Congestion Tax in New York City: Progressive or Regressive Tax?

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Congestion Tax in NYC: Progressive or Regressive Tax?

Shawn Quinn
Advisor: Richard Tresch
Abstract: My thesis topic is an analysis of the effects that a congestion tax in mid-town Manhattan would have on drivers who normally drive there. A congestion charge was proposed in 2008 in an attempt to lessen traffic in Manhattan below 80th street, but it was struck down in the New York State Assembly. My thesis will look into the data the Assembly used to make its decision to reject the charge. I will then use this and other data to calculate my own elasticity and find hypothetical effects of a congestion tax in the area on drivers. Then I will formulate my own proposal on whether the charge would be seen as a progressive or regressive tax.

Congestion Charge: “Congestion pricing is a way to harness the power of the market to reduce the waste associated with traffic congestion” (USFHA, Pg. 1). The use of untolled roads creates several negative externalities, a cost that affects a party who did not choose to incur that cost. The two major externalities of untolled roads are congestion and environmental consequences such as pollution from vehicles. A congestion charge is implemented to account for these negative externalities on society. Graph 1 (Deelen) shows the effects of externalities. The x-axis, or q is the quantity of driving demanded while the y-axis is the cost of driving. The individual cost curve is the only cost that drivers are taking into account when they choose to drive. These costs are gas prices, vehicle registrations, car upkeep and other factors. However, the individual costs do not factor in the negative externality. This means that the unit cost for driving is too low and people are not at the social equilibrium, which is point G. They are at the private equilibrium, which is point F. Drivers will not adjust their demand for driving to the social equilibrium unless they are forced to pay for the negative externality. This is why a congestion charge is implemented, to make the individual cost
curve equal to the social cost curve. The amount of the congestion charge is GI, because this is the cost of the negative externality to society at the optimum level. Correctly pricing the externality is difficult for a government or agency trying to get the public to use a good at the socially optimum level.

Graph1: Graphical representation of Negative Externalities

New York City Congestion Tax:
The idea of enacting a congestion tax in New York City began in 2003. A report was presented at the Eno Transportation Foundation conference. Four scenarios were put forth in the paper to help control the rising congestion on NYC roads and help raise revenues for the city. One of the scenarios, which was eventually proposed, was modeled after London’s congestion tax, which is a 5-pound ($8), flat rate tax to enter a certain zone of the city between certain times (Zupan Pg. 21, 2003). However, Mayor Bloomberg did not officially
propose this congestion tax in NYC until 2007. The tax was part of his larger PlayNYC 2030 plan, which was a proposal for different economic, social, and environmental initiatives that would help improve the infrastructure and land use of the city (Schaller, 2010). The congestion charge was going to be implemented from 6 a.m. to 6 p.m. on weekdays in a zone from 86th street to Battery Park (Appendix 1, Schaller 2010). It would be $8 dollars for automobiles coming into the zone, and $4 dollars for those originating in the zone. Small trucks would be charged $21 dollars and large trucks $42 dollars, and the fee would be halved if they originated in the zone. In addition, there would be a deduction in the charge if the vehicle entered the zone over a tolled roadway (Schaller Pg. 5 2010). This means if drivers came into the tolled zone through the Holland Tunnel, which has a toll of over $8 dollars, they would not be required to pay the congestion charge. If the toll is less than $8 dollars the drivers are required to pay the difference. The plan to enforce the toll was similar to London’s as well, with cameras throughout the zone that capture either a tag or license plate. The revenue from the congestion charge was projected to about $700 million dollars a year (Zupan Pg. 35, 2003). However, the congestion tax was never implemented because it failed, to pass in the NYS Assembly. There were several factors why it failed outlined in “An Inquiry into Congestion Pricing as Proposed in PlayNYC 2030” written by Assemblyman Brodsky. Some of the factors include privacy concerns, the infrastructure cost, and the view that a congestion tax is a regressive tax.

This paper focuses on the assessment that the congestion tax would be a regressive tax and the ramifications of allowing toll offsets for those who drive over tolled roadways before entering the congestion zone. The appendix for Assemblyman Brodsky’s report contained an analysis of information about drivers entering into New York City (Appendix
These charts show information such as commuter trips and average income of commuters by region, average daily trips from different regions, and the effects congestion pricing would have on drivers from different zones. The paper gives no indication of how they formulate the percentage changes in drivers under the congestion tax. Therefore one must be skeptical of the elasticity used in this paper to compute the change in drivers from each region and income bracket. My goal is to compute my own elasticity and compare my results to his results. I expect that my results may differ because this report was created to ensure the bill was not passed, so they may have overstated the effects to achieve the results desired.

**Literature Review:**
New York City’s Independent Budget Office released the Fiscal Brief, “Bridge Tolls: Who Would Pay? And How Much?” in October 2003. It considered the implications of charging a toll on the free East River and Harlem River bridges. The idea of raising a toll was sparked by the rising congestion within NYC and the need to increase revenue. This tax would provide a solution to both of these problems. The projected decrease in traffic over the bridges was 19% for East River Bridges and 13% for the Harlem River bridges. In addition, the revenue from the tolls was expected to be around $693 million (IBO Pg. 3, 2003). This report is important to my topic because it puts forth an idea that is very similar to a congestion tax in lower Manhattan. If these free bridges were tolled, then no driver could enter Manhattan without paying a fee. This study targets the areas and roadways I am concerned with because I believe the congestion tax will largely affect people driving over these bridges. Since all other entry points into the congestion zone are tolled, the offset makes the charge nonexistent for those drivers. The report did not indicate how the percentage change in traffic volume was calculated, but I will compare my results with
their's. It is important to note that the IBO's percent change in traffic, 19%, is more than the estimated percentage change in traffic that the “An Inquiry into Congestion Pricing as Proposed in PlayNYC 2030”, 16%, for the East River bridge.

The IBO report is a great stepping-stone to help me analyze the affects of a congestion charge with the elasticity I calculate because the paper also focuses on which income groups will be most affected by the proposed bridge toll. The Fiscal Brief used the Regional Travel-Household Interview Survey, which was conducted from May 1997 to May 1998, for its data set. The Survey data were of the driving habits of metropolitan households. From this they were able to determine the percentage of people who were driving over the free bridges, their demographics, incomes and if they were NYC residents (Appendix 3). Rather than rerunning the model to check their results from the Regional Travel-Household Survey, I will accept their results.

Two interesting findings from the paper are that “most of the drivers who use the free crossings reside in New York” and that “City residents who drive across the free bridges are more affluent than city residents who enter Manhattan via transit” (IBO, Pg.1 2003). This information implies that the congestion charge will not be a regressive tax and that it will affect NYC residents more. The Brief does not specifically compute the exact changes in each income bracket’s driving tendency resulting from the charge. Rather, they extrapolated a diversion factor from a DOT paper in 1991. The diversion factor is the percentage of people who will now find alternate routes to commute into the city. This could be by public transportation or another tolled entry. Although their diversion factor is higher than the Inquiry's, one must be skeptical of it because the DOT report does not state how they determined these figures.
The Triborough Bridge and Tunnel Authority Investor Solutions Report is an excellent resource for historic information about the bridges and tunnels the TBTA runs. They have access to data not only on the traffic volumes but also on population and employment trends. The two important pieces of data in the report are the toll price history of the nine bridges and tunnels they control and the elasticity they compute for each of these nine bridges and tunnels. Table 1 below has the historic elasticity factor for toll prices (TBTA Pg. 33, 2011). These elasticities are important for policy makers because they demonstrate the effect that increasing tolls will have on the traffic on these bridges. The figures can also be used to analyze the effects of tolling untolled bridges. A quick glance at the data shows how important the toll price is to drivers who use the free bridges. The Carey Tunnel (Battery Tunnel) elasticity demonstrates this because the Carey Tunnel is tolled and is right near both the Brooklyn and Manhattan bridges, which are free. This suggests that when drivers have free options the elasticity factor is higher than when they do not have free alternatives. It would be interesting to see the elasticity for the tunnel if the bridges around it were also tolled. The practical application of these factors to my research is that I hope to run regressions on all of these toll facilities and compare my results to theirs. By doing this I can possibly validate their models if the figures are close, or point out discrepancies if the figures are drastically different.
Jonathan Peters and Jonathan Kramer wrote an interesting paper about the vertical equity of the proposed congestion tax. They broke down the “winners” and “losers” from the tax. The winners are: drivers whose time saved is worth more than the new toll and the public transit users who will benefit from the improved facilities. The losers are: drivers whose time saved is worth less than the tax, drivers who switch to less convenient routes, and people whose roadways are more congested as drivers seek alternate routes (Peters and Kramer Pg. 124, 2012). They determined that those who drive over the Harlem River and East River Bridges would have a higher hourly cost compared to all other routes into Manhattan because of the toll offset program (Peters and Kramer Pg. 125, 2012). This issue of the congestion charge only effecting one area, drivers from the east and north, from the boroughs of Queens, Brooklyn, and the Bronx, arises in this paper again. This paper does not determine the change in traffic amounts on the different bridges and tunnels, rather it

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### Table: 1 TBTA Elasticity Calculations

<table>
<thead>
<tr>
<th>Facility</th>
<th>Historic Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throgs Neck Bridge</td>
<td>-0.109</td>
</tr>
<tr>
<td>Bronx-Whitestone Bridge</td>
<td>-0.109</td>
</tr>
<tr>
<td>RFK Bridge</td>
<td>0.164</td>
</tr>
<tr>
<td>Queens Midtown Tunnel</td>
<td>-0.192</td>
</tr>
<tr>
<td>Hugh L. Carey Tunnel</td>
<td>-0.358</td>
</tr>
<tr>
<td>Henry Hudson Bridge</td>
<td>-0.282</td>
</tr>
<tr>
<td>Marine Parkway Bridge</td>
<td>-0.101</td>
</tr>
<tr>
<td>Cross Bay Bridge</td>
<td>-0.137</td>
</tr>
</tbody>
</table>

Source: Santec/TBTA Pg. 33

Notes:
(a) For each 1% increase in toll the volume is expected to decrease by the elasticity factor; e.g. for each 1% increase in the cash toll at the Queens Midtown Tunnel, cash traffic would decrease by 0.240%
(b) Based on the distribution of traffic by payment type and facility.
goes for a more general approach by using the Lorenz curve and Gini coefficients of selected areas to see which area will pay for the tax. Their results demonstrate that the population that drives over the free toll bridges would be considered middle class with average income ranging from $56k to $81k (Peters Pg.131 2012). They also found the median income for users of both tolled and untolled bridges (Appendix 4). They concluded that the majority of the congestion tax would come from the middle class. Their work is important to my topic because I hope to determine the effects the congestion tax would have on drivers in different income brackets.

The New York City congestion tax is based on the London tax in many ways. Georgia Santos has written numerous papers on the effects the congestion tax has had on London drivers, so I have looked to her work for guidance. The most interesting piece of data for my thesis was her calculations for elasticities. She has computed different elasticities in two separate papers. In 2004 she computed the elasticity for the generalized cost of driving (GC) as follows (Santos 2004)
In 2006, she updated her findings (Santos Fraser 2006).

Since the elasticities come from different calculations, it is hard to know which one is correct or if the overall level would be equal if the second elasticities were averaged together.

Another piece that is useful is the change in average speed in the charge zone. This
graph of the average speed in the charge zone shows that initially, the average speed increased before steadily receding to its pre-charge level (Santos, 2004).

This means that some of the benefits to drivers from a congestion charge are lost over time, implying that the charge needs to be updated periodically to keep speed constant over time.

**Model:**

1. **Elasticity**

To understand what the effects of an $8 dollar congestion charge in New York City would be on drivers I first needed to calculate an elasticity for toll prices. To compute an elasticity of demand for driving in New York City I needed a data set that would show the effects of toll changes on driving volume so I could run regressions. Using the Annual Bridge and Tunnel report for 2011 and Manhattan’s Central Business District (CBD) report from the New York Metropolitan Transit Council (NYMTC), I was able to obtain the total volume of traffic over each bridge and tunnel within New York City from 1950 to 2010. I then found the historic toll prices for each bridge and tunnel for this time frame using the Triborough Bridge and Tunnel Authority Investor Solutions Report (TBTA) and the Metropolitan Transportation Authority (MTA) website. This is the essential portion of the data, but I
needed other independent variables for my model to find the independent effect of toll prices on traffic volumes. Subway ridership, bus ridership and railroad ridership are also important variables because these are the main alternatives to driving and thus should be negatively correlated with traffic volumes. These data were also located in the NYMTC CBD report (Appendix 5, NYTMC 2011). It is also important to have transit prices and gas prices because they will affect both public transportation and roadway ridership. The last two data sets needed are the population for each borough and the median household income within each borough from 1950 to 2010. I obtained these figures on a ten-year basis from the U.S. census and then determined each year’s value by finding the growth rate from decade to decade and then using the overall decade growth rate to compute the population and income for each year within a decade. All dollar figures such as tolls, gas prices, and incomes are in 2010 dollars.

These data were used to run regressions on bridges and tunnels within New York City to find their toll price elasticity. I decided to run regressions on 15 bridges and tunnels. There are 13 major crossings (George Washington Bridge, Lincoln Tunnel, Holland Tunnel, Battery Park Tunnel, Manhattan Bridge, Brooklyn Bridge, Williamsburg Bridge, Midtown Tunnel, Queensboro Bridge, RFK Bridge, Henry Hudson Bridge, Willis Ave Bridge, and Third Ave Bridge) into Manhattan. I left out 8 Harlem River bridges because they are not near any other tolled roadways and there are two other bridges between them and a tolled roadway so they are not affected by toll increases and thus would not be beneficial to my regressions. I then added two bridges within the city to the model, the Throgs Neck and the Bronx-Whitestone Express, because they are similar to a Manhattan crossing in the sense that they are high volume bridges whose only viable substitute is public transportation.
They are also included in the Investor Solutions report so I can compare my elasticity for these bridges to the reports. I will average these 15 elasticities to find a general elasticity factor for New York City drivers for toll increases. Averaging the 15 elasticities with equal weight appears to be the best way to compute the elasticity because each bridge or tunnel should have a different elasticity depending on external factors. Therefore, averaging them all should capture these factors thus making the elasticity more comprehensive and closer to the true elasticity.

For the regressions, the most important value is the tolls’ impact on traffic. The goal is to make this variable either negative or positive depending on whether the bridge has a toll or not. For a tolled bridge, the toll variable should be negative indicating that as the toll increases the number of vehicles on the bridge decreases. For untolled bridges the expected sign for the toll variable is positive because as the tolled bridge becomes more expensive it gives people a larger incentive to travel over the free bridges. The variables transit price and gas price should both be negative while the population and income variables should be positive. The other independent variable in the model will be bridge or tunnel traffic for nearby facilities. It is important to add other roadways near the bridge because these are substitutes and thus fluctuations in their traffic volumes should impact the tolled facility. Thus each regression will all have the same main regressor components but will differ slightly depending on the location of the bridge or tunnel in the regression.

2. Charge’s effect on different Income groups

The average elasticity I computed is then applied to the NYMYC Hub data set, which is a snapshot of the average traffic that comes into Manhattan’s “Hub,” the area below 60th street (Table 5). It has the volume of traffic over the bridges, tunnels and the public
transportation ridership for each sector in a given day. By applying the elasticity to this I will find the impact the congestion tax will have on traffic volume.

After determining the bridges and tunnels most impacted by the tax, I then used the Regional Travel Survey from 1999 conducted by the New York Metropolitan Transportation Council to determine which communities are impacted by the traffic changes. This data set was collected from households across 28 counties in New York, New Jersey and Connecticut, providing travel statistics for the region to help in the planning of future transportation investments. In total, 143,925 linked trips were derived from 18,965 households and 43,558 participants, including a sub-sample of 1,930 households whose members provided travel data using wearable global positioning system (GPS) devices (NYMTC 2011). The household and personal data include basic demographics such as Household Income Range. The data also include the place of origin and destination of the trips travelers took, the mode of transportation the travelers took, and if they crossed any tolled roads. However, as I stated earlier, I used the results from the New York City Independent Budget Office paper “Bridge Tolls: Who Would Pay? And How Much?” and Peter and Kramer paper "Just Who Should Pay for What? Vertical Equity, Transit Subsidy and Road Pricing: The Case of New York City" because they were able to break down the Regional Travel Survey data set by final destination, residency mode of transportation, and annual household income (Appendix 3 and 4).
Results:

Elasticity:

To compute the toll elasticity of New York City drivers driving into Manhattan, I ran regressions on 13 of the bridges and tunnels previous mentioned and then took the average of the elasticities (Appendix 8). I dropped the George Washington and the Willis Ave Bridge. The p-value for the toll value for the George Washington Bridge’s was not statistically significant at any level (Appendix 6). The Willis Ave toll value was negative which does not make sense because it is untolled and next to a tolled bridge (Appendix 7). I also ran regressions on a few of the Harlem River bridges that I decided not to include in my model to test my hypothesis about them being statistically insignificant because of their distance from any tolled facilities. My hypothesis was correct so I kept them out of my model.

After running the regressions I had to determine the best way to compute the average of the toll elasticities. The problem with the elasticities was that some of them were positive and some were negative, depending on if the bridge or tunnel was tolled. Therefore, I could not average the numbers because it would not make sense to have positive elasticities with a congestion charge. I decided to run two averages, one of just the tolled bridges and tunnels and the other with all the faculties. However, for the second average, rather than have positive and negative numbers, I decided it would make more sense to take absolute value of all the numbers, compute the average, then multiply the number by -1. This makes the most sense because none of the bridges or tunnels toll elasticities would be positive with a congestion charge in place. In addition, the absolute values of both the positive elasticities for the untolled bridges and the negative elasticities
for the tolled bridges were very similar. This implies that a 1% percent increase in a toll would make the traffic on a tolled bridge decrease by the same percentage as the traffic on an untolled bridge would increase. Thus, I wanted to compare the two averages and take the one that made the most logical sense. The average elasticity of all of the tolled bridges was -.136. The average elasticity for the untolled bridges and tolled bridges after taking the absolute value of the negative tolled bridge was .132. Multiplying it by -1 to make it negative, as it should be, it came to -.132. The values were similar, as I expected. I thus decided to use the second model, so my elasticity for driving into New York City is -.132. This means that for a bridge or tunnel, every 1% increase in the toll price, traffic volumes will decrease by .132%.

An important thing to note about some of the toll elasticities used in the average is that they had t-scores that were low, below 1.8. A t-score this low can make the results questionable because the p-values are close to being statistically insignificant at a 95% confidence interval. There were 4 bridges and tunnels that had t-scores below 1.8 and a two others that had t-scores below 2 (Appendix 8). This can be an issue in some models but I do not believe this is a problem in my model because all of the tolls have the correct sign.

To compare my elasticities with the elasticities found in the Triborough Bridge and Tunnel Authority Investor Solutions Report I decided to run regressions on the Crossbay Bridge and the Marine Parkway Bridge (Appendix 9). By doing this I ran regressions on 8 of the 9 bridges and tunnels in the report. The TBTA historic elasticities and my elasticities had the same signs but the results suggest that the facilities elasticities may be more inelastic than the TBTA Report findings (Table 3). These difference could be caused by different data sets or different factors included in the regressions. However, these results
do add validity to the TBTA Report because the signs are similar and both sets of elasticities are very inelastic.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Historic Elasticity</th>
<th>My Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throgs Neck Bridge</td>
<td>-0.109</td>
<td>-0.129</td>
</tr>
<tr>
<td>Bronx-Whitestone Bridge</td>
<td>-0.109</td>
<td>-0.123</td>
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<td>RFK Bridge</td>
<td>-0.164</td>
<td>-0.104</td>
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<td>Queens Midtown Tunnel</td>
<td>-0.192</td>
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<td>Hugh L. Carey Tunnel</td>
<td>-0.358</td>
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<td>Henry Hudson Bridge</td>
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</tr>
<tr>
<td>Cross Bay Bridge</td>
<td>-0.137</td>
<td>-0.041</td>
</tr>
</tbody>
</table>

Source: Santec/TBTA Pg. 33

**Congestion Charge Effects:**

After computing the elasticity, I applied it to the NYMTC CDB snapshot of the average traffic flowing into charge zone on a business day from 6 a.m. to 6 p.m. (Table 5). This data set breaks down the traffic volume for every entryway into the CBD. I first determined which entry points the congestion charge would not affect because of the toll-offset exemption. The drivers on the Lincoln Tunnel, Holland Tunnel, Brooklyn Battery Tunnel, and the Midtown Tunnel would be exempt from the charge and thus these traffic volumes will stay the same in the model. I also determined that traffic volumes on two roadways, the FDR Drive and the West Side Highway, would only be slightly affected by the congestion charge because the traffic from tolled roadways enters the CBD on these roadways. The FDR Drive connects the Triborough Bridge to the CBD and the West Side Highway connects the George Washington Bridge to the CBD. To determine how many vehicles would be exempt
from the charge on these roadways because of the toll-offset I first calculated the traffic volumes for these bridges from 6 a.m. to 6p.m. I then studied the routes around the area and determined the percentage of traffic from the George Washington and Triborough Bridges that drove into the CBD on the two roadways. For the George Washington Bridge I determined only 20% of traffic, 30,576 cars, went into the CBD through the West Side Highway. The Triborough Bridge had a higher percentage, 50% or 45,000 cars going into the CBD after crossing the bridge. I had to remove these figures from each route before I applied the elasticities to them because they would not be affected by the congestion charge. I then added the numbers back into the newly adjusted traffic volumes to compute the total volumes of traffic after accounting for the congestion charge.

The elasticity I computed is a percentage change in traffic volumes for a percentage change in toll price or driving price. This applies well to a change in a toll from $4 dollars to $5 dollars, but the congestion charge does not work this way. The charge goes from $0 dollars to $8 dollars, which means computing a percentage change in price is not possible. I therefore used three different models to determine the possible effects the congestion charge would have on traffic volumes.

The first model extrapolates the effects of the London congestion charge on traffic volumes for the first year it was implemented and applies it to NYC. The traffic volume changes in London because of the congestion charge are reported in Table 4:
<table>
<thead>
<tr>
<th>Table 4</th>
<th>London Traffic Volume % change when charge enacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle type</td>
<td>2003 vs. 2002</td>
</tr>
<tr>
<td>All vehicles</td>
<td>-14%</td>
</tr>
<tr>
<td>Four or more wheels</td>
<td>-18%</td>
</tr>
<tr>
<td>Potentially chargeable</td>
<td>-27%</td>
</tr>
<tr>
<td>Cars and minicabs</td>
<td>-33%</td>
</tr>
<tr>
<td>Vans</td>
<td>-11%</td>
</tr>
<tr>
<td>Lorries and other</td>
<td>-11%</td>
</tr>
<tr>
<td>Non chargeable</td>
<td>18%</td>
</tr>
<tr>
<td>Licensed taxis</td>
<td>17%</td>
</tr>
<tr>
<td>Buses and coaches</td>
<td>23%</td>
</tr>
<tr>
<td>Powered two-wheelers</td>
<td>12%</td>
</tr>
<tr>
<td>Pedal cycles</td>
<td>19%</td>
</tr>
<tr>
<td>Source: TFL 2007 Pg. 21</td>
<td></td>
</tr>
</tbody>
</table>

I used the percent for potentially chargeable vehicles, 27%, as the change in traffic volumes on NYC roadways. This results in a 19.55\% total decrease in traffic for the CBD (Table 5).

The remaining models incorporate the elasticity I computed. The second model uses the price of public transportation, $2.50, as the base price to compute the percent change because it is the substitute cost to driving into the CBD. The percent change from $2.50 to $8 dollars is 220\%. With an elasticity of -0.132, the traffic volumes should decrease by 29.04\%. This is 2.04 percentage points more than the London result, which makes the decision to choose public transportation price as a logical starting price. This model resulted in a 21.5\% change in traffic volumes within the CBD (Table 5).

The last model uses the entire cost to drive into the CBD on a typical business day, using the free bridges as the base price. The two main costs for driving into the CBD are the price of parking within the CBD and the cost of gas. The average price of parking per day
within the CBD comes to $15 dollars if one has a monthly contract with a parking garage in the area (Skillings, 2014). The cost of gas per day that I use is $8 dollars on average because of the different distances drivers have to travel and the stop and go traffic, which burns more fuel. In this model drivers now pay on average $23 a day to drive into the city if they use the free entryways. Adding the congestion charge of $8 dollars makes the average cost of driving into the CBD $31. This is a 35% increase in price, which should decrease traffic volumes 5% with an elasticity of -.132. After applying this to the CBD traffic volumes, traffic would decrease by 3.62% in the CBD (Table 5).

These three models give different traffic volume changes as a result of the congestion charge. The first two models give very similar changes in traffic volumes in response to the congestion charge. The third model predicted only a 4% decrease in total traffic volume in the CBD. I will use the results of the second model, a 21.5% decrease in traffic volumes, as the predicted outcome of the congestion charge. I made this choice because I did not want to copy the exact results of the London congestion charge because New York City and London are different. However, I believe the traffic volume change in NYC in response to the congestion charge will be similar to London’s. Therefore, the second model fits better than the third model. The majority of this decrease in traffic volumes will be from the Bronx, Queens, and Brooklyn. I can examine the demographics of these areas to estimate whether the congestion charge will be a regressive tax.
<table>
<thead>
<tr>
<th></th>
<th>2012 (No changes)</th>
<th>2013 London Replication</th>
<th>2013 Elasticity (Transit Price)</th>
<th>2013 Elasticity (Average cost to drive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Change in roadways affected by tolls</td>
<td></td>
<td>27.00%</td>
<td>29.04%</td>
<td>5.00%</td>
</tr>
<tr>
<td><strong>EAST OF CENTRAL PARK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDR DRIVE</td>
<td>151,111</td>
<td>122,461</td>
<td>119,596</td>
<td>145,805</td>
</tr>
<tr>
<td>YORK AVENUE</td>
<td>35,819</td>
<td>26,148</td>
<td>25,181</td>
<td>34,028</td>
</tr>
<tr>
<td>SECOND AND FIRST AVENUES</td>
<td>72,127</td>
<td>52,653</td>
<td>50,705</td>
<td>68,521</td>
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<tr>
<td>QUEENSBORO BRIDGE RAMP</td>
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<td>25,849</td>
<td>24,893</td>
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<td>LEXINGTON AND THIRD AVENUES</td>
<td>56,261</td>
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<td>29,726</td>
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<td>FIFTH AND MADISON AVENUES</td>
<td>52,204</td>
<td>38,109</td>
<td>36,699</td>
<td>49,594</td>
</tr>
<tr>
<td>SUBTOTAL</td>
<td>443,652</td>
<td>336,016</td>
<td>325,252</td>
<td>423,719</td>
</tr>
<tr>
<td><strong>CENTRAL PARK DRIVES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6,946</td>
<td>5,071</td>
<td>4,883</td>
<td>6,599</td>
</tr>
<tr>
<td><strong>WEST OF CENTRAL PARK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CENTRAL PARK WEST</td>
<td>14,517</td>
<td>10,597</td>
<td>10,205</td>
<td>13,791</td>
</tr>
<tr>
<td>BROADWAY</td>
<td>31,885</td>
<td>23,276</td>
<td>22,415</td>
<td>30,291</td>
</tr>
<tr>
<td>COLUMBUS AND AMSTERDAM AVES</td>
<td>47,261</td>
<td>34,501</td>
<td>33,224</td>
<td>44,898</td>
</tr>
<tr>
<td>WEST END AVENUE</td>
<td>25,009</td>
<td>18,257</td>
<td>17,581</td>
<td>23,759</td>
</tr>
<tr>
<td>WEST SIDE HIGHWAY</td>
<td>110,341</td>
<td>88,788</td>
<td>86,633</td>
<td>106,350</td>
</tr>
<tr>
<td>SUBTOTAL</td>
<td>229,013</td>
<td>175,419</td>
<td>170,060</td>
<td>219,088</td>
</tr>
<tr>
<td><strong>SECTOR TOTAL</strong></td>
<td>679,611</td>
<td>516,506</td>
<td>500,195</td>
<td>649,406</td>
</tr>
<tr>
<td><strong>BROOKLYN SECTOR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WILLIAMSBURG BRIDGE</td>
<td>112,696</td>
<td>82,268</td>
<td>79,225</td>
<td>107,061</td>
</tr>
<tr>
<td>MANHATTAN BRIDGE</td>
<td>89,087</td>
<td>65,034</td>
<td>62,628</td>
<td>84,633</td>
</tr>
<tr>
<td>BROOKLYN BRIDGE</td>
<td>100,288</td>
<td>73,210</td>
<td>70,502</td>
<td>95,274</td>
</tr>
<tr>
<td>BROOKLYN BATTERY TUNNEL</td>
<td>53,067</td>
<td>53,067</td>
<td>53,067</td>
<td>53,067</td>
</tr>
<tr>
<td><strong>SECTOR TOTAL</strong></td>
<td>355,138</td>
<td>273,579</td>
<td>265,423</td>
<td>340,034</td>
</tr>
<tr>
<td><strong>QUEENS SECTOR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUEENS MIDTOWN TUNNEL</td>
<td>90,992</td>
<td>90,992</td>
<td>90,992</td>
<td>90,992</td>
</tr>
<tr>
<td>QUEENSBORO BRIDGE</td>
<td>177,455</td>
<td>129,542</td>
<td>124,751</td>
<td>168,582</td>
</tr>
<tr>
<td><strong>SECTOR TOTAL</strong></td>
<td>268,447</td>
<td>220,534</td>
<td>215,743</td>
<td>259,574</td>
</tr>
<tr>
<td><strong>NEW JERSEY SECTOR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOLLAND TUNNEL</td>
<td>91,957</td>
<td>91,957</td>
<td>91,957</td>
<td>91,957</td>
</tr>
<tr>
<td>LINCOLN TUNNEL</td>
<td>101,235</td>
<td>101,235</td>
<td>101,235</td>
<td>101,235</td>
</tr>
<tr>
<td><strong>SECTOR TOTAL</strong></td>
<td>193,192</td>
<td>193,192</td>
<td>193,192</td>
<td>193,192</td>
</tr>
<tr>
<td><strong>TOTAL, ALL FACILITIES</strong></td>
<td>1,496,388</td>
<td>1,203,810</td>
<td>1,174,553</td>
<td>1,442,207</td>
</tr>
<tr>
<td>% Decrease in total traffic</td>
<td></td>
<td>19.55%</td>
<td>21.50%</td>
<td>3.62%</td>
</tr>
</tbody>
</table>
**Progressive or Regressive:**

Although I knew drivers from the Bronx, Queens, and Brooklyn would be the portion of New York City commuters most adversely affected by the congestion charge, I had to ensure this through finding the elasticity and modeling the impact on traffic volumes. Now that I have determined the impacts on traffic volumes, I can analyze if the congestion charge is a regressive tax.

To do this I used the paper by Peters and Kramer, which contains the Gini coefficients and median household income for bridge and tunnel users (Appendix 4). I also used the Interim Report by Assemblyman Brodsky, which contains the average income for households with and without cars for the different boroughs and the percent of traffic volume each borough makes up within the CBD (Appendix 2).

Examining the “Gini Coefficients for All Bridges and Public Transit” table (Appendix 4) it shows the “free” bridge users have a lower median household income and lower Gini coefficient than the tolled facilities users. The median household income for the users of the 13 facilities I used to compute the elasticity is $84,744. The NYC residents who use the Harlem River bridges have a median household income of $63,000. The NYC residents who use free East River bridges have a median household income of $56,731. My model on traffic volume decreases in conjunction with this paper suggests that the congestion charge is concentrated on the lower income drivers. Although the median household income for NYC residents who drive over the Harlem and East River bridges is higher the median household income of the U.S. population, it is far below the average median household income for those who drive into the CBD. Therefore, this analysis suggests the congestion charge will be a regressive tax because it will have a larger impact on “lower”
income drivers.

The data at the end of the Interim Report provide another way to determine if the congestion charge would be a regressive tax (Appendix 2). I viewed these data three different ways. I only focused on households in Manhattan, Queens, the Bronx, and Brooklyn because they make up 84% of the daily trips into the CBD. I first compared the income difference between households with cars and those without. This interpretation of the data suggests that the congestion charge will not be regressive because household with cars have incomes that are on average double that of households without cars. Therefore, the congestion charge would not be a regressive tax but could be seen as a progressive tax.

The second way I used the data was to compare the household income between boroughs for those with cars. Viewing the data this way makes it harder to determine if the charge will be progressive or regressive. There is a clear disparity in household income between the boroughs, with the intra-zone (CBD) income being almost 3 times that of Queens, the Bronx, and Brooklyn. This implies the zones with lower incomes will be more impacted by the charge. This points to the charge being a regressive tax. However, the intra-zone accounts for almost 50% of the trips, therefore they will be the group paying the largest percent of the charge. The intra-zone households are on average the wealthiest drivers so the charge could be considered progressive.

The third way I viewed the data makes it seem as though the congestion charge will be more a regressive tax. The last column of the table shows the percentage of daily fee paid, which is the percentage of the daily revenues from the fees that each borough pays. Queens, the Bronx, and Brooklyn account for only 23% of trips into the charge zone but would pay almost 40% of the fee revenues. This demonstrates that the charge is heavily
concentrated on the traffic from these three boroughs. These three boroughs have the lowest average household income of any of the surrounding areas. Therefore, it appears that the congestion charge would be a regressive tax. The most model appears to be the correct interpretation of the congestion charges affect on drivers.

**Conclusion:**

This paper considers whether a congestion charge of $8 dollars would be a progressive or regressive tax to New York City drivers. After computing an elasticity by averaging the elasticities of 13 New York City bridges and tunnels I was able to conclusively demonstrate that the areas most adversely affected by the congestion charge would be Queens, Brooklyn, and the Bronx. I then used the data sets in the paper by Peter and Kramer and the Interim Report by Assemblyman Broody to try to determine whether the congestion charge would be a progressive or regressive tax. After my analysis of the data and information I believe this charge will be a regressive tax. The inclusion of the toll-offset program makes it a regressive tax in my opinion. By including the offset, the congestion charge mainly becomes a toll for users of the free bridges and drivers who live within the congestion-zone. However, those who live within the zone are the wealthiest and pay a reduced fee so the impact on them is less severe. I therefore agree with the Assemblyman’s interpretation of the congestion charge as being regressive. However, I still believe the charge is a good idea and can have benefits for New York City residents if implemented properly. The only way the congestion charge will not be a regressive tax is if the Harlem River and East River bridges are kept toll free. This is not likely to happen and should not happen because these bridges cause major traffic congestion in the CBD. However, the revenues from these bridges should be used to increase and improve the public
transportation infrastructure for Queens, Brooklyn, and the Bronx. Figure 2 from Peter and Kramer (Pg. 127) displays the percentage of the population in each borough that lives within ½ mile of a subway station. This demonstrates that there is still a lot that can be done from an infrastructure standpoint to make taking public transportation into the CBD more attractive. Improving the public transportation lines would offset the regressive nature of the congestion charge and could actually benefit lower income workers more in the long run. Therefore, a congestion charge would not be as regressive if the revenues were used solely to upgrade and build new public transportation lines. Therefore my recommendation is for a congestion charge that has no toll-offsets and that the revenues from the charge are used to improve public transportation.

Figure 2

Acknowledgments: I would like to thank Professor Tresch for all of his help and guidance throughout the year; this could not have been completed without him.
Sources:


“Hub Bound Travel Data 2011,” (2013). New York Metropolitan Transportation Council (NYMTC),


Stantec and TBTA (2013). HISTORY AND PROJECTION OF TRAFFIC, TOLL REVENUES AND
EXPENSES HISTORY AND PROJECTION OF TRAFFIC, TOLL REVENUES AND EXPENSES. Metropolitan Transportation Authority, New York


Appendix 1: Map of the Charge Zone and Bridges and Tunnels in the Area (Schaller 2010)

Appendix 2: Appendix from Brodsky report:

<table>
<thead>
<tr>
<th>Zones</th>
<th>Baseline</th>
<th>Pricing</th>
<th>Delta</th>
<th>Pct. Delta</th>
<th>Average Household Income With Cars</th>
<th>Average Household Income Without Cars</th>
<th>Percent of Traffic</th>
<th>Percent of Daily Fee Paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-zone</td>
<td>845,000</td>
<td>611,000</td>
<td>-34,000</td>
<td>-5.30%</td>
<td>193,136</td>
<td>82,637</td>
<td>49%</td>
<td>22%</td>
</tr>
<tr>
<td>Upper Manhattan</td>
<td>155,000</td>
<td>142,000</td>
<td>-13,000</td>
<td>-8.40%</td>
<td>109,657</td>
<td>45,224</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>Queens</td>
<td>141,976</td>
<td>117,886</td>
<td>-24,090</td>
<td>-17.00%</td>
<td>64,941</td>
<td>35,806</td>
<td>11%</td>
<td>16%</td>
</tr>
<tr>
<td>Bronx</td>
<td>53,440</td>
<td>46,155</td>
<td>-7,285</td>
<td>-13.60%</td>
<td>57,183</td>
<td>27,378</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>108,264</td>
<td>91,369</td>
<td>-16,895</td>
<td>-15.60%</td>
<td>64,560</td>
<td>32,067</td>
<td>8%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Appendix 3: Table of untolled trips over East River and Harlem River bridges and demographics of the commuters (IBO, Pg. 4, 2003).

<table>
<thead>
<tr>
<th>Analysis of Untolled East and Harlem River Crossings</th>
<th>Total</th>
<th>East River</th>
<th>Harlem River</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By destination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manhattan</td>
<td>1,717,299</td>
<td>1,227,998</td>
<td>492,203</td>
</tr>
<tr>
<td>New Jersey</td>
<td>107,633</td>
<td>72,653</td>
<td>34,980</td>
</tr>
<tr>
<td>Bx, Westch., and north</td>
<td>167,642</td>
<td>167,642</td>
<td>0</td>
</tr>
<tr>
<td>Sl, Bklyn, Qns, Ll</td>
<td>185,562</td>
<td>0</td>
<td>185,562</td>
</tr>
<tr>
<td>Other</td>
<td>82,884</td>
<td>82,884</td>
<td>0</td>
</tr>
<tr>
<td><strong>By residence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NYC residents</td>
<td>1,643,635</td>
<td>1,177,334</td>
<td>466,301</td>
</tr>
<tr>
<td>Non-NYC residents</td>
<td>620,287</td>
<td>373,842</td>
<td>246,445</td>
</tr>
<tr>
<td><strong>By mode</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto driver</td>
<td>541,752</td>
<td>345,467</td>
<td>196,285</td>
</tr>
<tr>
<td>Auto passenger</td>
<td>240,318</td>
<td>155,292</td>
<td>85,026</td>
</tr>
<tr>
<td>Transit</td>
<td>1,332,249</td>
<td>947,877</td>
<td>384,372</td>
</tr>
<tr>
<td>Other</td>
<td>149,603</td>
<td>102,540</td>
<td>47,063</td>
</tr>
<tr>
<td><strong>By annual household income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $25,000</td>
<td>327,877</td>
<td>202,041</td>
<td>125,836</td>
</tr>
<tr>
<td>$25,000 to $50,000</td>
<td>464,950</td>
<td>322,699</td>
<td>142,251</td>
</tr>
<tr>
<td>$50,000 to $100,000</td>
<td>592,357</td>
<td>444,674</td>
<td>147,683</td>
</tr>
<tr>
<td>$100,000 or more</td>
<td>407,430</td>
<td>284,476</td>
<td>122,954</td>
</tr>
<tr>
<td>Don’t know/Did not answer</td>
<td>471,306</td>
<td>297,285</td>
<td>177,021</td>
</tr>
</tbody>
</table>

SOURCES: IBO: Regional Travel-Household Interview Survey.
Appendix 4: Table of commuters into NYC and their Median Income and Gini coefficient. The ranks “Columns 3 and 5 of Table 3 rank the various systems that one can use to reach Manhattan based on their potential strength to reduce the regressivity of the proposal. The lower the number ranking, the greater the potential a particular route has to reduce the regressive nature of the proposal.” (Peter and Kramer Pg. 131-132, 2003)

<table>
<thead>
<tr>
<th>Public Transit Users</th>
<th>NYC Resident Users</th>
<th>Non-NYC Resident Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GINI Coeff.</td>
<td>GINI Rank</td>
</tr>
<tr>
<td>Harlem River</td>
<td>0.2665</td>
<td>1</td>
</tr>
<tr>
<td>East River</td>
<td>0.4033</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harlem River</td>
<td>0.6940</td>
</tr>
<tr>
<td></td>
<td>East River</td>
<td>0.6939</td>
</tr>
<tr>
<td></td>
<td>NJ Transit North Rail (Hudson River)</td>
<td>0.6951</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Free” Bridge/Tunnel Users</th>
<th>NYC Resident Drivers</th>
<th>Non-NYC Resident Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GINI Coeff.</td>
<td>GINI Rank</td>
</tr>
<tr>
<td>Harlem River</td>
<td>0.5471</td>
<td>5</td>
</tr>
<tr>
<td>East River</td>
<td>0.4928</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harlem River</td>
<td>0.5826</td>
</tr>
<tr>
<td></td>
<td>East River</td>
<td>0.6122</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOLLED BRIDGE/TUNNEL USERS</th>
<th>All Drivers</th>
<th>Cross Bay Bridge</th>
<th>Verrazano-Narrows Bridge</th>
<th>Marine Parkway Bridge</th>
<th>Triborough Bridge Bronx</th>
<th>Port Authority Tunnels</th>
<th>Bronx Whitestone Bridge</th>
<th>Throgs Neck Bridge</th>
<th>Brooklyn Battery Tunnel</th>
<th>Triborough Bridge Manhattan</th>
<th>Henry Hudson Bridge</th>
<th>Queens Midtown Tunnel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.5338</td>
<td>4</td>
<td>$65,275</td>
<td>5</td>
<td>TBTA</td>
<td>0.6233</td>
<td>8</td>
<td>$72,369</td>
<td>6</td>
<td>TBTA</td>
<td>0.6357</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6550</td>
<td>10</td>
<td>$73,597</td>
<td>7</td>
<td>TBTA</td>
<td>0.6668</td>
<td>11</td>
<td>$93,935</td>
<td>14</td>
<td>Port Auth. of NY &amp; NJ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6719</td>
<td>12</td>
<td>$79,903</td>
<td>10</td>
<td>TBTA</td>
<td>0.6857</td>
<td>13</td>
<td>$85,701</td>
<td>12</td>
<td>TBTA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7529</td>
<td>17</td>
<td>$91,689</td>
<td>13</td>
<td>TBTA</td>
<td>0.7677</td>
<td>18</td>
<td>$96,558</td>
<td>15</td>
<td>TBTA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7806</td>
<td>19</td>
<td>$110,765</td>
<td>20</td>
<td>TBTA</td>
<td>0.7952</td>
<td>20</td>
<td>$106,713</td>
<td>19</td>
<td>TBTA</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5: NYMTC CBD report of “PERSONS AND VEHICLES ENTERING THE HUB ON A FALL BUSINESS DAY, FOR SELECTED YEARS” (in thousands) (NYMTC, 2011)

<table>
<thead>
<tr>
<th>PERSONS BY MODE</th>
<th>2004</th>
<th>2005</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO, TAXI, VAN &amp; TRUCK</td>
<td>1,172</td>
<td>1,016</td>
<td>974</td>
<td>951</td>
<td>940</td>
</tr>
<tr>
<td>BUS</td>
<td>286</td>
<td>269</td>
<td>268</td>
<td>268</td>
<td>268</td>
</tr>
<tr>
<td>SUBWAY</td>
<td>1,687</td>
<td>1,926</td>
<td>2,066</td>
<td>2,067</td>
<td>2,166</td>
</tr>
<tr>
<td>RAILROAD</td>
<td>274</td>
<td>284</td>
<td>300</td>
<td>302</td>
<td>303</td>
</tr>
<tr>
<td>PASSENGER FERRY</td>
<td>53</td>
<td>52</td>
<td>55</td>
<td>53</td>
<td>52</td>
</tr>
<tr>
<td>TRAM</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BICYCLE</td>
<td>9</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>3,662</td>
<td>3,569</td>
<td>3,688</td>
<td>3,688</td>
<td>3,755</td>
</tr>
</tbody>
</table>

Appendix 6: George Washington Bridge Regression

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>Std. Err.</td>
<td>t</td>
<td>P&gt;</td>
<td>t</td>
</tr>
<tr>
<td>reallpny</td>
<td>-1030.77</td>
<td>5410.224</td>
<td>-0.19</td>
<td>0.850</td>
<td>-11877.62</td>
</tr>
<tr>
<td>realgasprice</td>
<td>-7263.479</td>
<td>9307.358</td>
<td>-0.78</td>
<td>0.439</td>
<td>-25928.51</td>
</tr>
<tr>
<td>realtransit</td>
<td>152281.4</td>
<td>17999.68</td>
<td>8.46</td>
<td>0.000</td>
<td>116194.2</td>
</tr>
<tr>
<td>railroadridership</td>
<td>0.2021421</td>
<td>0.1523974</td>
<td>1.35</td>
<td>0.177</td>
<td>-0.023361</td>
</tr>
<tr>
<td>subwayridership</td>
<td>-1.1081473</td>
<td>0.369954</td>
<td>-2.92</td>
<td>0.004</td>
<td>-1.823197</td>
</tr>
<tr>
<td>busridership</td>
<td>0.2334225</td>
<td>0.2649668</td>
<td>0.88</td>
<td>0.382</td>
<td>-0.2977841</td>
</tr>
<tr>
<td>_cons</td>
<td>73265.63</td>
<td>72999.14</td>
<td>1.00</td>
<td>0.320</td>
<td>-73088.84</td>
</tr>
</tbody>
</table>

Appendix 7: Willis Ave Bridge Regression

|     | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|-----|-------|-----------|------|----|------------------|
| thirdave | 0.2745935 | 0.1076123 | 2.55 | 0.014 | 0.0287585 | 0.5204335 |
| realbronxin | 0.5344532 | 0.2803588 | 1.84 | 0.067 | -0.0949601 | 1.163867 |
| realmtaboll | -1070.016 | 1166.3 | -0.92 | 0.363 | -3411.462 | 1271.429 |
| realtransit | 13228.36 | 5870.182 | 2.25 | 0.029 | 1427.408 | 25029.29 |
| realgasprice | -6819.999 | 1935.285 | -3.52 | 0.001 | -10705.25 | -2934.752 |
| subwayridership | 0.0356116 | 0.0117837 | 3.02 | 0.004 | 0.0119848 | 0.0592685 |
| busridership | 0.0752634 | 0.0342299 | 2.14 | 0.034 | -0.0319875 | 0.1825144 |
| bronxpop | -0.064881 | 0.021821 | -2.97 | 0.003 | -0.1086886 | -0.0210736 |
| triborough | -1.1321665 | 0.1800245 | -0.73 | 0.466 | -0.4936007 | 0.2292707 |
| _cons | 33302.43 | 20445.77 | 1.63 | 0.109 | -7664.16 | 74429.02 |
Appendix 8: Regression results of 13 bridges used in model.


Untoled Bridges:

Brooklyn Bridge

| Variable                  | Coef.  | Std. Err. | t   | P>|t| | 95% Conf. Interval |
|---------------------------|--------|-----------|-----|-----|-------------------|
| brooklynbridge            |        |           |     |     |                   |
| realmtabtoll              | 6505.079 | 2201.03  | 2.96 | 0.005 | 2083.944 | 1082.21 |
| batterytunnel             | .901088  | .2088509 | 4.31 | 0.000 | .4813865 | 1.32075 |
| realgasprice              | -1479.94 | 3792.115 | -3.77 | 0.000 | -2169.49 | -688.403 |
| realtransit               | 19490.01 | 9993.029 | 2.19 | 0.023 | 1617.997 | 37363.62 |
| realkingsincome           | .6623519 | .4891251 | 1.45 | 0.152 | -.260712 | 1.59275 |
| busridership              | .1123082 | .0921805 | 1.22 | 0.222 | -.728593 | .297628 |
| railroadridership         | 0.0349034 | .0255749 | 1.37 | 0.170 | -.016413 | .0883782 |
| brooklynpop               | -1.07454 | .0288746 | 3.73 | 0.001 | -.165398 | -.0049286 |
| manhattanbridge           | -0.7416897 | .1667542 | -4.45 | 0.000 | -1.076755 | -.4066247 |
| williamsburgbridge        | -0.3566803 | .1858307 | 1.94 | 0.052 | -.726162 | .0127413 |
| _cnn                      | 266459 | 58996.91 | 4.52 | 0.000 | 147860.3 | 384977.8 |

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### Manhattan Bridge

| variable      | Coef.  | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|---------------|--------|-----------|-------|------|----------------------|
| realmtabtoll  | 4645.101 | 1595.347 | 2.91  | 0.005 | 1439.131 - 7651.072  |
| brooklynbridge | -.3878484 | .0871896 | -4.40 | 0.000 | -5630.624 -.212634  |
| batterytunnel | .7074161 | .1458132 | 4.85  | 0.000 | .414994 - 1.000439  |
| realpricespec | .2262.53 | 2539.522 | -4.97 | 0.000 | -37712.89 - 7509.171 |
| realthereal  | .5020.605 | 6706.967 | 0.75  | 0.457 | -9445.333 - 18466.94 |
| realningsincome  | -.6875811 | .3323392 | -2.07 | 0.044 | -1.835442 - .019705  |
| busridership  | .2229703 | .0596996 | 3.74  | 0.000 | .130067 - 0.324293  |
| subwayridership | .0090536 | .0187985 | 0.48  | 0.632 | -.0287254 - 0.468927 |
| railroadridership  | .0289014 | .0540474 | 0.53  | 0.595 | -.0797109 - 0.1375137 |
| brooklynpop  | -.5504984 | .2248688 | -2.23 | 0.029 | -.836874 - .2559653  |
| williamsburgbridge | -.9841534 | .1265606 | -3.04 | 0.004 | -.6388665 - 1.299204 |
| _cons         | 19439.00 | 42502.66 | 4.57  | 0.000 | 10897.89 - 29780.11 |

| variable      | cy/ex  | Std. Err. | z     | P>|z|  | [95% C.I.]  |
|---------------|--------|-----------|-------|------|----------------|
| realmt-l      | .1500857 | .05158 | 2.91  | 0.004 | .04901 - .251181 |
| brookl-e      | -.3076835 | .1143 | -4.44 | 0.000 | -.731888 - .283839 |
| batter-l      | .5079797 | .10483 | 4.94  | 0.000 | .302422 - 0.713337 |
| realga-e      | -.397553 | .00816 | -4.96 | 0.000 | -.584766 - .240414 |
| realtr-t      | .1066476 | .14299 | 0.75  | 0.454 | -.170207 - 0.384953 |
| realkl-e      | -.3613265 | .17479 | -2.07 | 0.039 | -.704104 - 0.018933 |
| busrid-p      | .7353127 | .19698 | 3.73  | 0.000 | .349066 - 1.12122 |
| subway-p      | .220012 | .45685 | 0.48  | 0.030 | -.675604 - 1.11543 |
| railro-p      | .0853882 | .15959 | 0.53  | 0.593 | -.227453 - 0.391291 |
| brookl-p      | -.1647093 | .73366 | -2.25 | 0.025 | -.380850 - .209146 |
| willia-t      | -.4505534 | .14852 | -3.03 | 0.002 | -.741368 - .159460 |

### Williamsburg Bridge

| variable      | Coef.  | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|---------------|--------|-----------|-------|------|----------------------|
| realmtabtoll  | 2980.36 | 1765.095 | 1.69  | 0.098 | -.568.6018 - 5329.322 |
| manhattanbridge | -.4117429 | .1353696 | -3.08 | 0.003 | -.695945 - .142987 |
| brooklynbridge | -.1284299 | .1084077 | -1.19 | 0.139 | -.327492 - .066103 |
| batterytunnel | .6689025 | .1600156 | 4.31  | 0.000 | .3671606 - 1.010635 |
| realpricespec | -.6994.164 | 2964.836 | -3.03 | 0.006 | -.14955.37 - 3.032.963 |
| realtransit   | 3494.869 | 6954.611 | 0.50  | 0.619 | -.10492.24 - 17492.07 |
| realningsincome | .0619662 | .3981050 | 0.16  | 0.873 | -.7258963 - 0.849603 |
| busridership  | .1713817 | .0710785 | 2.41  | 0.020 | .0284833 - 0.314289 |
| subwayridership | .01854 | .0192336 | 1.14  | 0.261 | -.016817 - .065257 |
| railroadridership | .1541191 | .0517199 | 2.99  | 0.004 | .0504293 - 2.984079 |
| brooklynpop  | -.0506877 | .0229826 | -2.27 | 0.017 | -.103136 - -.007606 |
| midtowntunnel | -.2136307 | .1857994 | -1.15 | 0.256 | -.3871631 - 0.1599618 |
| _cons         | 143180.8 | 46848.03 | 2.95  | 0.005 | 45668.98 - 240692.6 |

| variable      | cy/ex  | Std. Err. | z     | P>|z|  | [95% C.I.]  |
|---------------|--------|-----------|-------|------|----------------|
| realmt-l      | .0821108 | .04864 | 1.69  | 0.091 | -.012313 - .177425 |
| manhat-e      | -.355908 | .11547 | -3.08 | 0.002 | -.582223 - .129593 |
| brookl-e      | -.1766808 | .12164 | -1.45 | 0.146 | -.41529 - .061528 |
| batter-l      | .4216938 | .09803 | 4.30  | 0.000 | .229595 - 0.613873 |
| realga-e      | -.2417196 | .07971 | -3.03 | 0.002 | -.397995 - 0.085484 |
| realtr-t      | .063185 | .12577 | 0.50  | 0.615 | -.183325 - 0.309694 |
| realkl-e      | .0277441 | .17565 | 0.16  | 0.874 | -.316523 - 0.372011 |
| busrid-p      | .4817565 | .19986 | 2.41  | 0.016 | .090036 - 0.873477 |
| subway-p      | .4250871 | .39892 | 1.14  | 0.256 | -.328381 - 1.223392 |
| railro-p      | .3887594 | .13026 | 2.98  | 0.003 | .133453 - 0.644066 |
| brookl-p      | -.1582039 | .63942 | -2.47 | 0.013 | -.828328 - -.286801 |
| midtovl-1     | -.1690232 | .147 | -1.15 | 0.250 | -.457129 - 0.119802 |

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### Queensborough Bridge

| variable         | Coef.   | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|------------------|---------|-----------|-------|------|----------------------|
| realmtabtoll     | 4170.427 | 1808.745  | 2.31  | 0.025 | 540.9139 – 7799.939  |
| midtowntunnel    | -7501987 | 2713603   | -2.82 | 0.007 | -1309723 – 2206744  |
| realtransit      | 5059.333 | 8042.693  | 0.63  | 0.532 | -11079.51 – 21198.18 |
| realgasprice     | 1459.732 | 2653.571  | 0.55  | 0.585 | -3865.048 – 6784.511|
| subwayridership  | -0.193869| 0.017288  | -1.65 | 0.104 | -.0429225 – 0.041487 |
| busridership     | .1150059 | 0.0785215 | 1.46  | 0.149 | -.0425391 – 0.2725708|
| queenspce        | .1474744 | 0.0219556 | 6.72  | 0.000 | 0.1034172 – 0.1915316|
| realqueensn      | .2401709 | 0.2594482 | 0.93  | 0.359 | -.2804503 – 0.7607921|
| _cons            | -123525.1 | 267753.55 | -4.62 | 0.000 | -.1772136 – -69836.82|

### 3rd Ave Bridge

| variable         | Coef.   | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|------------------|---------|-----------|-------|------|----------------------|
| realmtabtoll     | 3734.172 | 1553.326  | 2.44  | 0.018 | 654.3959 – 6813.948  |
| willis-e         | .4542667 | .1812026  | 2.50  | 0.016 | .0900592 – .8194541  |
| realbronx        | .6282471 | .5075605  | 1.24  | 0.221 | -.3910302 – 1.647892 |
| realtransit      | -16341.13 | 758.764   | -2.25 | 0.029 | -30920.29 – -1761.478|
| realgasprice     | -653.1107 | 2664.976  | -0.25 | 0.807 | -.6050.89 – 6499.443 |
| railreadridership| -.001005  | .0007973  | -0.13 | 0.898 | -.1090193 – 0.108029 |
| subwayridership  | .0219664 | .0186226  | 1.15  | 0.256 | -.0160181 – 0.057901 |
| busridership     | -.0593474 | .066748   | -0.89 | 0.376 | -.1934062 – 0.0747134|
| bronxpop         | -.0498267 | .0283531  | -1.79 | 0.076 | -.1084301 – 0.0092277|
| triborough       | -.0104821 | .2262779  | -0.05 | 0.963 | -.4649748 – 0.4440105|
| _cons            | 75128.23  | 23912.46  | 3.14  | 0.003 | 27098.64 – 123197.8  |

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Tolled Facilities: Midtown Tunnel

| variable         | ey/ex     | Std. Err. | z     | P>|z| | [ 95% C.I. ] | X     |
|------------------|-----------|-----------|-------|------|-------------|-------|
| realmtabttoll    | -0.0438334| 0.03185   | -1.38 | 0.169| -.106252    | .018585| 2.45393 |
| realtransit      | .1311411  | 0.10356   | 1.27  | 0.205| -.071837    | .334119| 1.61033 |
| realgasprice     | .0645785  | 0.05089   | 1.27  | 0.204| -.035159    | .164316| 2.39377 |
| subwayridership  | -.7645946 | .14912    | -5.13 | 0.000| -.105686    | -.472333| 1.8e+06 |
| busridership     | .3772359  | .15211    | 2.48  | 0.013| .079112     | .675359| 250385  |
| queenspop        | 2.745367  | .30999    | 8.66  | 0.000| 2.13761     | 3.35239| 2.0e+06 |
| queensboro bridge| -.4170892 | .14017    | -2.62 | 0.005| -.708304    | -.127475| 139120  |

Battery Tunnel

| variable         | ey/ex      | Std. Err. | z     | P>|z| | [ 95% C.I. ] |
|------------------|------------|-----------|-------|------|-------------|-------|
| realmtabttoll    | -.2077508  | .05552    | -3.76 | 0.000| -.315943    | -.09574| 2.45393 |
| realtransit      | .3400257   | .09852    | 3.50  | 0.000| .151932     | .53812| 2.39377 |
| realgasprice     | -.01367    | .16027    | -0.09 | 0.932| -.327786    | .300446| 1.61033 |
| realkingswin    | .1399352   | .20341    | 0.68  | 0.495| -.259748    | .537618| 39930.8 |
| subwayridership  | -.6551589  | .23218    | -2.82 | 0.005| -.111022    | -.200695| 250385  |
| busridership     | .0004066   | .51356    | 0.10  | 0.922| -.956151    | 1.05696| 1.8e+06 |
| railro         | -.1906691  | .17766    | -1.02 | 0.309| -.529802    | .167523| 224241 |
| brooklynbridge  | .659035    | .85082    | 0.77  | 0.443| -.102442    | 2.34269| 2.5e+06 |
| manhattanbridge | .5572515   | .94453    | 4.31  | 0.000| .303764     | .810739| 75943.4 |
| williamsburgbridge | .639024  | .13192    | 4.84  | 0.000| -.59035     | .849754| 75943.4 |
| _cons            | .6482254   | .15625    | 4.15  | 0.000| -.341976    | .954475| 89070   |
### Triborough Bridge

| variable         | Coef  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|------------------|-------|-----------|-------|-----|----------------------|
| realmtabtoll     | -3457.225 | 1644.647  | -2.10 | 0.041 | -6762.266 | -152.1833 |
| realrtransit     | 8785.331 | 5184.528  | 1.69  | 0.097 | -1633.368 | 19204.03 |
| realgasprice     | -8043.119 | 2095.027  | -3.84 | 0.000 | -12253.23 | -3833.005 |
| realbronx      | -1.90607 | 0.449763  | 4.26  | 0.000 | -2.799716 | 0.685379 |
| queenspop        | 0.0964504 | 0.166135  | 5.81  | 0.000 | 0.036342 | 0.1298367 |
| bronxpop         | -1.646897 | 0.024189  | -6.81 | 0.000 | -2.313292 | -1.160661 |
| busridership     | 0.101665 | 0.046191  | 2.28  | 0.027 | 0.011988 | 0.191329 |
| subwayridership  | 0.036555 | 0.0115687 | 3.19  | 0.003 | 0.013603 | 0.0601038 |
| queenseborbridge | -1.348523 | 0.0799213 | -1.69 | 0.099 | -2.954601 | 0.257556 |
| willisave        | -0.3673504 | 0.1698505  | -2.16 | 0.032 | -0.708677 | -0.0260232 |
| thirdev          | -0.0747243 | 0.1042301  | -0.72 | 0.477 | -0.2641282 | 0.1346795 |
| _cons            | 70644.8 | 19440.47  | 3.63  | 0.001 | 31577.72 | 109711.9 |

### Throgs Neck Bridge

| variable         | Coef  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|------------------|-------|-----------|-------|-----|----------------------|
| realmtabtoll     | -3984.012 | 3055.474  | -1.30 | 0.198 | -10112.52 | 2144.493 |
| realga         | 8233.812 | 4721.606  | -1.75 | 0.087 | -17710.15 | 1230.531 |
| bronxwhitestone | -0.7447632 | 0.1580389 | -4.71 | 0.000 | -1.061749 | -0.4277712 |
| bronxp      | -0.038936 | 0.034522 | -1.12 | 0.266 | -0.108431 | 0.030729 |
| queenspop      | 0.0948072 | 0.0318907 | 3.00 | 0.004 | 0.031464 | 0.1581501 |
| realqueens      | 8.794009 | 2.004809 | 4.39 | 0.000 | 4.772872 | 12.81515 |
| realbronx       | -13.361 | 3.609133 | -3.70 | 0.001 | -20.6 | -6.121995 |
| _cons            | 50472.86 | 48004.57 | 1.05 | 0.298 | -45812.11 | 146757.8 |

### Variable Descriptions
- **realmtabtoll**: This variable represents the coefficient for Triborough Bridge, indicating a strong negative relationship with the dependent variable. The standard error is relatively small, suggesting the coefficient is statistically significant.
- **realga**: Represents the coefficient for Throgs Neck Bridge, showing a positive relationship with the dependent variable.
- **bronxwhitestone**: Indicates the coefficient for Bronx Whitestone Bridge, with a significant negative impact on the dependent variable.
- **queenspop**: Shows the coefficient for Queens, indicating a positive influence on the dependent variable.
- **realqueens**: Represents the coefficient for Real Queens, with a significant positive impact.
- **realbronx**: Indicates the coefficient for Real Bronx, showing a negative relationship.

These coefficients and their associated standard errors provide insights into the relative importance and significance of each bridge in predicting the dependent variable.
### Bronx-Whitestone Express Bridge

| variable     | Coef.   | Std. Err. | t    | P>|t|   | [95% Conf. Interval] |
|--------------|---------|-----------|------|-------|---------------------|
| realmtoll    | -4499.9995 | 2336.506  | -1.93 | 0.060 | -9190.726 to 190.7355 |
| throgsneck   | -3.6622511 | 0.8101599 | -4.52 | 0.000 | -5.280855 to -2.035709 |
| realgasprice | -7813.386 | 3499.349 | -2.27 | 0.028 | -14836.39 to -906.3784 |
| bronxpop     | -0.0553569 | 0.0259254 | -3.26 | 0.002 | -0.154149 to -0.0565639 |
| queenpop     | 0.080616 | 0.0212401 | 3.79 | 0.000 | 0.037093 to 0.123929 |
| realqueensn  | 3.679442 | 1.650198 | 2.23 | 0.030 | 0.366520 to 6.992553 |
| realbronx    | -6.540548 | 2.018991 | -3.22 | 0.024 | -12.20491 to -0.881877 |
| subwayridership | 0.033719 | 0.016081 | 2.10 | 0.041 | 0.001435 to 0.066033 |
| realtransit  | 14217.25 | 7414.437 | 1.92 | 0.061 | -667.8494 to 29102.36 |
| _cons        | 71192.65 | 35622.58 | 2.00 | 0.051 | -322.6701 to 142708 |

### Lincoln Tunnel

| variable     | Coef.   | Std. Err. | t    | P>|t|   | [95% Conf. Interval] |
|--------------|---------|-----------|------|-------|---------------------|
| realpany     | -2242.537 | 1740.937 | -1.29 | 0.203 | -5732.906 to 1247.333 |
| realtransit  | 50379.5 | 5792.054 | 8.70 | 0.000 | 38767.13 to 61991.87 |
| realgasprice | -2478.092 | 2994.983 | -0.83 | 0.412 | -8492.671 to 3525.486 |
| railroadridership | 0.092505 | 0.0490394 | 1.89 | 0.065 | -0.005813 to 0.190821 |
| subwayridership | -0.035976 | 0.019046 | -3.02 | 0.004 | -0.059664 to -0.012302 |
| busridership | 0.163651 | 0.065268 | 2.52 | 0.012 | -0.152765 to 0.479066 |
| _cons        | 77204.1 | 23460.14 | 3.29 | 0.002 | 30109.2 to 124299 |

| variable     | Coef.   | Std. Err. | t    | P>|t|   | [95% Conf. Interval] |
|--------------|---------|-----------|------|-------|---------------------|
| realpany     | -0.1136973 | 0.08828 | -1.29 | 0.198 | -0.286718 to 0.059323 |
| realtr-t     | 0.8117263 | 0.09386 | 8.65 | 0.000 | 0.627763 to 0.995809 |
| realre-t     | -0.0593528 | 0.07174 | -0.83 | 0.408 | -0.199954 to 0.081248 |
| railroad-p   | 0.207549 | 0.11006 | 1.89 | 0.059 | -0.008159 to 0.42357 |
| subway-p     | -0.6647044 | 0.21998 | -3.02 | 0.003 | -1.09585 to -0.23355 |
| busr-p       | 0.046069 | 0.2136 | 0.22 | 0.829 | -0.372649 to 0.464667 |

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Holland Tunnel

| variable     | Coef.  | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|--------------|--------|-----------|-------|------|----------------------|
| realpany     | -2952.2| 1514.98   | -1.95 | 0.057| [-5892.553, 85.1331] |
| realtransit  | 3147.05 | 2040.381  | 1.54  | 0.060| [2136.45, 4157.54]  |
| realgasprice | -1559.737| 2606.263 | -0.64 | 0.527| [-6884.979, 3565.504] |
| railroadridership | 0.2214352| 0.0426746 | 5.19  | 0.000| [0.1350778, 0.309926] |
| subwayridership | -0.0034407| 0.0103595 | -0.33 | 0.740| [-0.0242163, 0.0173209] |
| busridership  | -1.1612903| 0.0741956 | -2.44 | 0.018| [-3.300453, -0.032333] |
| _cons        | 43400.99 | 20441.35  | 2.12  | 0.038| [2418.56, 84383.43]  |

| variable     | ey/ex  | Std. Err. | z     | P>|z|  | [95% C.I.]  | X          |
|--------------|--------|-----------|-------|------|-------------|------------|
| realpany     | -0.2046019 | 0.10314   | -1.95 | 0.051| -0.410875, 0.001271 | 5.06721  |
| realtransit  | 0.0937944 | 0.11159   | 0.62  | 0.000| 0.0475067, 0.912501 | 0.63035  |
| realgasprice | -0.0543327| 0.08542   | -0.64 | 0.012| -0.221905, 0.113019 | 2.39377  |
| railroad-p   | 0.6797977 | 0.13139   | -5.17 | 0.000| 0.422277, 0.937319 | 2.24241  |
| subway-p     | -0.0871341| 0.26174   | 0.33  | 0.020| -0.600144, 0.425876 | 1.8e+06  |
| busrid-p     | -0.6214443| 0.2545    | -2.44 | 0.015| -1.12026, -1.22629 | 2.50385  |

Henry Hudson Bridge

| variable     | Coef.  | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|--------------|--------|-----------|-------|------|----------------------|
| HenryToll    | -6570.969| 1738.923  | -3.78 | 0.000| [-10057.3, -3084.639] |
| realgasprice | -0.9688.043| 1579.52   | -3.72 | 0.000| [-9034.79, -2701.297] |
| realtransit  | 5107.974 | 3922.689  | 1.32  | 0.192| -2676.562, 10052.51  |
| railroadridership | 0.2949637| 0.0263944 | 11.11 | 0.000| 0.2417253, 0.348202 | 3.48202  |
| subwayridership | 0.0239139| 0.0063075 | 3.79  | 0.000| 0.0112682, 0.0365597 | 0.0365597 |
| busridership  | -0.0785112| 0.0422733 | -1.86 | 0.069| -0.1623641, 0.0062417 | 0.062417  |
| _cons        | -22446.06 | 11766.85  | -1.91 | 0.062| [-46037.18, 1145.054] |

| variable     | ey/ex  | Std. Err. | z     | P>|z|  | [95% C.I.]  | X          |
|--------------|--------|-----------|-------|------|-------------|------------|
| HenryToll-1  | -0.1623905| 0.04301   | -3.76 | 0.000| -0.246689, -0.078083 | 1.32836  |
| realgasprice | -0.261331 | 0.07041   | -3.71 | 0.000| -0.399326, -0.123336 | 2.39377  |
| realtransit  | 0.1554272| 0.11753   | 1.32  | 0.186| -0.074933, 0.385799 | 1.61033  |
| railroad-p   | 1.230545 | 0.11167   | 11.02 | 0.000| 1.01167, 1.44942 | 22.4241  |
| subway-p     | 0.8210693| 0.21577   | 3.79  | 0.000| 0.396213, 1.24593 | 1.8e+06  |
| busrid-p     | -0.3657255| 0.19696   | -1.86 | 0.063| -0.751769, 0.020318 | 2.50385  |
Appendix 9: Regression results of Cross Bay and Marine Parkway bridges

### Marine Parkway Bridge

| Variable         | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|------------------|--------|-----------|-------|------|----------------------|
| rmaccrossstoll   | -592.7106 | 305.513  | -1.54 | 0.130 | -1365.618 180.1964 |
| realtransit      | 3690.689 | 1038.506 | 3.55  | 0.001 | 1608.61 5772.769   |
| realgasprice     | -1099.358 | 397.1763 | -2.77 | 0.008 | -1685.648 -303.0674 |
| busridership     | -0.0076935 | 0.011863 | -0.65 | 0.520 | -0.0315175 0.0161305 |
| subwayridership  | -0.0056727 | 0.0021695 | -2.61 | 0.012 | -0.0100222 -0.0013232 |
| crossbay         | 0.5984965 | 0.1414316 | 4.23  | 0.000 | 0.3149432 0.8820498 |
| _cons            | 19246.32 | 3959.537 | 4.86  | 0.000 | 11307.93 27184.71  |

### Cross Bay Bridge

| Variable         | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|------------------|--------|-----------|-------|------|----------------------|
| rmaccrossstoll   | -494.2568 | 318.0938 | -1.55 | 0.126 | -1131.997 143.4828  |
| realtransit      | 731.0501 | 820.2334 | 0.89  | 0.377 | -913.4189 2375.519  |
| realgasprice     | -139.2666 | 307.8252 | -0.45 | 0.653 | -756.419 477.8859  |
| busridership     | 0.0382442 | 0.007997 | 4.78  | 0.000 | 0.022113 0.0542772 |
| subwayridership  | 0.0090497 | 0.0011481 | 7.88 | 0.000 | 0.006748 0.0113514 |
| queenspop        | 0.0004889 | 0.0009721 | 0.56 | 0.000 | 0.0004264 0.0015497 |
| _cons            | -26817.09 | 2435.54 | -11.01 | 0.000 | -31700.05 -21934.12 |

### Variable Coefficients

| Variable | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|----------|--------|-----------|-------|------|----------------------|
| rmaccr-l | 0.0407754 | 0.26252 | -1.54 | 0.124 | -0.09276 0.11209 1.3159 |
| realr-t  | 0.3107087 | 0.08746 | 3.55  | 0.000 | 0.139284 0.482134 1.61033 |
| realga-e | -0.1375793 | 0.04972 | -2.77 | 0.006 | -0.255022 0.040137 2.39377 |
| busrid-p | -0.1007083 | 0.15555 | -0.65 | 0.517 | -0.405582 0.20166 2.50385 |
| subway-p | -0.5473125 | 0.20936 | 2.61  | 0.009 | -0.957651 -0.136974 1.8e+06 |
| crossbay | 0.5094785 | 0.12046 | 4.23  | 0.000 | 0.273375 0.745582 16282.9 |
| _cons    | 19246.32 | 3959.537 | 4.86  | 0.000 | 11307.93 27184.71 |

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