RA Task

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Goal: Studying the firearm ownership in United States & the link between this ownership and crime.

1. Collect and summarise the data on firearm traces.

1.1. Data download

1.2. Description of firearm trace

A firearm trace is a record of any firearm that records its movement from its manufacturer or its first impression in the US through importers through a distribution channel till it had reached the hands of an unlicensed purchaser. Such unlicensed guns make their way into the ATF system when they are recovered by various law enforcement agencies who then raise a trace request for a firearm which then triggers an entire process of tracking this movement of that firearm from registered firearm manufacturers through wholesalers, retailers and finally, the buying end-user.

1.3. Summary Statistics

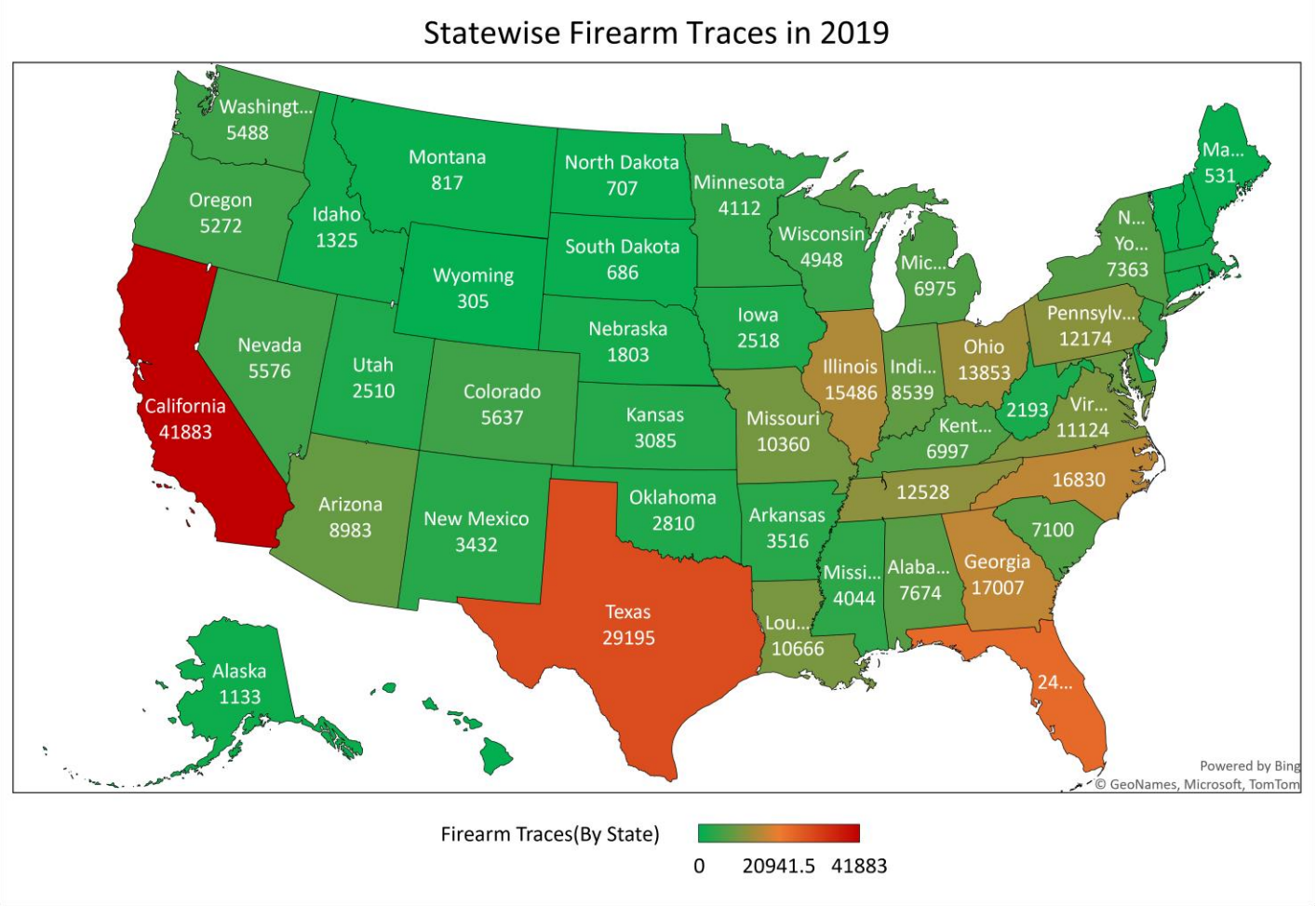
Table 1: Summary Statistics for traces data

	mean	standard deviation	minimum	maximum	median
Pistols	1,97,132	50413.06	1,31,562	2,78,267	1,99,508
Revolver	43,041	2673.837	37,778	45,407	43,799
Rifle	43,337	3144.72	38,854	46,993	44,085
Shotgun	26,480	922.9169	24,719	27,519	26,378
N=1,512					

Notes: ATF Firearms traces and recovered data.

Firearm level observations. Data has been gathered year wise for the years 2014-20 from the Firearms Tracking Systems by aft.gov

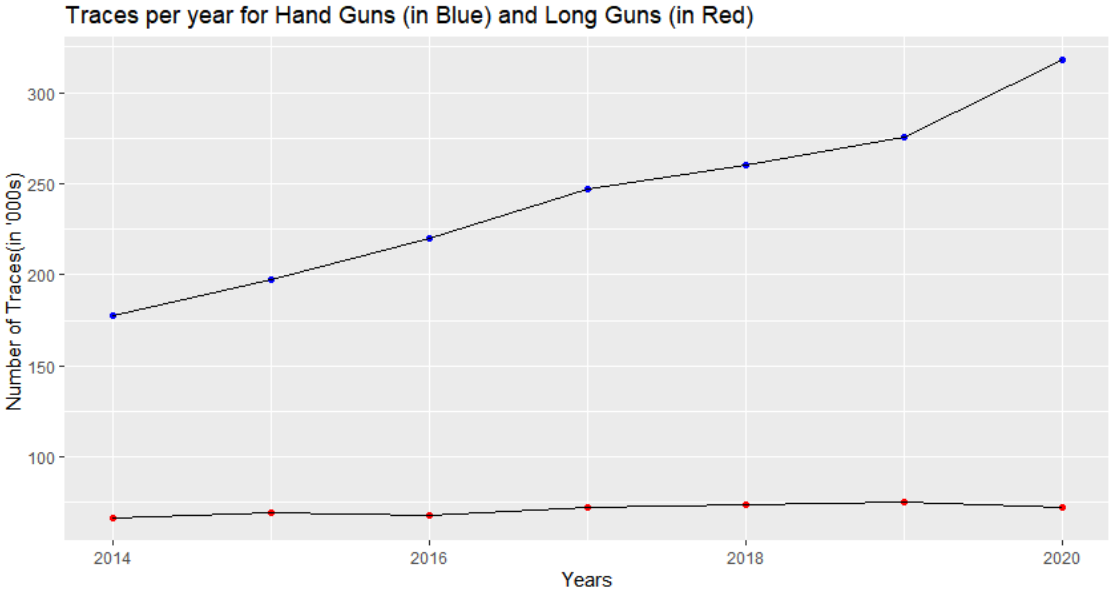
1.4. Total number of Traces by State in 2019



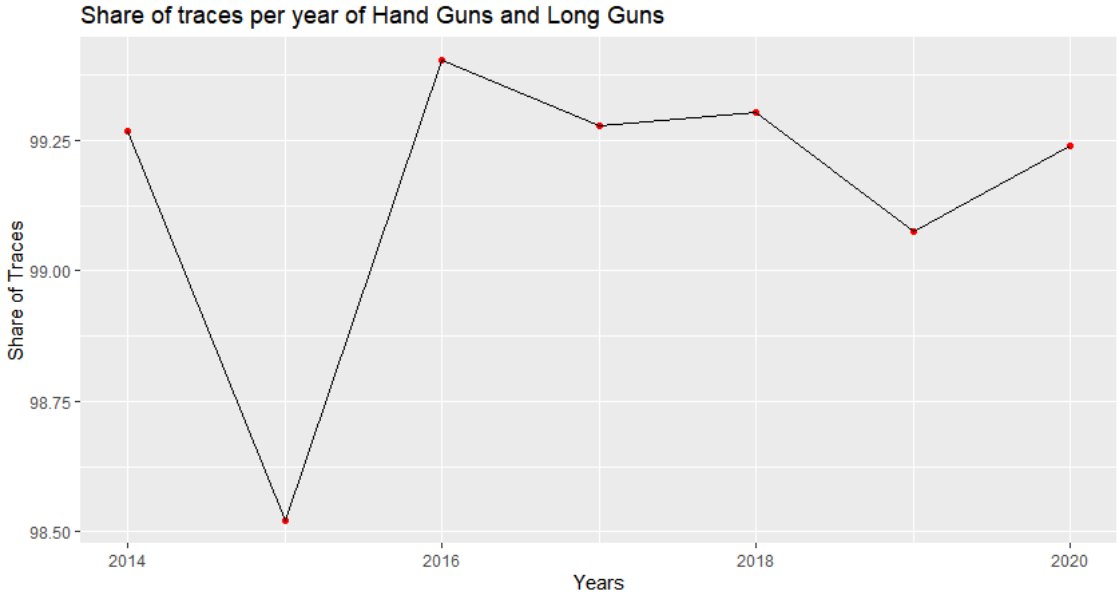
Note: Guam and Norther Islands have total 43 Traces in 2019 but aren't displayed on the map.

1.5. Time Series Plots

1.5. (a) Number of traces per year nationally, separated out by "hand gun" and "long gun"



1.5. (b) Share of Traces per year nationally that are “hand guns” or “long guns”



1.5. (c) Interpreting these trends

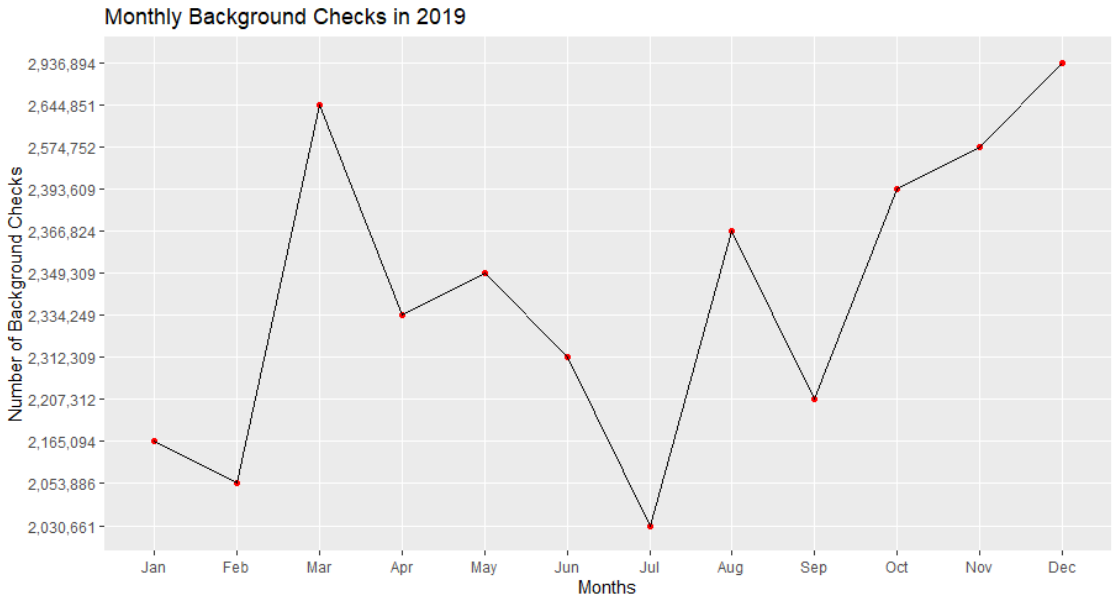
The time series plots of handguns and long guns indicates that the number of long gun traces over the period of 2014-20 have remained almost constant increasing by around 8% as well as the sharp increase in the number of traces of handguns which have increased by 78%. Further, we can clearly observe that the largest increase in handgun traces was observed between 2019 and 2020 where the number of handguns went up by 41, 985 or 15%. Observing the share of handguns or long Guns makes it clear that in most cases (except 2015) less than 1% traces belonged to any other firearm type except handguns or long guns.

2. Collect NICS Background Data

2.1. Description of the genesis of NICS data

NICS or the National Instant Criminal Background Checks Systems is a background checks system that was created under the Brady Act that mandated background checks for any individual who wishes to own a firearm. Any Federal Firearm Licensee (FFL) that is to sell a firearm to an individual is expected to perform a NICS background check on them to ensure they are legally permitted to buy a firearm. Essentially, it is a list of people who are legally prohibited from owning or possessing a firearm. Developed by ATF, this system is used by all Federal Firearm Licensees (FFLs) in determining whether they are legally permitted to sell an individual a firearm or not.

2.2. Number of background checks by month during 2019



2.3. How are background checks and traces related? How would you go about using these two to learn about the average number of crimes per gun by type?

Observing annual background checks and trace data, it is evident that there is a positive correlation between firearm traces and background checks. Further, observing the total firearm trace data and background check data of 2019 and 2020, we find that a 40% increase in background checks has resulted in a 10% increase in trace data. If monthly trace data can be obtained, then trends in background checks can be correlated with gun types. On a broader level, it is evident that firearms that may be identified as handguns increased by 15% between 2019-20 and simultaneously background checks increased by 40% for the same period. Based on monthly trace data, we may be able to identify a rough proportion of gun types in background checks. This can then be extrapolated to identify the number of firearms of each gun type sold and can be used to calculate the average number of crimes per gun by type.

3. Preliminary Analysis

3.1. Data download

3.2. Regression output

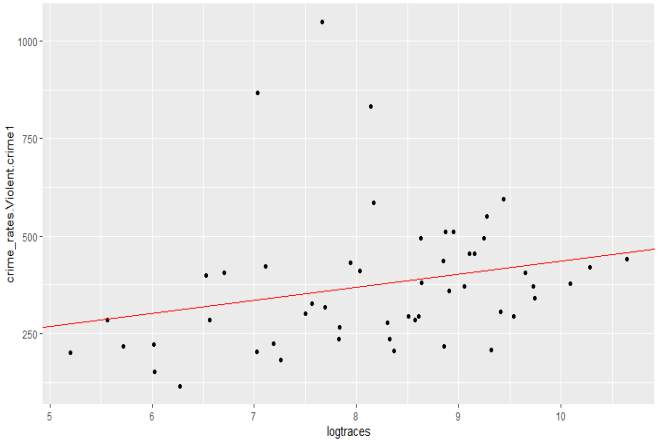
Table 2: Regression coefficients

Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	102.33	156.03	0.656	0.5149
log(ATF traces)	33.45	18.88	1.772	0.0825

Table 3: Regression Statistics

Regression Statistics	
Residual SE	174.2
Multiple R Square	0.05909
Adjusted R Square	0.04028
p-value	0.08247
Observations	52

3.3. Interpretation of coefficients



Linear regressor line fitting to the data

The coefficients indicate that logarithm of the number of ATF traces is directly proportional to crime rates. This implies that state-wise traces increase exponential with crime rates crime rates. Hence, greater a state's crime rates larger would be the firearm traces in that state. We also observe a huge positive intercept value in the regression which implies that some component of these crime rates is unexplainable by the number of traces and is dependent on factors that need looking into and stays the same for all states indicating a larger overall issue.