude to the charges. The index of the fourth factor, *EQUI* (equity concerns, positive view of governmental allocation), does not significantly influence the attitude to the charges.

We may thus conclude that the support for the charges is influenced by self-interest – measured by variables such as toll payments, value of time and car ownership – and by attitudes to associated issues, such as equity, environment, taxation and trust in the government. Attitudes to associated issues have a substantially higher influence on the support for congestion charges than self-interest. Taken on their own, the attitude factors can explain 79% of the explanatory power of the full model, while the self-interest variables on their own can only explain 54% of the explained variation in the full model. Once attitudes and self-interest variables are included in the model, socio-economic variables account for almost nothing – 0.2% of the explained variation in the full model.[7]

Finally, beliefs in positive and negative effects, respectively, tend to influence attitude to the charges in the expected directions. Two of the beliefs, increased public transport crowding and decreased traffic volumes, were not significant. As pointed out earlier, the causality between these beliefs and the attitude towards the charges most likely runs in both directions, so there is clearly a risk for reverse causality in this model.

Since there are significant year-specific constants, we can conclude that the entire change in attitudes between the years cannot be explained by changes in the variables alone, neither by changes in attitudes nor any other variables. We interpret this as a sign of status quo bias (H7). The year-specific constants are significant for women and for men with at least two cars in the household. The constant for women is more than twice as large as the constant for men with at least two cars in the household. Apart from these differences, the year-specific constants do not depend on socioeconomic characteristics, travel behaviour or toll payments. If loss aversion was a contributing factor (H6), the year-specific constant would have been larger for responders paying a lot in tolls, or the parameter for "tolls paid" should have changed between the years; hence, this rules out (H6).

5.3. Calculation of factors' contribution to attitude changes

The next step in our analysis is to calculate the approximate contribution of the variables in Model 2 to the change in the support for congestion charges. First, a model with only socioeconomic and self-interest variables plus year-specific constants for 2013 is estimated. Then the year-specific constants are set to zero; this gives the predicted support for the

[5] According to Swedish tax rules, the costs for congestion charges are included in the generic tax that employees pay for the benefit of having access to a company car.

[6] In the 2012 survey, the anticipated number of trips across the cordon when the charges apply.

[7] A model with one constant only (applying to both years) has Log Likelihood (LL) –4735, adding the attitude variables increases the LL to –4179, adding self-interest variables increases the LL further to – 4031, and adding socio-economic variables increases the LL to – 4031.

charges in 2013, if only changes in socioeconomic and self-interest variables are taken into account. We then continue by adding more and more variables to the model, which allows us to separate the contributions of the variables from each other. The models predict support on a 5-grade scale. To make results easier to interpret, we summarise predicted support in two different ways (the rightmost columns): the share of yes-voters excluding "don't know" votes, and a support index showing the average of the simulated votes (ranging from 1 = Definitely no to 5 = Definitely yes). Results are shown in Table 6.[8]

The stated support increased from 33% in favour in 2012 to 50% in favour in 2013. The model with only self-interest and socioeconomic variables (A) actually predicts a slight drop in the support 2013, so apparently changes in self-interest and socioeconomics do not contribute to the increased support. This is evident already from the fact that these variables remain virtually unchanged between the years.

The change in attitude factors (B) explains 26% of the increase in support (4 of 17 percentage points, or a .13 change in the support index out of a total change of .5; it turns out not to matter which summary measure is used). This lends some support to (H4), that changes in related attitudes may cause a second-order effect on the attitude to the charges. However, as pointed out earlier, there was a general left/green political trend between the two surveys. The attitudes that change in our survey are increased equity concerns and more disagreement with the statement that taxes and car costs are too high. Since these attitudes are associated with left/green political views, these attitude changes are most likely caused by this general political trend to some extent, rather than being caused by the introduction of the charges.[9]

The increase in public transport satisfaction (C) explains virtually nothing of the increased support for the charges: 0.7% of the change in support, and 4% of the change in the support index. This result rules out (H3).

The change in beliefs about effects (D) explains 12% of the increase in support. However, this change is likely to be subject to reverse causality, at least to some extent. (H2) may hence contribute somewhat to the change, but not in a major way.

Most of the attitude change (75%) remains unexplained and is captured in the year-specific constant. We argue that this means that three quarters of the increased support for the charges can be attributed to status quo bias (H7) (see the next section).

5.4. Conclusions: What explains the attitude change?

With the results above, we are now in a position to determine the contributions from our potential mechanisms (H1)–(H7).

(H1) *Larger benefits than expected.* This mechanism was rejected already in Section 4.2, since beliefs in positive effects from the charges actually decreased.

(H2) *Smaller downsides than expected.* This may have had some effect, although there is almost certainly some reverse causality here. The analysis in 5.3 indicates that changes in beliefs of the effects may have contributed to around 12% of the total change in attitudes. Even disregarding the reverse causality problem, this is not a major cause of the change.

(H3) *Benefits of accompanying measures.* Public transport satisfaction did in fact increase with the extended bus services, but according to the analysis in 5.3, this has a negligible effect on the attitude to the congestion charges.

(H4) *Changes in related attitudes.* These are the only measured variables that can explain the change in congestion pricing attitude to any substantial extent. As shown in 4.3, attitudes changed in a direction that tended to increase the support for the charges. The analysis in 5.3 indicates that this could explain around a quarter of the total change in congestion pricing attitudes. Still, this should be interpreted with caution: at least part of the changes in related attitudes are probably due to a general increase in support for the left/green political parties, rather than caused by the introduction of the congestion charges.

(H5) *Reframing.* The parameters for the attitude factors in the models estimated in 5.2 measure the strength of the association between support for congestion charges and, for example, environmental concerns. Hence, the parameters can be seen as an indication of how the charges are perceived: if the charges are perceived as an environmental measure, for example, the association between environmental concerns and support for the charges will be strong. If reframing contributed to the change, the parameters measuring the influence of the attitude factors on the congestion pricing attitude would have changed between the years. For example, if the charges had become perceived less as a tax, then the association between opinions about taxes and opinions about the charges would have become weaker. As the statistical tests in 5.2 showed, these associations (the model parameters) do not change. We can hence conclude that there is no evidence of reframing, since the links between the congestion pricing attitude and the various other attitudes are (statistically) identical in the two years.

[8] To estimate the contribution from different variables we have also used and alternative method: We calculate the average latent variable for 2012, $u_{2012} = \beta x_{2012}$, where x_{2012} is the population averages in the 2012 sample and the average latent variable for 2013, $u_{2013} = \beta x_{2013}$, where x_{2012} is the population averages in the 2013 (including the year-specific variables, which captures the "unexplained" change in attitudes). The difference u_{2013}–u_{2012} is a measure of the total attitude change in the population. To estimate the contribution from each type of variable, we replace the 2012 population averages with the 2013 population averages for one group of variables at a time. Using this method, we arrive at the same conclusion as with the simulation method presented in Table 6.

[9] That more respondents now view pricing a ferry as a fair allocation mechanism may be due to the introduction of the charges, however.

(H6) *Loss aversion.* Loss aversion means that something is valued higher once you have it, and vice versa. This would mean that the loss of tolls paid would hurt less and time savings would be valued higher after the change than before. As shown in the tests in 5.2, the parameters for tolls paid and value of time are unchanged between the years. We can hence conclude that loss aversion, in this sense, does not appear to play a role for the attitude change.

(H7) *Status quo bias.* When all other effects are controlled for, and any changes in their influence accounted for, there is still a substantial remaining change in the support for congestion charges. This shows up in our models as year-specific constants. We interpret these constants as a status quo bias.

Interpreting the year-specific constants as a sign of status quo bias may be questioned, in the sense that status quo bias can seldom be conclusively *proven* outside controlled laboratory settings. Still, we think that this interpretation is natural. Our survey was designed to cover all determinants of the attitude towards congestion pricing that have been suggested in the previous literature. Controlling for all these determinants in our models, we find that changes in these determinants can only explain a minor part of the change in the support. The models behave well regarding parameters across years, and are stable with respect to specifications and inclusion of different variables.

Outside perfectly controlled laboratory settings, it is in practice impossible to conclusively rule out the possibility that some unmeasured variable has caused a change, and that this omitted variable is instead picked up as a status quo bias by the model. In this sense, status quo bias can virtually never be proved in practice, only inferred once all variables the researcher can think of are controlled for. In our case, interpreting the year-specific constants as a sign of status quo bias is especially natural since the constants do not vary with travel patterns, toll payments, socioeconomic characteristics (except gender) or attitudes.

We use the term status quo bias in a broad sense: it could be caused by risk aversion, respondents' uncertainty of effects or how to adapt their travel behaviour, or a general fear of the unknown.

Status quo bias can also be caused by cognitive dissonance, i.e. accepting unavoidable or irreversible changes (as shown in a nice experiment by Schade and Baum (2007)). However, this seems to be unlikely in this case, since the political debate about the charges and the associated infrastructure package was extremely lively at the time of the surveys. The impression was certainly not that the outcome was inevitable; in fact, a referendum about the charges was scheduled for the autumn of 2014, a year after our second survey.

6. Conclusions

Virtually all cities that have introduced congestion charges have seen public opinion become more positive after the introduction. Gothenburg is the latest example in this series. The share of respondents who would "definitely" or "likely" vote yes in a referendum about the charges and the associated infrastructure package increased from 33% right before the introduction to 50% a year later (excluding "don't know" responses). The share of positive respondents stating that they "definitely" would vote yes increased from a third to almost a half.

Several explanations of this phenomenon have been put forward in the previous literature. The explanations are not mutually exclusive, so they may all contribute to some extent to the attitude change. Using surveys before and after the introduction, we have tested how much the various explanations contribute to the change.

The most commonly proposed explanation is that positive effects turn out to be larger than expected. In Gothenburg, this can be ruled out: in fact, beliefs in positive effects decreased after the introduction. On the other hand, beliefs in *negative* effects also decreased. The perception that things did not turn out as bad as feared may have contributed somewhat to the more positive attitudes. If we ignore reverse causality (that more positive attitudes may reduce beliefs in negative effects, rather than the other way around), decreased beliefs in negative effects can have contributed with up to an eighth of the total change in attitudes. Since there is almost certainly some degree of reverse causality, the real number is most likely lower than this.

Several improvements in the public transport system were made shortly before the introduction of the charges. They were partly funded by the revenues from the charges, and were marketed as a part of the general charge/infrastructure package. This hypothecation of charge revenues may have increased support for the charges. However, our analyses suggest that this contribution is negligible.

The process of introducing congestion charges and the associated debate and political campaigns, and possibly also the experience of congestion charges, may change related attitudes, for examples attitudes to equity, environment or pricing policies in general. For example, it has been suggested that a contributing factor to the increased support for the Stockholm charges was an increased acceptance of pricing as a method for allocating scarce resources and regulating externalities. Our results lend some support to this. Changes in related issues contribute with around a quarter of the total change in attitude towards the charges. However, this change in related attitudes is not necessarily caused by the introduction of the charges – it might simply be a part of general, longer trend in favour of the left/green political block, which just happens to work in favour of the charges.

There may also be changes in what other attitudes influence the attitude towards the charges. A political debate or campaign may cause a reframing of the congestion charges, where the charges can be reinterpreted or "re-branded" from, say, a fiscal measure to an environmental measure. In the longer perspective, this is most likely an important mechanism, but there

is no evidence of this in our results, which only encompass one year. All variables, including attitude factors, seem to influence the attitude towards the charges in exactly the same way before and after the introduction.

The final explanation, then, is status quo bias. This seems to be by far the most important mechanism, contributing with three quarters of the total change in attitudes. Interestingly, this effect is much stronger among women. The status quo bias does not seem to be caused by loss aversion; if it was, we would for example have seen a smaller attitude change among respondents who pay little or nothing compared to those who pay a lot. Instead, we see a similar change in attitudes across almost all groups, be it car drivers, environmentalists or public transport users, irrespective of self-interest and general attitudes. Hence, the status quo bias seems to be a general phenomenon: the change is resisted partly just because it is a change. Once the policy is there, the support increases partly just because "it's there". The existence of status quo bias poses a philosophical problem for democracies and welfare evaluation. If a population would vote against a policy before it is introduced, but would vote in favour of keeping it once it has been introduced, and the only reason for the change in attitudes is status quo bias – is it then democratically defensible to introduce the policy? One way to come to grips with this question is to say that it has to do with the characteristic of the policy: if it in some way means that resources are spent more efficiently, and if reasonable measures of public welfare increase, then one is tempted to answer yes. But this is far from an obvious answer; the question goes well beyond the scope of this paper.

We can only speculate regarding whether our conclusions are applicable to other cities. After all, the benefits from congestion reduction in Gothenburg were small compared to cities like Stockholm and London. Indeed, one can question whether congestion charges are even appropriate in Gothenburg from the perspective of economic efficiency. The visible congestion reductions in London and Stockholm were both larger and less expected, so the "larger benefits than expected" may be a bigger factor in those cities. However, Eliasson (2014) shows that this can only explain a minor part of the attitude change in Stockholm. The Norwegian systems were not designed or intended to reduce congestion, so changes in beliefs in the effects are not likely major drivers of the increase in the public opinion in Norway.

It is clear that the framing of congestion pricing – for example, whether it is presented as a fiscal, environmental or traffic-engineering measure – plays a substantial role for public acceptability (Eliasson and Jonsson, 2011; Hamilton and Eliasson, 2012; Schade and Schlag, 2003). In the longer run, how congestion pricing is framed is most likely a decisive factor. However, reframing seems to be too slow a process to affect attitudes to congestion pricing in the short run studied here, and hence it seems unlikely that this is the main driver behind the considerable attitude change that many cities have experienced after the introduction. Given this, we are inclined to believe that status quo bias has played a major role for the change in public attitudes to congestion pricing in other cities as well.

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