Tax Contributions Versus Charitable Contributions

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## Summary

Charitable Organizations support a critical need of their community. They supplement and, in some cases, replace services that are not otherwise provided by local, state, or federal government agencies or organizations. These services, if performed by the government, would be funded by tax revenue. Whereas Charitable Organizations are funded thru private donations. This paper will analyze a ‘Charitable Dollar’ and a ‘Tax Dollar’ as a percent of total income of their donors. It seeks to answer the question if the use of charitable organizations results in everyone paying their fair share when compared to government funded services.

## Introduction

Citizens consume public services (‘services’) as they have a need during the normal course of their lives. Highways, courts, schools, and utilities such as water and electricity are examples of a few services that are provided directly, indirectly, funded or managed by the Federal Government of the United States(‘government’). The services are shared resources available to all citizens and provide a collective benefit.

The government services are funded, at least in part, by income taxes paid by its citizens. Income taxes are progressive in nature. Meaning that citizens are taxed at a progressively higher rate as their income increases. These rates are updated annually by the internal revenue service (‘IRS’). The income tax rates for 2017 can be found in Table 1 below.

Table 1: 2017 Income Tax Break Points

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tax Rate | Single | Married Filing Joint | Married Filing Separately | Head of Household |
| 10.00% | 0 | 0 | 0 | 0 |
| 15.00% | 9,325 | 18,650 | 9,325 | 13,350 |
| 25.00% | 37,950 | 75,900 | 37,950 | 50,800 |
| 28.00% | 91,900 | 153,100 | 76,550 | 131,200 |
| 33.00% | 191,650 | 233,350 | 116,675 | 212,500 |
| 35.00% | 416,700 | 416,700 | 208,350 | 416,700 |
| 39.60% | 418,400 | 470,700 | 235,350 | 444,500 |

## Literature Review

According to Halseth & Ryser (2007) governments in both Canada and the United States (Brown 2017) have engaged local providers, including Charitable Organizations, to provide services that the governments themselves were unable or unwilling to provide to its citizens. These services provide the same public benefit as if they were provided and therefore funded by the government. However, unlike taxes, the funding for charitable organizations is made voluntarily by citizens at a rate that is both voluntary and discretionary.

There was not direct literature comparing Tax Dollars to Charitable Dollars that was reasonably accessible. Whereas tax dollars and government services are easily quantifiable relative to funding, it was quickly discovered that Charitable organizations relative to funding is not as clear. Services and funding of services by donors is driven by a donor’s interest in the cause and their perception of the effectiveness of the Charitable Organization to effectively address a particular need according to Pelligra, (2011). Not all Charitable Organizations have equal access to nor an equal ability to solicit donations. Furthermore, a charitable Dollar is not uniform across the Charitable Services space.

In addition to the inequality of access to funds or capital to support a Charitable Organization the dollars necessary to operate a Charitable Organization differs widely between organizations. According Rose-Ackerman some charities purchase and advertise ‘state of the are equipment’. Some have large professional salaried staff. Others rely solely upon volunteers (1987). With some charities likely to fall somewhere between these two extremes by having both paid staff but still utilizing volunteers. A charitable dollar when given is directed toward a public good. A dollar donated does not fully quantify the total ‘income’ of a charitable organization. In addition to monetary donations they receive free labor of volunteers, use of public or private facilities without charge, and other contributed goods and services. These are items that will be absent in a Charitable Dollar but be included in a Tax Dollar if spent to provide the same good or service by the government.

To confuse the value of a Charitable Dollar even more, some charitable organizations, like those discussed in the articles by Halseth & Ryser (2007) and Brown (2017), receive Tax Dollars as a part of their funding. As a result, either none, some, or all of the funding for a charitable organization could be by a tax dollar. In this case the Charitable Dollar and the Tax dollar would by definition be equal and therefore result in everyone paying their ‘fair share’.

The progressive income tax system is designed so that each citizen is expected to pay their ‘Fair Share’. If they have been blessed with good fortune to earn substantially more income, they are in turn taxed at a higher rate than those who earn far less. Consideration as to whether a progressive tax system is proper and/or achieves its desired effect is beyond the scope of this paper. This paper recognizes that the progressive rates are deemed legal and therefore understands the idea of each paying their ‘fair share’ as just.

Since charitable organizations are funded voluntarily by its citizens there are no guarantees or assurances that each citizen is paying their ‘fair share’ when compared to the progressive tax system. In this paper we will review federal contributions in 2017 by citizens in the State of Kentucky. We will review the percent of income contributed to taxes by total income and the percent contributed to charitable organizations by total income. In addition, we will evaluate the amount contributed to determine if contributions are more progressive or less progressive as total income increases.

## Theory

This paper is exploring the relationship between a Charitable Dollar and a Tax Dollar relative to the idea of each citizen paying their ‘fair share’. This exploration includes:

1. Evaluate the percent contribution by total income. Since citizens volunteer labor, goods, services, and facilities a ‘Charitable Dollar’ cannot be considered a 100% accounting of the charitable value.  
2. Evaluate the rate of contribution for Tax Dollars and Charitable Dollars. The contributions can be normalized and compared by Total Income to measure rate of contribution.

It is the presumption of the author that the rate of contribution for a Tax Dollar will be more than that of a ‘Charitable Dollar’. Meaning it is expected that citizens are not paying their ‘fair share’ using the model of the progressive tax rate established by government tax policy when using Charitable Organizations.

## Data

Census data for the state of kentucky was retrieved from <https://www2.census.gov/programs-surveys/popest/datasets/2010-2017/counties/asrh/cc-est2017-alldata-21.csv>. The data includes:

## SUMLEV STATE COUNTY STNAME CTYNAME YEAR AGEGRP TOT\_POP TOT\_MALE  
## 1 50 21 1 Kentucky Adair County 1 0 18656 9208  
## 2 50 21 1 Kentucky Adair County 1 1 1169 594  
## 3 50 21 1 Kentucky Adair County 1 2 1127 585  
## 4 50 21 1 Kentucky Adair County 1 3 1132 589  
## 5 50 21 1 Kentucky Adair County 1 4 1609 819  
## 6 50 21 1 Kentucky Adair County 1 5 1405 705  
## TOT\_FEMALE WA\_MALE WA\_FEMALE BA\_MALE BA\_FEMALE IA\_MALE IA\_FEMALE AA\_MALE  
## 1 9448 8767 9076 298 217 21 17 18  
## 2 575 559 539 11 15 1 1 5  
## 3 542 557 526 9 2 2 1 1  
## 4 543 561 518 19 10 2 2 0  
## 5 790 728 737 75 31 1 2 1  
## 6 700 646 666 47 29 3 1 0  
## AA\_FEMALE NA\_MALE NA\_FEMALE TOM\_MALE TOM\_FEMALE WAC\_MALE WAC\_FEMALE BAC\_MALE  
## 1 28 3 6 101 104 8868 9179 345  
## 2 0 0 1 18 19 577 558 25  
## 3 2 0 1 16 10 573 536 19  
## 4 1 0 0 7 12 568 530 22  
## 5 3 1 1 13 16 741 753 85  
## 6 1 1 0 8 3 654 669 52  
## BAC\_FEMALE IAC\_MALE IAC\_FEMALE AAC\_MALE AAC\_FEMALE NAC\_MALE NAC\_FEMALE  
## 1 265 63 63 31 37 4 9  
## 2 30 3 3 7 2 1 2  
## 3 10 3 3 6 2 0 1  
## 4 15 4 7 2 3 0 0  
## 5 41 3 6 2 5 1 1  
## 6 32 6 1 1 1 1 0  
## NH\_MALE NH\_FEMALE NHWA\_MALE NHWA\_FEMALE NHBA\_MALE NHBA\_FEMALE NHIA\_MALE  
## 1 9022 9315 8605 8962 291 211 19  
## 2 571 561 538 526 11 15 1  
## 3 562 527 537 513 9 1 2  
## 4 572 528 547 506 16 9 2  
## 5 794 775 710 724 72 30 1  
## 6 686 688 628 654 47 29 3  
## NHIA\_FEMALE NHAA\_MALE NHAA\_FEMALE NHNA\_MALE NHNA\_FEMALE NHTOM\_MALE  
## 1 17 16 27 1 3 90  
## 2 1 4 0 0 0 17  
## 3 1 1 2 0 0 13  
## 4 2 0 1 0 0 7  
## 5 2 1 3 0 1 10  
## 6 1 0 1 1 0 7  
## NHTOM\_FEMALE NHWAC\_MALE NHWAC\_FEMALE NHBAC\_MALE NHBAC\_FEMALE NHIAC\_MALE  
## 1 95 8695 9056 334 254 54  
## 2 19 555 545 24 30 3  
## 3 10 550 523 17 9 2  
## 4 10 554 516 19 12 4  
## 5 15 720 739 81 39 1  
## 6 3 635 657 52 32 5  
## NHIAC\_FEMALE NHAAC\_MALE NHAAC\_FEMALE NHNAC\_MALE NHNAC\_FEMALE H\_MALE H\_FEMALE  
## 1 59 29 36 2 6 186 133  
## 2 3 6 2 1 1 23 14  
## 3 3 6 2 0 0 23 15  
## 4 7 2 3 0 0 17 15  
## 5 6 2 5 0 1 25 15  
## 6 1 1 1 1 0 19 12  
## HWA\_MALE HWA\_FEMALE HBA\_MALE HBA\_FEMALE HIA\_MALE HIA\_FEMALE HAA\_MALE  
## 1 162 114 7 6 2 0 2  
## 2 21 13 0 0 0 0 1  
## 3 20 13 0 1 0 0 0  
## 4 14 12 3 1 0 0 0  
## 5 18 13 3 1 0 0 0  
## 6 18 12 0 0 0 0 0  
## HAA\_FEMALE HNA\_MALE HNA\_FEMALE HTOM\_MALE HTOM\_FEMALE HWAC\_MALE HWAC\_FEMALE  
## 1 1 2 3 11 9 173 123  
## 2 0 0 1 1 0 22 13  
## 3 0 0 1 3 0 23 13  
## 4 0 0 0 0 2 14 14  
## 5 0 1 0 3 1 21 14  
## 6 0 0 0 1 0 19 12  
## HBAC\_MALE HBAC\_FEMALE HIAC\_MALE HIAC\_FEMALE HAAC\_MALE HAAC\_FEMALE HNAC\_MALE  
## 1 11 11 9 4 2 1 2  
## 2 1 0 0 0 1 0 0  
## 3 2 1 1 0 0 0 0  
## 4 3 3 0 0 0 0 0  
## 5 4 2 2 0 0 0 1  
## 6 0 0 1 0 0 0 0  
## HNAC\_FEMALE  
## 1 3  
## 2 1  
## 3 1  
## 4 0  
## 5 0  
## 6 0

Tax information for the state of kentucy was retrieved from <https://www.irs.gov/pub/irs-soi/17incyky.xlsx>. The data of interest began at line 7 and includes:

#GET IRS INCOME INFORMATION  
#URL of IRS website. Returns XLSX file  
kyirsurl <- "https://www.irs.gov/pub/irs-soi/17incyky.xlsx"  
  
#Reads XLSX file from URL to Data Frame  
kyirsdata <- read.xlsx(kyirsurl,sheet=1,startRow=7,colNames=FALSE)  
head(kyirsdata)

## X1 X2 X3 X4 X5 X6 X7 X8 X9  
## 1 0 KENTUCKY 1919800 858240 753020 266410 1750620 89010 1075430  
## 2 0 Under $1 23610 12360 9520 320 18210 2070 17440  
## 3 0 $1 under $10,000 282870 221190 27070 31750 251040 16370 134640  
## 4 0 $10,000 under $25,000 434040 247350 78360 99150 398230 18420 228160  
## 5 0 $25,000 under $50,000 484950 235470 139630 92860 445910 20450 260520  
## 6 0 $50,000 under $75,000 265860 87890 143370 27860 243800 11650 159180  
## X10 X11 X12 X13 X14 X15 X16 X17 X18 X19  
## 1 1263410 3745520 1201980 46240 26270 19970 6690 295020 453190 107694074  
## 2 4600 38170 5300 100 60 40 0 220 12230 -1633911  
## 3 170560 285770 75400 10390 6050 4340 2630 43550 44950 1505918  
## 4 322450 743580 258290 16210 9210 6990 3070 99020 90690 7439670  
## 5 358390 928200 305760 13520 8010 5510 990 91810 102750 17548406  
## 6 176930 590070 180960 3990 1870 2130 0 34320 72710 16341248  
## X20 X21 X22 X23 X24 X25 X26 X27 X28  
## 1 1915080 109057797 1611010 77708777 446940 609519 275290 2020165 257560  
## 2 18880 -1615870 4630 138264 7180 19517 3790 23345 3400  
## 3 282880 1540750 227470 1237285 28470 13587 17130 19651 15840  
## 4 434040 7536604 348740 5764986 53590 35468 27560 52687 25090  
## 5 484950 17716742 421740 14402348 81080 56706 43290 98563 39950  
## 6 265860 16501112 230330 12621733 73350 58550 42300 132932 39280  
## X29 X30 X31 X32 X33 X34 X35 X36 X37 X38  
## 1 1645437 314650 320203 287300 3225807 243050 4486777 174420 2884082 398370  
## 2 16923 550 1329 8760 -72213 5720 62331 1370 15707 3180  
## 3 13723 1610 1297 37150 145181 15070 13015 10520 44829 25310  
## 4 36244 7750 4738 64230 558861 23280 51940 26500 188411 71530  
## 5 71678 40770 22916 53440 421349 36710 112352 35580 350349 93490  
## 6 99538 60050 39191 38530 327280 36150 164007 30530 406703 71630  
## X39 X40 X41 X42 X43 X44 X45 X46 X47 X48 X49  
## 1 9325437 72560 62830 248095 270780 3454304 95790 5207582 449700 1363723 43400  
## 2 35635 5680 60 239 0 0 4570 -306967 4410 18041 50  
## 3 126309 5020 2800 8231 170 747 2810 -6296 38090 34832 130  
## 4 778674 9830 14510 56311 33940 61248 6180 15321 76590 96934 1240  
## 5 1643113 14400 19250 74027 82570 526788 11170 66470 99770 168336 9850  
## 6 1747330 12340 11810 48077 59150 852503 11850 128111 74100 159864 8980  
## X50 X51 X52 X53 X54 X55 X56 X57 X58 X59 X60 X61  
## 1 11206 6580 143947 44430 297395 24420 117492 159930 164741 9760 22675 6600  
## 2 9 0 0 1120 5370 160 615 410 406 470 1507 160  
## 3 29 0 0 2640 9398 260 967 3320 2719 1990 5941 170  
## 4 284 60 239 5060 18480 1480 4791 17520 14191 1100 2870 130  
## 5 2379 240 2120 7390 33200 6320 23447 48490 47141 1290 2864 570  
## 6 2278 460 4731 6210 34684 5700 26056 35760 38046 1450 2828 690  
## X62 X63 X64 X65 X66 X67 X68 X69 X70 X71  
## 1 110655 511690 11735955 63253009 99170 897721 448960 3885408 52210 54387  
## 2 693 0 0 0 0 0 0 0 0 0  
## 3 317 6510 96761 37454 4800 45868 1640 3273 3180 1679  
## 4 532 24850 373127 442505 16740 148516 12360 20655 10280 6533  
## 5 2111 80470 1140761 3118694 27930 228749 64410 172260 14020 12462  
## 6 2687 95320 1514906 5938222 21460 182212 83060 337047 10630 11530  
## X72 X73 X74 X75 X76 X77 X78 X79 X80 X81 X82  
## 1 449720 1165189 395190 172497 510340 5307181 388170 2356520 5130 18672 10150  
## 2 0 0 0 0 0 0 0 0 0 0 0  
## 3 4360 8942 3240 1022 6140 16590 3100 15738 0 0 20  
## 4 17160 29874 15480 5148 24430 63242 11820 58009 170 711 140  
## 5 61740 103754 56070 18566 80190 309096 53420 244272 930 3387 990  
## 6 81900 152062 72000 24543 95140 528410 72630 359416 1070 3446 1720  
## X83 X84 X85 X86 X87 X88 X89 X90 X91 X92 X93 X94  
## 1 5029 28370 31361 8970 43718 410520 2219784 118150 909499 11060 123373 1460940  
## 2 0 0 0 0 0 0 0 0 0 0 0 0  
## 3 1 150 147 80 42 3890 5963 2300 6964 60 340 29860  
## 4 23 990 1168 50 59 17740 48076 7240 42130 490 3079 271110  
## 5 593 6920 7344 460 493 56300 164255 24560 173294 1230 7200 467070  
## 6 993 9230 10281 620 842 70860 234365 25860 180448 1690 11347 264900  
## X95 X96 X97 X98 X99 X100 X101 X102 X103 X104 X105  
## 1 73274054 1455610 13283454 36530 207663 22700 20125 573080 656311 70830 36316  
## 2 0 130 305 0 0 280 73 0 0 0 0  
## 3 51198 30280 5851 0 0 1910 629 880 86 710 16  
## 4 1730608 269310 182810 0 0 5420 2225 75600 23539 2220 73  
## 5 9077024 464450 1109816 20 28 10280 7570 192860 157333 8090 409  
## 6 10575301 264140 1451299 140 226 3380 5717 112480 157724 11040 846  
## X106 X107 X108 X109 X110 X111 X112 X113 X114 X115 X116 X117  
## 1 71890 38620 101740 106709 141640 24437 317090 391189 13870 7070 222410 580246  
## 2 0 0 0 0 0 0 0 0 0 0 2180 4760  
## 3 0 0 90 25 0 0 0 0 0 0 32460 25690  
## 4 3370 1091 17230 9643 33300 5068 22270 7143 370 110 54890 91594  
## 5 17020 8996 27960 27295 82620 15286 111620 103165 2990 1332 38390 81801  
## 6 13000 6787 19340 22735 25720 4083 77640 119070 3250 1495 27690 67599  
## X118 X119 X120 X121 X122 X123 X124 X125 X126 X127 X128  
## 1 38750 163427 44350 178395 54310 36781 1838080 16809188 393390 956452 341270  
## 2 1490 8692 1670 8744 0 0 10520 46206 1350 1430 600  
## 3 5270 27846 5480 26985 30 23 253990 254393 100340 124721 90390  
## 4 13780 56341 14100 55040 19950 10341 411230 1302828 171270 570382 151910  
## 5 15250 59279 16560 62904 23390 14136 475080 2109480 118760 259324 97510  
## 6 2690 10628 4800 18730 7610 6946 262390 1846340 1670 595 860  
## X129 X130 X131 X132 X133 X134 X135 X136 X137 X138  
## 1 835078 253410 329175 83590 72298 15880 12532 1319930 12618988 1433280  
## 2 619 250 387 380 352 1010 924 100 188 3610  
## 3 110915 35050 22442 7700 6562 2290 1734 29850 5782 64010  
## 4 505264 121450 166301 17710 14759 7440 5214 225070 159286 275270  
## 5 217957 84160 122229 17510 14646 4750 4247 386940 952476 407960  
## 6 323 11360 15761 12460 10831 390 413 252690 1293577 256270  
## X139 X140 X141 X142 X143 X144 X145 X146 X147 X148  
## 1 13506014 24400 42809 30030 125862 320360 1468868 1552450 4761298 1521630  
## 2 8612 50 103 0 0 1950 3799 9380 40337 8760  
## 3 32098 0 0 0 0 21420 10250 241720 232590 240820  
## 4 264264 0 0 0 0 35230 35764 387860 1073356 385900  
## 5 1057733 0 0 0 0 61950 89197 420590 1137493 417090  
## 6 1380538 50 24 0 0 57770 120750 207450 583167 203490  
## X149 X150 X151  
## 1 4173029 39180 569775  
## 2 28529 670 7102  
## 3 230626 1080 2259  
## 4 1068768 2810 4358  
## 5 1127159 5030 9774  
## 6 571056 5650 12841

Population data had to be limited to those items of interest: State, County, Total Population, and Year.

df <- select(kypopdata,STNAME, CTYNAME, TOT\_POP, AGEGRP, YEAR)

We were interestedin year number 7 so the data was filtered for group 0 and year 7. The results included:

#Filter for sum and year 7  
df <- df[df$AGEGRP==0 & df$YEAR==7,]  
head(df)

## STNAME CTYNAME TOT\_POP AGEGRP YEAR  
## 115 Kentucky Adair County 19246 0 7  
## 305 Kentucky Allen County 20497 0 7  
## 495 Kentucky Anderson County 21824 0 7  
## 685 Kentucky Ballard County 8191 0 7  
## 875 Kentucky Barren County 43028 0 7  
## 1065 Kentucky Bath County 12129 0 7

The column names were updated from abbreviations to human readable. Also insured county was of type character by casting.

#Change Column Names for State, County, and Population  
names(df)[names(df)=="STNAME"] <- "STATE"  
names(df)[names(df)=="CTYNAME"] <- "COUNTY"  
names(df)[names(df)=="TOT\_POP"] <- "POPULATION"  
  
#make sure COUNTY is character  
df$COUNTY = as.character(df$COUNTY)

Removed the word county.

#Remove word "County"  
df$COUNTY <- substr(df$COUNTY,1,nchar(df$COUNTY)-7)

Did not need agegroup or year for analysis. Data now included:

#Get rid of AGEGRP and YEAR  
df$AGEGRP <- NULL  
df$YEAR <- NULL  
head(df)

## STATE COUNTY POPULATION  
## 115 Kentucky Adair 19246  
## 305 Kentucky Allen 20497  
## 495 Kentucky Anderson 21824  
## 685 Kentucky Ballard 8191  
## 875 Kentucky Barren 43028  
## 1065 Kentucky Bath 12129

IRS information was a large set with broad set of columns.The data dictionary found at <https://www2.census.gov/programs-surveys/popest/datasets/2010-2017/counties/asrh/cc-est2017-alldata.pdf> was used to identify columns of interest

#Move applicable columns to new dataframe with income, chartiable deductions, and income tax.  
di <- select(kyirsdata,1,2,20,21,88,89,94,95,138,139)

Meaningful column names were assigned to the dataframe.

#Set column Names and update data frame  
ccnames <- c("CountyFIPSCode","CountyIncomeBracket","TotalIncomeReturns", "TotalIncome", "CharitableDeductionReturns","CharitableDeductions","TaxableIncomeReturns", "TaxableIncome", "TotalTaxLiabilityReturns", "TotalTaxLiability")  
colnames(di) <- ccnames

## Methodology

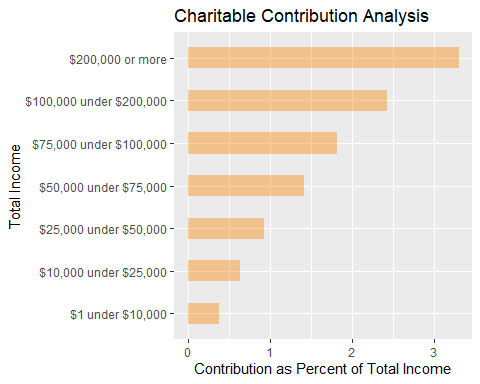
Once the data was cleaned and prepared for analysis, we started work with contribution data. THe data was Loaded data into a new dataframe and a new column “Percent of Income” as added. The data now included:

#Get First Data to use to report Charitable Deductions as a Percent of Total Income  
#Look at all of kentucky: Rows 7(totals) 9 - 15 OR 1, 3:9 FROM di  
di\_cd <- di[c(3:9),]  
  
di\_cd <- di\_cd%>%select(CountyIncomeBracket,TotalIncome,CharitableDeductions)%>%mutate(PercentOfIncome=CharitableDeductions/TotalIncome \* 100)  
  
head(di\_cd)

## CountyIncomeBracket TotalIncome CharitableDeductions PercentOfIncome  
## 1 $1 under $10,000 1540750 5963 0.3870193  
## 2 $10,000 under $25,000 7536604 48076 0.6379000  
## 3 $25,000 under $50,000 17716742 164255 0.9271174  
## 4 $50,000 under $75,000 16501112 234365 1.4202982  
## 5 $75,000 under $100,000 14698845 268390 1.8259258  
## 6 $100,000 under $200,000 27482922 666534 2.4252661

The data was plotted in a barchart to illustrate the Contribution as a percent of income versus Total Income. The Total Income was a large text entry and the barplot was flipped to make the visualization more easily accessible.

#Get the Percent of Income and Charitable Percent of Income in df &  
#plot the data strat by Income Bracket. Transpose or flip axis to illustrate Contributions  
di\_cd %>%   
 arrange(PercentOfIncome) %>%  
 mutate(CountyIncomeBracket = factor(CountyIncomeBracket, levels = CountyIncomeBracket)) %>%  
 ggplot( aes(x=CountyIncomeBracket, y=PercentOfIncome)) +  
 geom\_bar(stat="identity", fill="#fc8403", alpha=.4, width=.5) +  
 coord\_flip() +  
 xlab("") +  
 theme\_bw()%>%   
 labs(title = "Charitable Contribution Analysis", x="Total Income", y = "Contribution as Percent of Total Income")



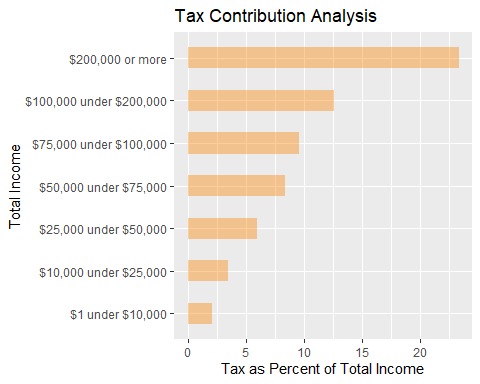
Once the contribution information was analyzed, the tax data was loaded into a dataframe and the column TaxPercentOfIncome was added to calculate the Tax as a percent of total income. The data included:

#Plot Percent of Income by Strat  
di\_tx <- di[3:9,]  
  
di\_tx <- di\_tx %>%select(CountyIncomeBracket,TotalTaxLiability,TotalIncome)%>%mutate(TaxPercentOfIncome = TotalTaxLiability/TotalIncome \* 100)  
  
head(di\_tx)

## CountyIncomeBracket TotalTaxLiability TotalIncome TaxPercentOfIncome  
## 1 $1 under $10,000 32098 1540750 2.083271  
## 2 $10,000 under $25,000 264264 7536604 3.506407  
## 3 $25,000 under $50,000 1057733 17716742 5.970246  
## 4 $50,000 under $75,000 1380538 16501112 8.366333  
## 5 $75,000 under $100,000 1406825 14698845 9.570990  
## 6 $100,000 under $200,000 3476060 27482922 12.648073

Like contribution data the tax was plotted in a barchart to illustrate the tax as a percent of income versus total income. This was the comparison to used to see differences between Charitable and Tax Contributions.

di\_tx %>%   
 arrange(TaxPercentOfIncome) %>%  
 mutate(CountyIncomeBracket = factor(CountyIncomeBracket, levels = CountyIncomeBracket)) %>%  
 ggplot( aes(x=CountyIncomeBracket, y=TaxPercentOfIncome)) +  
 geom\_bar(stat="identity", fill="#fc8403", alpha=.4, width=.5) +  
 coord\_flip() +  
 xlab("") +  
 theme\_bw()%>%   
 labs(title = "Tax Contribution Analysis", x="Total Income", y = "Tax as Percent of Total Income")



## Results

The barcharts showed that tax and charitable contributions were both progressive and appeared to be of a similar progression. Furthermore the charts showed Tax and Charitable contributions as a percent of total income were not on a similar scale. The tax ‘contribution as percent of total income’ was nearly 10 times as large as charitable . To compare the contributions a normalize function was created and the data was normalized {0..1}.

##Normalize to 0..1 for both charitable as percent and tax as percent to compare  
##create a function to normalize data  
normalize <- function(x) {  
 return ((x - min(x))/ (max(x)-min(x)))  
}  
  
#Normalize tax percent  
di\_tx$NormalizedPercent <- normalize(di\_tx$TaxPercentOfIncome)  
head(di\_tx)

## CountyIncomeBracket TotalTaxLiability TotalIncome TaxPercentOfIncome  
## 1 $1 under $10,000 32098 1540750 2.083271  
## 2 $10,000 under $25,000 264264 7536604 3.506407  
## 3 $25,000 under $50,000 1057733 17716742 5.970246  
## 4 $50,000 under $75,000 1380538 16501112 8.366333  
## 5 $75,000 under $100,000 1406825 14698845 9.570990  
## 6 $100,000 under $200,000 3476060 27482922 12.648073  
## NormalizedPercent  
## 1 0.00000000  
## 2 0.06696269  
## 3 0.18289350  
## 4 0.29563643  
## 5 0.35231906  
## 6 0.49710479

#Normalize charitable deduction percent  
di\_cd$NormalizeCharitable <- normalize(di\_cd$PercentOfIncome)  
head(di\_cd)

## CountyIncomeBracket TotalIncome CharitableDeductions PercentOfIncome  
## 1 $1 under $10,000 1540750 5963 0.3870193  
## 2 $10,000 under $25,000 7536604 48076 0.6379000  
## 3 $25,000 under $50,000 17716742 164255 0.9271174  
## 4 $50,000 under $75,000 16501112 234365 1.4202982  
## 5 $75,000 under $100,000 14698845 268390 1.8259258  
## 6 $100,000 under $200,000 27482922 666534 2.4252661  
## NormalizeCharitable  
## 1 0.00000000  
## 2 0.08604184  
## 3 0.18523159  
## 4 0.35437246  
## 5 0.49348614  
## 6 0.69903539

Once normalized the values were loaded into a dataframe. Meaningful column names were assigned and the data included:

#group normalized values to plot  
dr\_cdtx <- data.frame(di\_cd$CountyIncomeBracket,di\_cd$NormalizeCharitable,di\_tx$NormalizedPercent)  
cnames <- c("Bracket", "Charitable", "Tax")  
colnames(dr\_cdtx)<-cnames  
  
head(dr\_cdtx)

## Bracket Charitable Tax  
## 1 $1 under $10,000 0.00000000 0.00000000  
## 2 $10,000 under $25,000 0.08604184 0.06696269  
## 3 $25,000 under $50,000 0.18523159 0.18289350  
## 4 $50,000 under $75,000 0.35437246 0.29563643  
## 5 $75,000 under $100,000 0.49348614 0.35231906  
## 6 $100,000 under $200,000 0.69903539 0.49710479

The data was tidy up to make plotting with ggplot easier and moved to dataframe dr\_cdtx\_tidy.

#Tidy up data to make reporting with ggplot easier  
dr\_cdtx

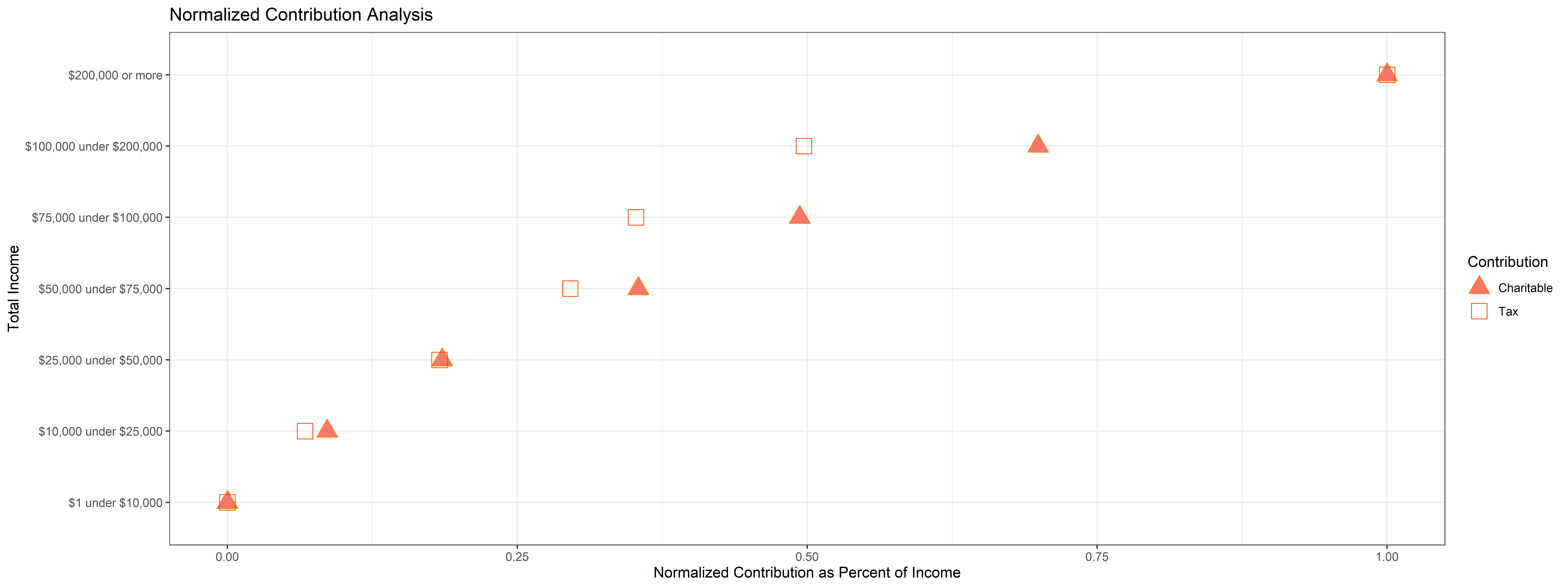
## Bracket Charitable Tax  
## 1 $1 under $10,000 0.00000000 0.00000000  
## 2 $10,000 under $25,000 0.08604184 0.06696269  
## 3 $25,000 under $50,000 0.18523159 0.18289350  
## 4 $50,000 under $75,000 0.35437246 0.29563643  
## 5 $75,000 under $100,000 0.49348614 0.35231906  
## 6 $100,000 under $200,000 0.69903539 0.49710479  
## 7 $200,000 or more 1.00000000 1.00000000

dr\_cdtx\_tidy <- dr\_cdtx %>%   
 mutate(Bracket = factor(Bracket, levels = Bracket)) %>%  
 pivot\_longer(names\_to="Contribution", values\_to="Normalized\_Contribution",cols = -Bracket)  
head(dr\_cdtx\_tidy)

## # A tibble: 6 x 3  
## Bracket Contribution Normalized\_Contribution  
## <fct> <chr> <dbl>  
## 1 $1 under $10,000 Charitable 0   
## 2 $1 under $10,000 Tax 0   
## 3 $10,000 under $25,000 Charitable 0.0860  
## 4 $10,000 under $25,000 Tax 0.0670  
## 5 $25,000 under $50,000 Charitable 0.185   
## 6 $25,000 under $50,000 Tax 0.183

The data was plotted into a point plot to illustrate the differences in the normalized Charitable and normalized Tax rates

ggplot(dr\_cdtx\_tidy, aes(x =Normalized\_Contribution, y=Bracket, fill=Contribution)) +  
 geom\_point(aes(shape = Contribution, color = Contribution), size=5) +  
 scale\_shape\_manual(values = c(24, 0)) +  
 scale\_color\_manual(values = c("#fc8403", "#FC4E07"))+  
 theme\_bw()+  
 labs(title = "Normalized Contribution Analysis", x="Normalized Contribution as Percent of Income", y = "Total Income")



The plot of the normalized contribution as percent of total income clearly showed that charitable contributions were more progressive as total income increased.

## Conclusion

The theory that citizens in the State of Kentucky were not paying their ‘fair share’ for charitable services was not true. Charitable contributions were in fact more progressive than tax contributions. However, it was also shown that there were approximately ten-times as many tax dollars available as charitable dollars as a percent of total income to fund services.

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