

# The Rise of PRESTO Positively Impacts the Usage of the TTC for the Residents of Toronto\*

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## Abstract

With the rapid increase in digital commodities and on-the-go customer experiences for TTC (Toronto Transit Commission) Transit riders, a study was conducted to see the shift in transit fare sales in the past decade between physical fares (i.e. cash, tokens, or passes) and digital fares from PRESTO cards. When looking at the TTC sales matrix from year to year, there is an increase in usage of the TTC where most of the sales derive directly from the PRESTO sales rather than physical fares regardless of the type of fare; whether the fare pertains to a single-fare ticket or monthly passes. Similarly, the relationship between PRESTO sales and the sales for rail transits, like subway and SRT, perceived a positive increase in usage in the past decade, alluding to the riders being more interested in using the TTC for a more faster and efficient ride experience around Toronto. It is quite evident that Torontonians value the explicit interaction of being efficient and quick when it comes to using the TTC, by using this insight the TTC can slowly transition into using PRESTO as their main source of selling fares while increasing the development of subways to cater to the needs of Toronto's TTC riders.

## 1 Introduction

There has been a rise of TTC fares and the usage of the TTC transit by Torontonians in the past decade, giving rise to contactless smart cards encrypted with NFC called the PRESTO card which allows riders to use the TTC without the need for any physical fares. PRESTO is a payment system that works across the city of Toronto for all transit systems to make the experience of a rider more secure and convenient to help them commute from one place to another. While TTC is one of the main ways for people to commute and travel across the city, it will be great to see what aspects of TTC are more prevalent in Torontonian's riding experience. This will help hone onto a specific sector of TTC and help improve the experience further to lessen the pain for the TTC riders.

The study focused on assessing the total number of sales for PRESTO, a digital payment system for quick fares, and total number of sales for physical fares, like cash, tokens, passes, or tickets, for Torontonians from 2009 - 2019. This study was conducted by looking at a TTC dataset obtained from the Toronto Open Data Portal, that focused on illustrating the information about the sales of the fares for both digital and physical assets as well as distinguishing the amount of fares for the types of transits that TTC offers. Since the study aimed to look into the trajectory of the sales from a large period of time, looking at the characteristics of the total number of sales per year seemed to be the most appropriate data to analyze for this study. By visualizing this data over a period of time, it gives us a great sense of how the ticket sales increased or decreased in a specific portion of the TTC ecosystem while identifying the main reasoning for that relationship. When comparing these variables, it shows that there is an increase in the usage of the TTC from 2009 - 2019, where the majority of those sales came from PRESTO sales and Rail transit sales. This further elaborates on the behaviour of Torontonians while using the TTC service and its products as they are more inclined to take a type of transit that is convenient, fast, efficient, and gets them to their destination without any hiccups. The TTC can use this knowledge to further push their agenda in strengthening that specific sector in their roadmap to improve the experience further so TTC riders continue to utilize their services according to their liking.

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\*Code and data are available at: [https://github.com/levi24/PRESTO\\_VS\\_TTC](https://github.com/levi24/PRESTO_VS_TTC)

## 2 Data

The data discussed in this paper is extracted from the opendatatoronto portal (Gelfand 2020) and has been captured from 1985 to 2019. The matrix encompasses the total number of TTC rides that a Torontonion has made in all of those years, where the numbers detailed in each column is the total number of rides for that year under that specific “ride” category. The dataset has a wide variety of data like:

- type of fare(PRESTO, cash, tokens, tickets, passes, etc.),
- type of transit(subway, bus, and rail),
- age group (adult, senior, and youth),
- and the time of the ride (weekday or weekends).

For the purpose of this study, the data that is being manipulated in this study is to look at the trajectory of the type of fares that Torontonians have used in the past/recent decade (2009 - 2019). As well as look at the total amount of rides per category based on the age group as the total numbers for the types of fares have been divided up by the age group specifically. Hence, in order to learn the true trajectory of all Torontonians and the data provided around the usage of the TTC, we will need to look at the total usage of the transit system for every single age group.

Moreover, the dataset has many other breakdowns when the variable for the types of fares is concerned. The dataset is filled with numbers around the wide variety of services that TTC offers to their customers as there are a lot of ways a person can use the TTC. To further elaborate, the dataset contains data on:

- single ride fare,
- two-time fare (back and forth rides),
- monthly passes,
- weekly passes,
- post-secondary passes,
- two hour rides,
- free rides,
- and many others

The paper will ignore the data around most of these types of fares except for the single fare ticket sales for the TTC in general. This accounts for both PRESTO fares and physical TTC fares like: cash, tokens, and tickets, where the physical fares like the two-time fares and the different types of passes will be ignored for this study. Also, another thing to note is that the total number of fares listed in the dataset is listed in the thousandths value. In other words, some data in the csv file is listed in single or double digits but that does not mean that there were less than 10 types of sales for that specific category of fares for the year. Instead, it means that there were less than 10,000 sales for that specific type of sale for that year. This could be the case due to a new service being adopted by the city or a late adoption of that service in the year which could have caused such an outlier in the data.

Lastly, the data that is presented in the dataset separates the different types of fares by age group (adult, senior, and youth). In order to see the full trajectory and comparison between the digital and physical fares of TTC in the past/recent decade, the data will need to be aggregated at the end to see a more visually accurate comparison of the types of fares.

## 3 Results

Based on the testing that was done as part of this paper by looking at the dataset for the TTC usage from 2009-2019, there could be a lot that can be derived from the tables and the charts detailed below. Some of these results include:

- The sales for PRESTO has drastically increased in the recent decade, where it encompasses the majority of the sales in 2019.
- More than 50% of the sales are committed through digital fares for the TTC.
- The sales for physical fares in 2009 comprised more than 90% of the TTC fares.
- In 2009, the most common types of fares were cash and tickets that Torontonians use when riding on the TTC.
- In the recent decade, there was a visible decrease of physical fares and an increase in digital fares.

Most of these results are available to see in Table 1, which details the total number of sales in the thousandths for the different types of fares for every single year starting from 2009 to 2019. The usage of TTC by physical fares was

Table 1: Total Number of People Using PRESTO and TTC

| Type of Fare                | 2019    | 2018    | 2017   | 2016    | 2015    | 2014    | 2013    | 2012    | 2011    | 2010    | 2009    |
|-----------------------------|---------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|
| PRESTO - ADULT SINGLE RIDE  | 166,871 | 110,950 | 67,829 | 27,397  | 13,323  | 9,862   | 8,194   | 4,399   | 1,139   | 0       | 0       |
| CASH                        | 26,287  | 32,251  | 36,045 | 41,536  | 48,873  | 49,120  | 48,623  | 46,467  | 43,795  | 43,149  | 41,445  |
| TOKENS                      | 21,669  | 46,974  | 76,106 | 102,073 | 110,945 | 111,157 | 112,360 | 117,962 | 124,748 | 120,366 | 114,686 |
| TICKETS                     | 0       | 0       | 0      | 0       | 0       | 0       | 0       | 0       | 0       | 1,298   | 8,807   |
| PRESTO - SENIOR SINGLE RIDE | 11,203  | 5,587   | 2,728  | 680     | 210     | 6       | 0       | 0       | 0       | 0       | 0       |
| PRESTO - YOUTH SINGLE RIDE  | 16,975  | 8,429   | 2,975  | 741     | 228     | 6       | 0       | 0       | 0       | 0       | 0       |
| CASH                        | 9,363   | 11,476  | 12,532 | 10,440  | 12,170  | 12,037  | 8,538   | 8,164   | 7,609   | 5,856   | 5,526   |
| TICKETS                     | 15,876  | 25,772  | 31,195 | 32,997  | 32,595  | 33,408  | 35,472  | 37,039  | 38,299  | 38,674  | 38,615  |
| TICKETS                     | 0       | 0       | 0      | 0       | 1,066   | 7,097   | 7,563   | 7,929   | 8,304   | 8,287   | 8,562   |
| PRESTO - FREE CHILD RIDE    | 6,168   | 1,384   | 163    | 36      | 10      | 0       | 0       | 0       | 0       | 0       | 0       |
| CASH                        | 0       | 0       | 0      | 0       | 526     | 3,705   | 2,708   | 2,589   | 2,433   | 2,539   | 2,410   |

on a rise in 2009 with over 120,000,000 (120 Million) sales through tokens alone, where sales through cash were over 45,000,000 (45 Million) and the sales through tickets were over 15,000,000 (15 Million). In total the physical sales in 2009 were over 180 Millions sales through physical fares. Conversely, when you look at Table 1 in 2019, the physical fares have decreased dramatically to only 60,000,000 (60 Million) sales in the year. Though 60 Million sales is a lot, that is a third of the sales of what it used to be a decade ago.

To elaborate further, the data for the cash has now been reversed a decade later where the digital fares (PRESTO) has taken the reins in achieving the most sales for the year of 2019. In 2019, the sales for adult usage of the TTC through PRESTO was over 166,00,000 (160 Million) and the total usage through PRESTO rose above 200,000,000 (200 Million) sales in the year. This number far exceeds the number of total physical fare sales in 2009 by a minimum of 20 Million sales.

## TTC Fare Breakdown – 2019

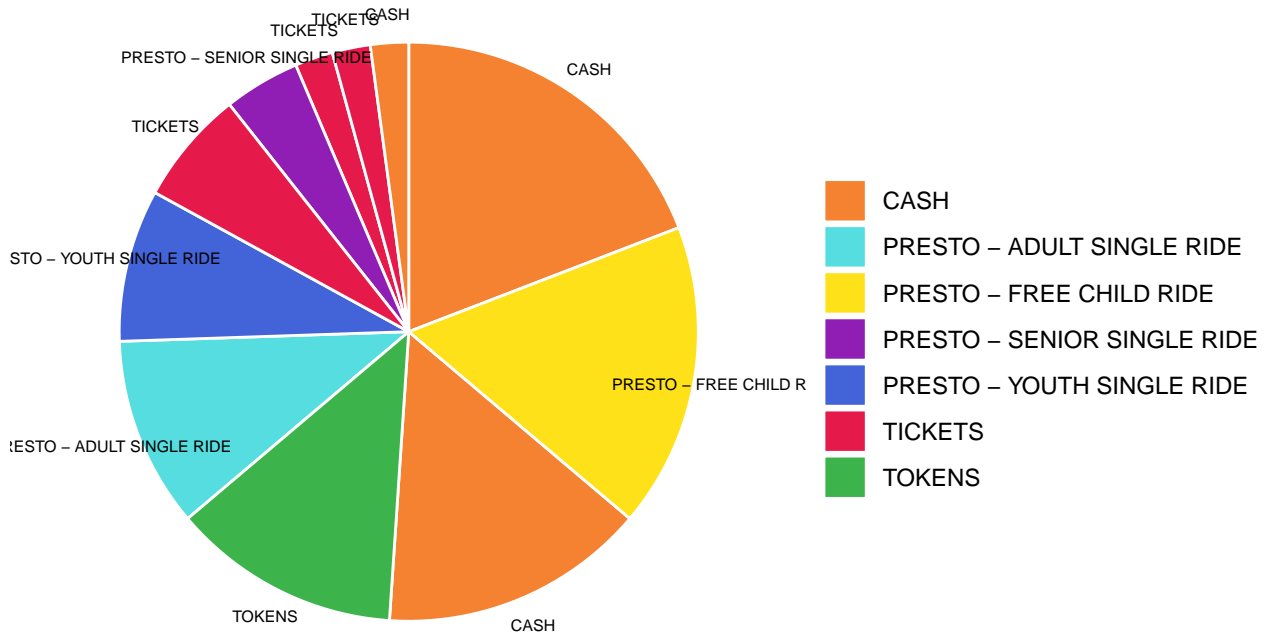


Figure 1: The figure shows the breakdown of the different types of TTC fares in the year 2019

Figure 1 illustrates the total number of TTC fares in 2019, where you can easily see that physical fares are still relevant, the digital fares or PRESTO make up the majority of the graph. In particular, the sales of PRESTO have reached over 50% of the sales and holds the majority of the sales through digital sales. Conversely, Figure 2 illustrates the opposite where more than 75% of the TTC sales are held by the physical TTC fares. Red and Orange colours in the pie chart make up most of the sales within the chart which are represented by both cash and tickets as the type of fares mostly used by Torontonians in 2009.

TTC Fare Breakdown – 2009

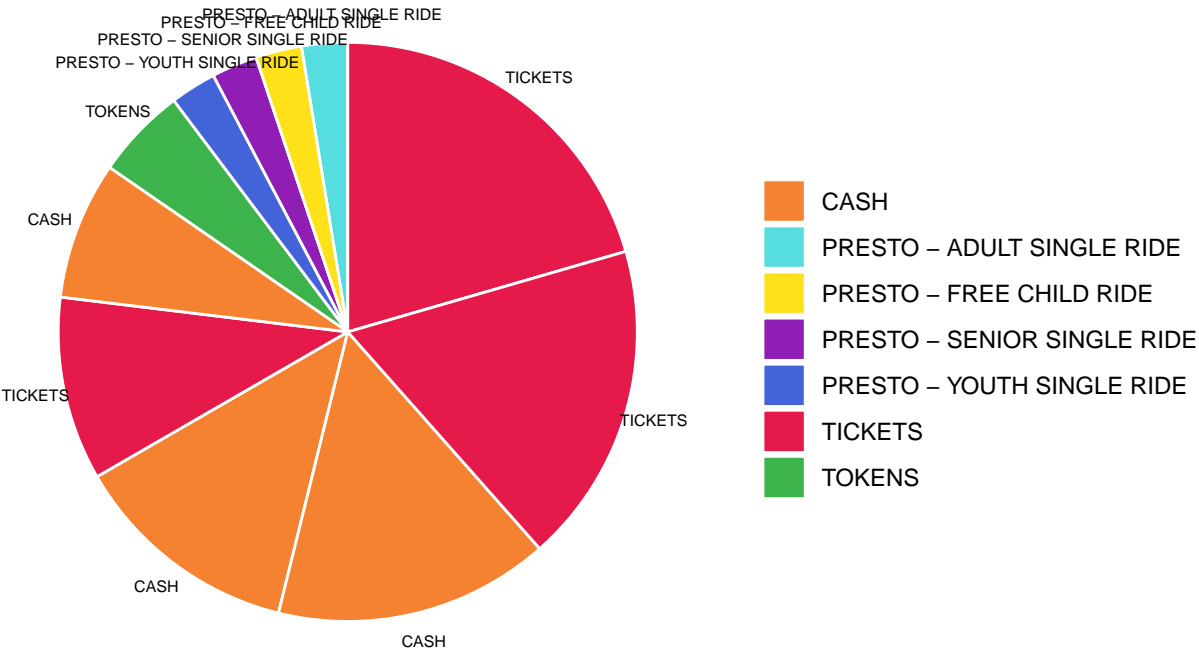


Figure 2: The figure shows the breakdown of the different types of TTC fares in the year 2009

## 4 Discussion

### 4.1 Final Takeaways

This study looked at the data for TTC fare sales from 2009 to 2019 and analyzed the trajectory of the sales through the type of fares indicated in the dataset. Based on the results detailed above, it can be derived that the sales of physical TTC fares have decreased throughout the years and the digital fares have experienced a rise as the digital technology matures year-to-year. Through the data it can be seen that Torontonians have gotten a slow but surely adoption to the new ways of commuting across Toronto using the ‘tap and go’ method of transportation through PRESTO technology. While the adoption of this was quite low when it was first released, as you can see from the results displayed in this paper, as years went on the usage of physical fares have decreased and the digital fares have increased. This result is to the point where digital sales have out-grown the sales of physical sales from a decade ago in sheer numbers alone.

In the last decade, there was an increase of 20 Million sales for digital as compared to the sales in 2019 for physical shares. There could be a lot of reasons why this could be the case for the TTC. This insight can be conveyed through the large amount of usage of the TTC in the most recent year as people are using the TTC more often as it is more convenient. With the use of PRESTO, users can automatically load amounts on their card, can use their PRESTO card without the need of having multiple types of fares but only need to keep track of one card that they can use,

and make more frequent trips back and forth without keeping track of their ticket in any shape or form. It could also be a result of Toronto's population in the recent years as it has increased since 2009. Regardless the increase of digital sales have impacted both Torontonians and the TTC in a positive manner as the sales continue to rise from year-to-year and will continue to grow for years to come.

## 4.2 What We Learned

Based on the key takeaways, we can tell that Torontonians are heading towards a more digital and convenient way to commute across the city in the upcoming years. With the data seen in this paper, it is evident that people's primary way of using the TTC is through PRESTO and physical fares have become a secondary method of commuting on the TTC. It seems like that people need to use the physical fares in other circumstances other than the norm of taking the TTC from one location to another. The usage of physical fares is seen as a minority use case for people who have yet to fully transition over to the digital way of commuting or can be used as an alternate method of payment for when they do not have the PRESTO card on them. This could be due to them misplacing their card, expiration of their old card, or they may have damaged their card in any sort of way.

Using this data, TTC can look into other alternate methods of improving the experience of PRESTO technology to make it even more convenient for TTC users in commuting across the city with the TTC. This could mean that they start including alternate methods of when people are not using the PRESTO cards, like misplacement of their card or other use cases. For instance, TTC can now look into adding people's PRESTO cards to their digital wallets so that they can use their phones or watch to "tap" onto a TTC terminal to pay for their fares. This could be a huge step for the TTC in encouraging more people to adopt the digital fares of PRESTO, which will result in a more exponential increase of sales for the digital fares in the next decade to come.

## 4.3 Next Steps

This paper looked at the different types of fares that TTC riders use from a year to year basis but it fails to look at an aggregated view of all of the fares that Torontonians use on a daily basis. It would have been nice to see a linear regression of data from all of the years on one graph or model for each type of fare and see the relationship for the data for all of the years for both physical and digital fares. This was the initial intention of the paper but was lost as the regression model became more and more complicated with the dataset that was used from opendatatoronto. By doing that, there could have been a more accurate representation of the data that is clearly visible through the data table and pie charts in the paper but is lacking the visible trajectory that anyone can easily glance and notice the change in the years.

Also, moving forward it will be interesting to see what TTC introduces to the Toronto public in terms of either fares and see if this trajectory of digital fares tends to increase in the upcoming years. However, I am assuming that TTC sales have noticed a natural decline in sales due to the recent pandemic and will continue to see a decrease in sales until the pandemic is over. Once the pandemic is over, it can be assumed that people will start using more and more digital fares as compared to physical fares as we have seen an increase in distancing with human contact during the pandemic. So it feels like the PRESTO sales will continue to increase once the pandemic is over or may even notice a huge influx of sales due to the convenience of digital fares.

## 5 Footnote

We analyzed the data using the language R (R Core Team 2020) by using `rStudio` (Friendly et al. 2020), where we installed packages to help assist our code such as:

- `tidyverse` (Wickham et al. 2019),
- `dplyr` (Wickham et al. 2021),
- `janitor` (Firke 2021),
- `here` (Müller 2020),
- `readr` (Wickham and Hester 2020),
- `huxtable` (Hugh-Jones 2021),
- `kableExtra` (Zhu 2021),
- `here` (Müller 2020),
- `plyr` (Wickham 2011),

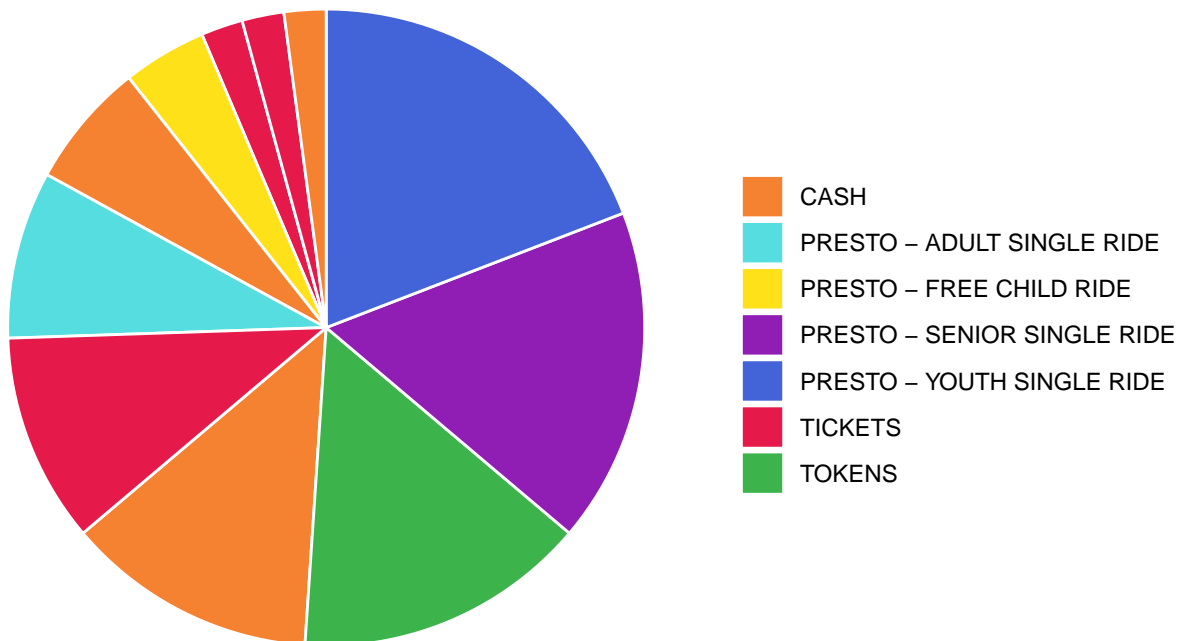
Also, all of our graphs were plotted in the paper using `ggplot` (Wickham 2016).

## 6 Appendix

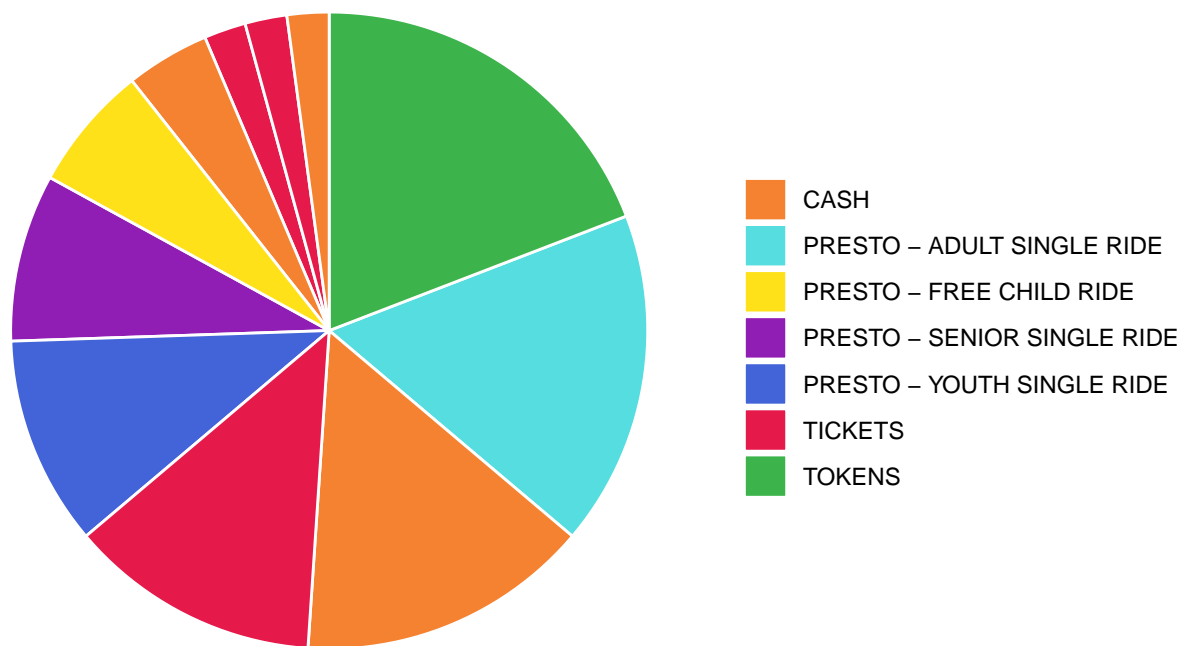
### 6.1 All Pie Charts (2010 - 2018)

Below is a list of pie charts for the other years if you want to see a more detailed view on all the years in between. Starting from 2018 to 2010.

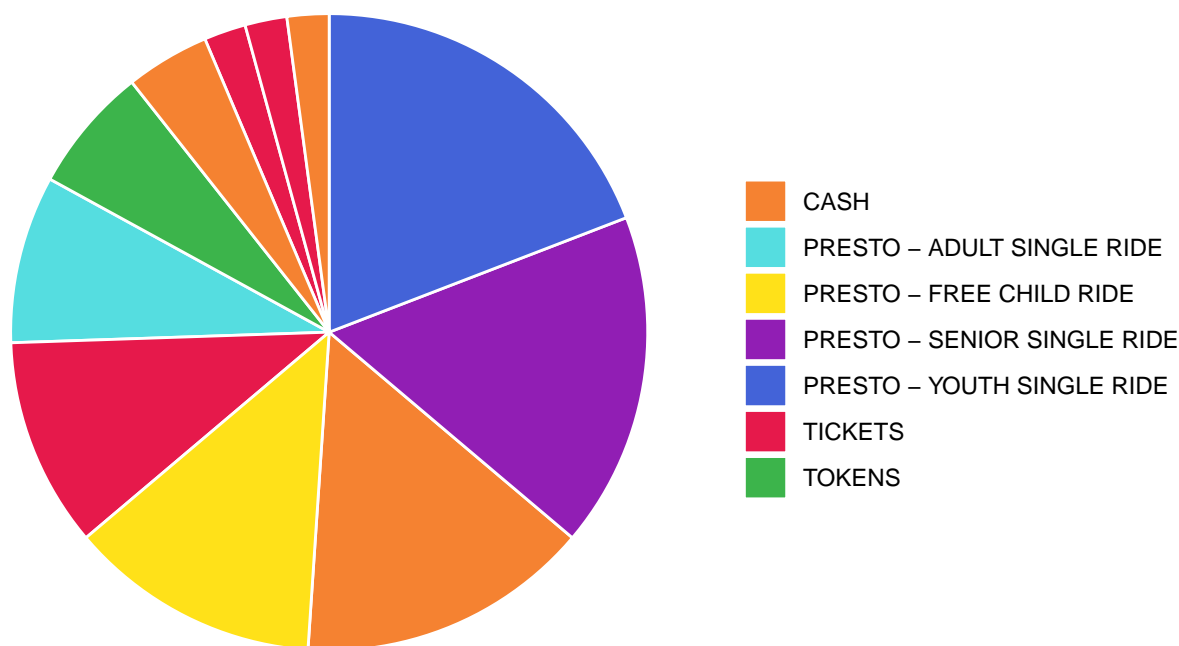
#### TTC Fare Breakdown – 2018



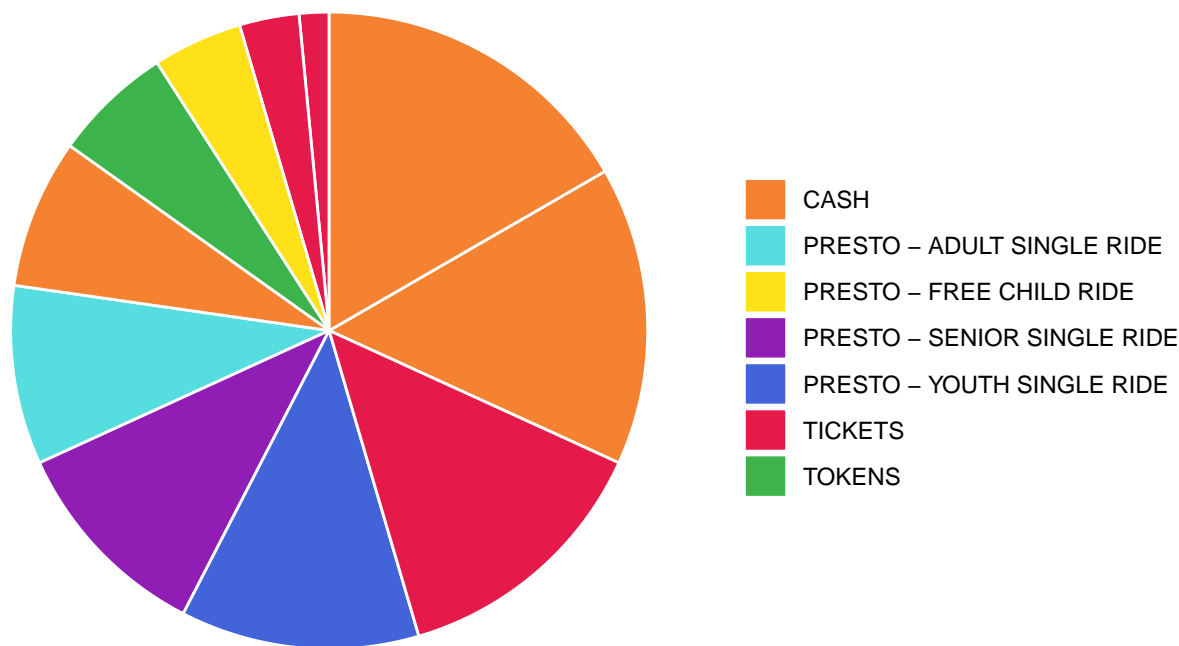
TTC Fare Breakdown – 2017



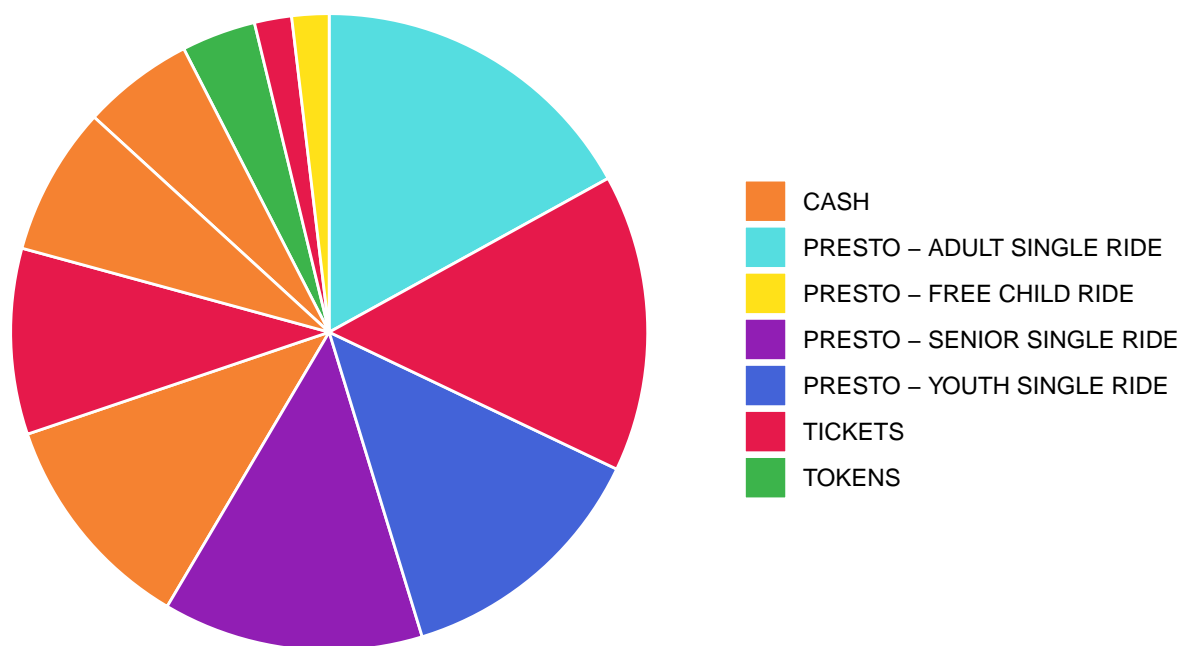
TTC Fare Breakdown – 2016



TTC Fare Breakdown – 2015

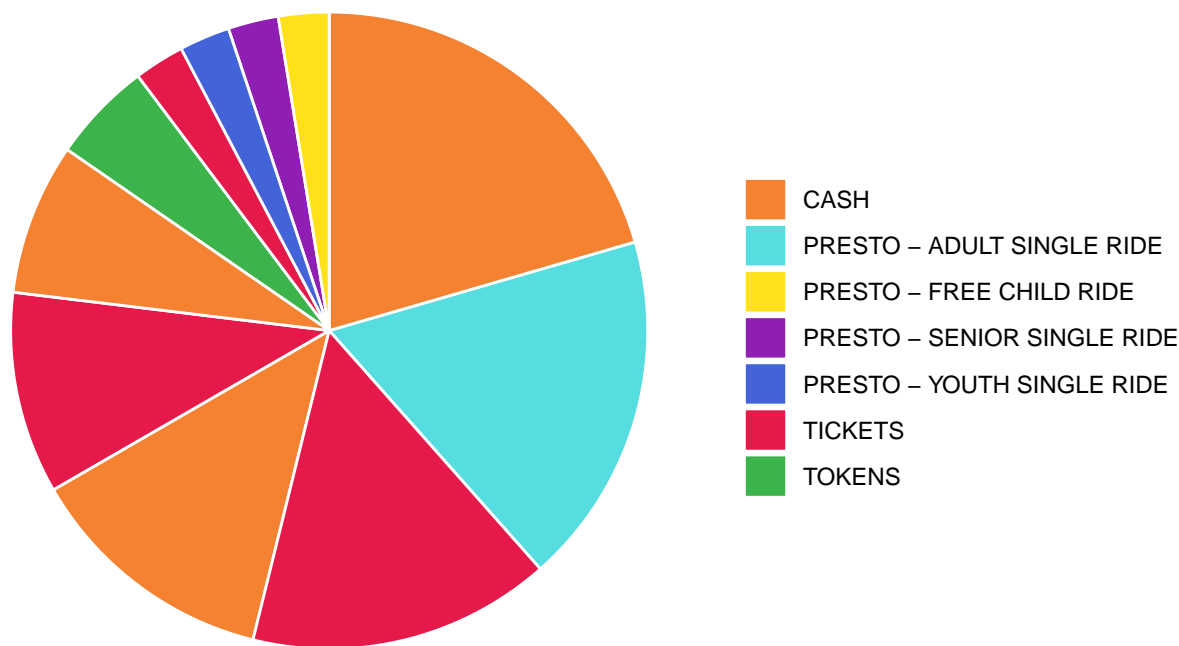


TTC Fare Breakdown – 2014

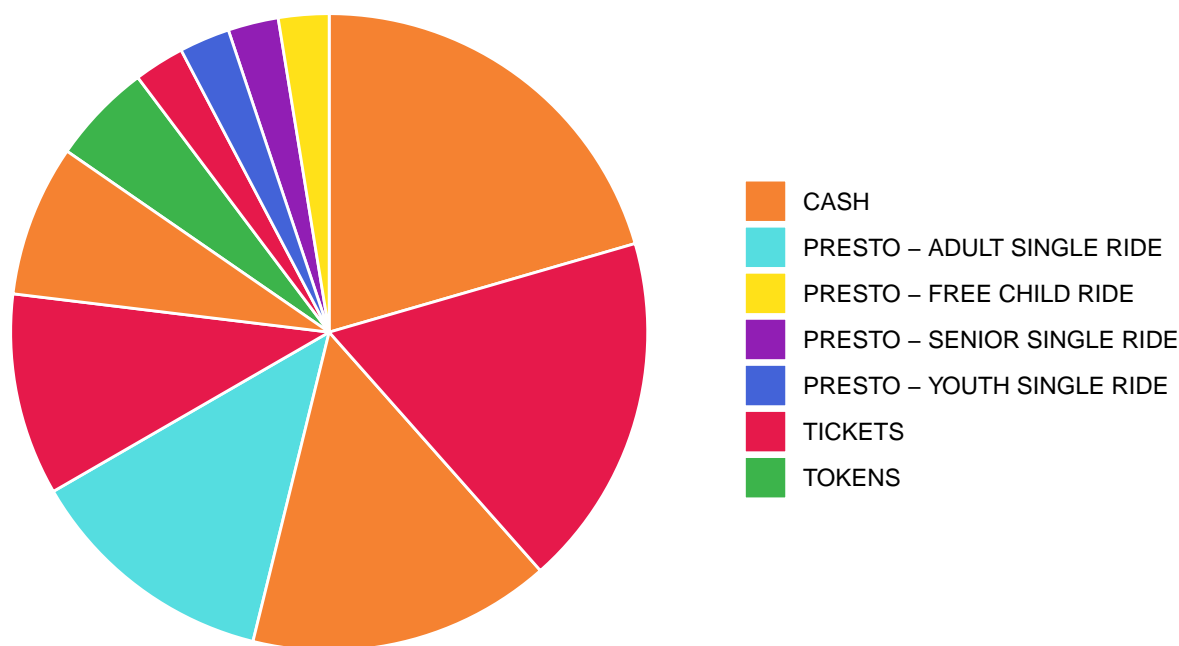




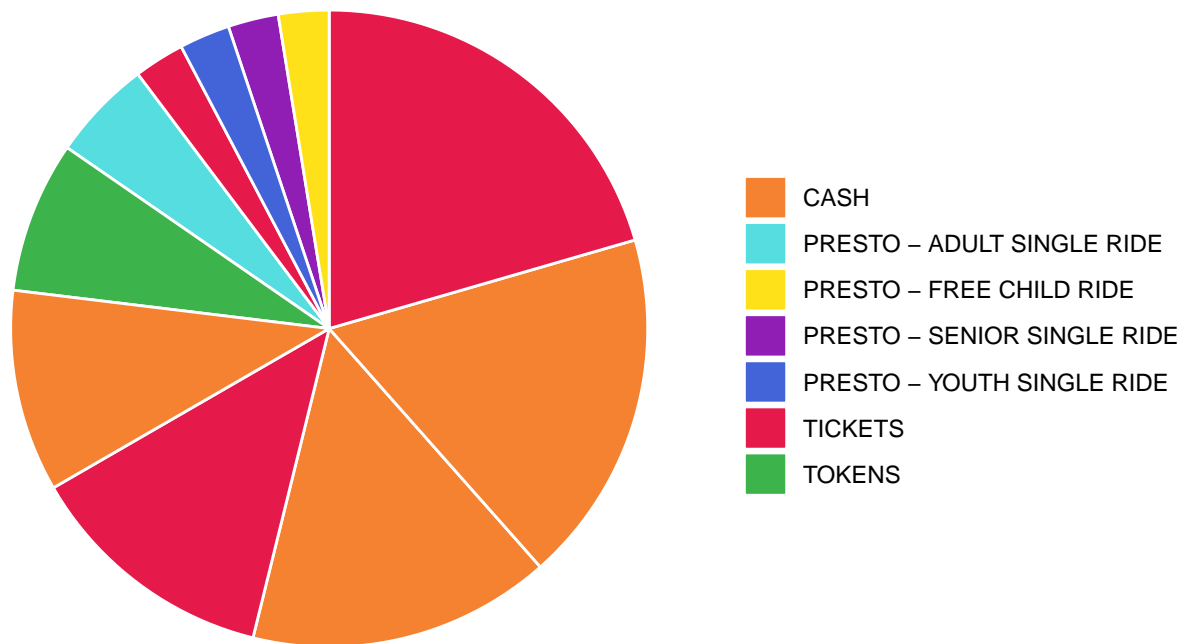
TTC Fare Breakdown – 2013



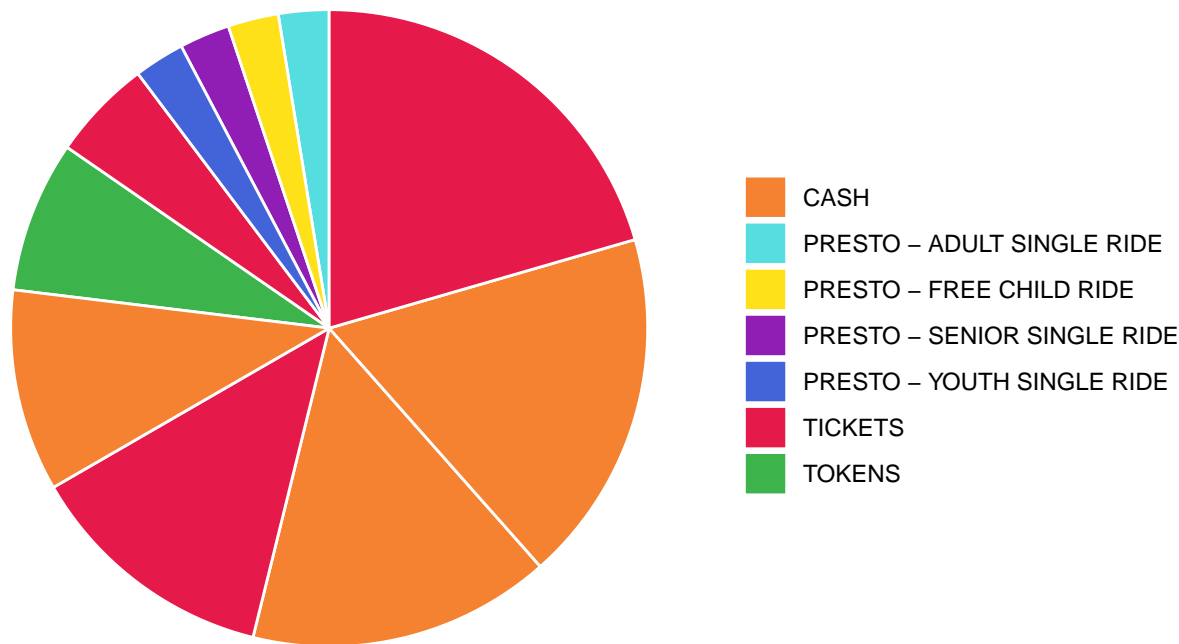
TTC Fare Breakdown – 2012



TTC Fare Breakdown – 2011



TTC Fare Breakdown – 2010



## 6.2 Code that did not work

Below is all of the code that I tried but did not work or failed to comply in any shape or form. Also, these codes were not the only ones that did not work but wanted to show you that I tried. There were others I forgot to document...

I combined all pie charts to show the most drastic change in the decade from the most recent year to the oldest year in question of the study.

```
#grid.arrange(pie2019, pie2018, pie2017, pie2016, pie2015,  
#pie2014, pie2013, pie2012, pie2011, pie2010, pie2009)  
#Combining did not work.
```

I GIVE UP! I spent days in combining the data for cash, tickets, and tokens together and I just cannot get it to work. The intention was to combine the strings of data into one row of data to easily visualize and compare between the different types of fares and the years. Without combining the data together, the numbers for each fare is out of order and not in chronological/alphabetical/categorical order.

```
#dffare <- data.frame(  
  #fare = presto_vs_ttc$fare_media,  
  #twenty_nineteen = strtoi(c(presto_vs_ttc$x2019)),  
  #twenty_eighteen = strtoi(presto_vs_ttc$x2018),  
  #twenty_seventeen = strtoi(presto_vs_ttc$x2017),  
  #twenty_sixteen = strtoi(presto_vs_ttc$x2016),  
  #twenty_fifteen = strtoi(presto_vs_ttc$x2015),  
  #twenty_fourteen = strtoi(presto_vs_ttc$x2014),  
  #twenty_thirteen = strtoi(presto_vs_ttc$x2013),  
  #twenty_twelve = strtoi(presto_vs_ttc$x2012),  
  #twenty_eleven = strtoi(presto_vs_ttc$x2011),  
  #twenty_ten = strtoi(presto_vs_ttc$x2010),  
  #two_thousand_nine = strtoi(presto_vs_ttc$x2009)  
#)  
#ddply(dffare, "fare", numcolwise(sum))  
#new_dffare <-  
  #dffare %>%  
  #group_by(fare) %>%  
  #summarise(twenty_nineteen = sum(twenty_nineteen))
```

```
#ttc_vs_presto_model <-  
  # lm(x2019 ~ x1 + fare_media, data = ttc_clean_data)  
#summary(ttc_vs_presto_model)
```

## 7 References

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