ECO 395M Time Series Assignment 1

Lutfi Sun

Feb 3, 2021

1 Incarceration in Turkey

1.0.1 Data series information and plots

- I am using data from TurkStat website on incarceration in Turkey. The data covers 20 years from 2000 to 2019. I look at the number of people received into prison by their educational background.

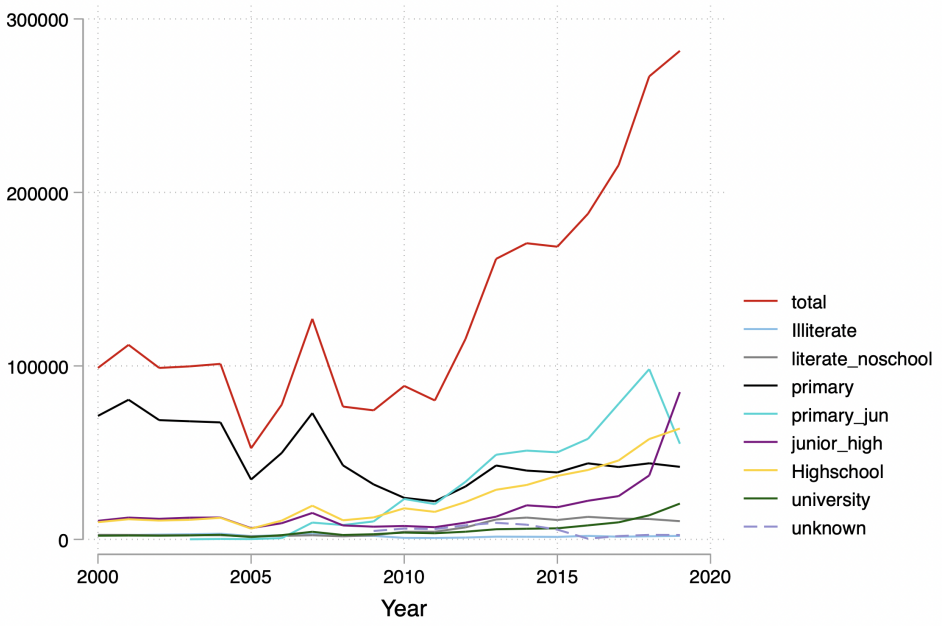

Figure 1: Convicts in Turkey Received Into Prison by Educational Status

1.0.2 Data treatment commands

- Here I combine the variables into two broader categories: those with at least eight years of education vs those with below eight years of education.

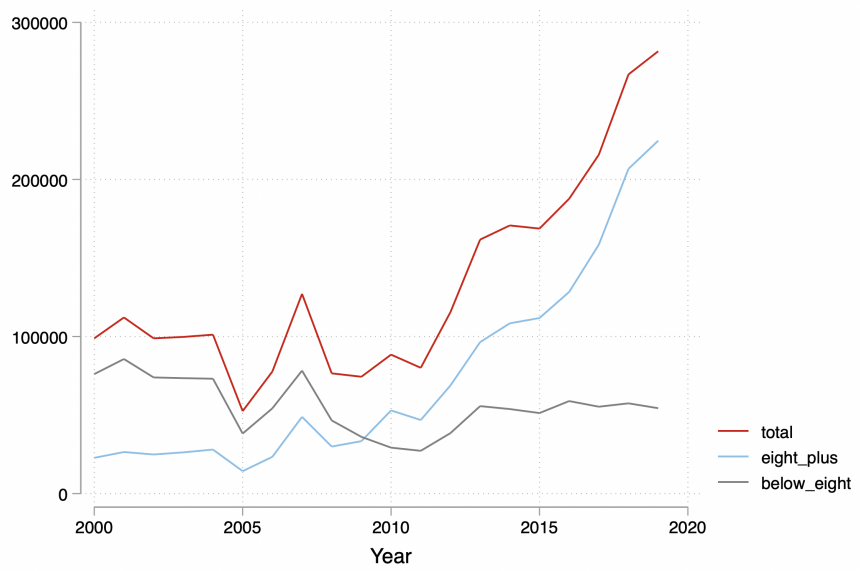

Figure 2: Imprisonment in Turkey by Educational Status

- A quadratic trend fits the total and eightplus series, whereas the beloweight series seem to have a linear trend.

```
* Combining vars into two broader categories: 8+ years of education vs 8-
gen below_eight = illiterate + literate_noschool + primary
gen eight_plus = primary_jun + junior_high + highschool + university
replace eight_plus =  junior_high + highschool + university if eight_plus == .

twoway (line total year) (line eight_plus year) (line below_eight year)
* a significant rise in the imprisonment of educated population
* possibly due to a shift in overall population to more educated
* or a rise in politically driven criminalization and incarceration

tset year
gen trend = year - 2000
gen trend2 = trend * trend

gen election_year = 0
replace election_year = 1 if (year == 2002) | (year == 2007) ///
                          | (year == 2011) | (year == 2015) | (year == 2018)

reg total trend trend2 election_year
reg total trend trend2 l.election_year
* a quadratic trend fits well
* we see no seasonality with respect to election period (neither with its lag)

reg total trend trend2
predict total_trend2
label variable total_trend2 "quadratic trend for #imprisonments"

predict total_dtd2, residuals
label variable total_dtd2 "detrended #imprisonments"

twoway (scatter total year) (line total_trend2 year)

gen tot_diff = total - total[_n-1]
label variable tot_diff "first difference #imprisonments"

twoway (line total_dtd2 year)
twoway (line tot_diff year)
```

Figure 3: Data Treatment Commands

1.0.3 New plots if removing trend and seasonality

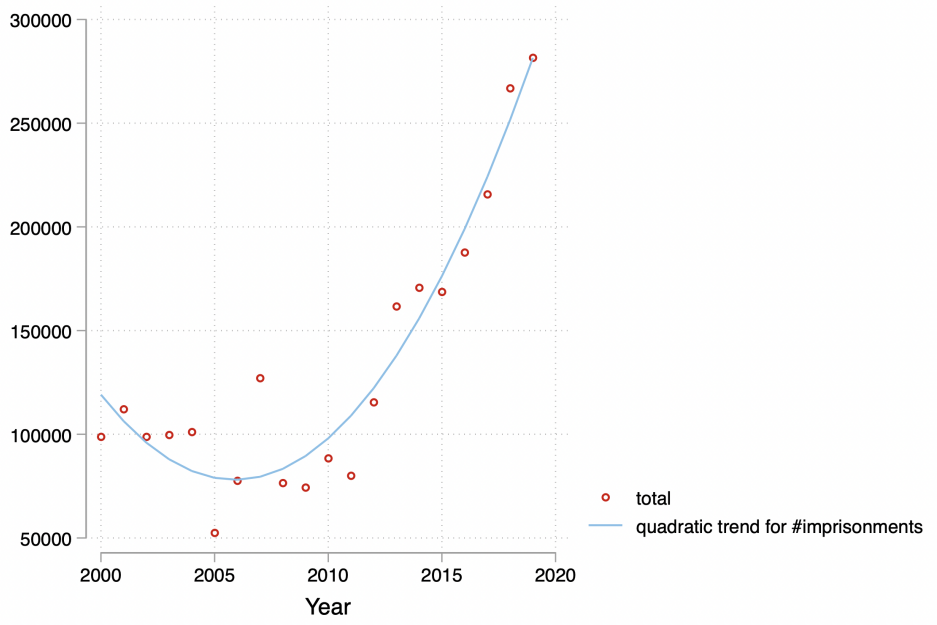

Figure 4: The Trend of Imprisonment in Turkey

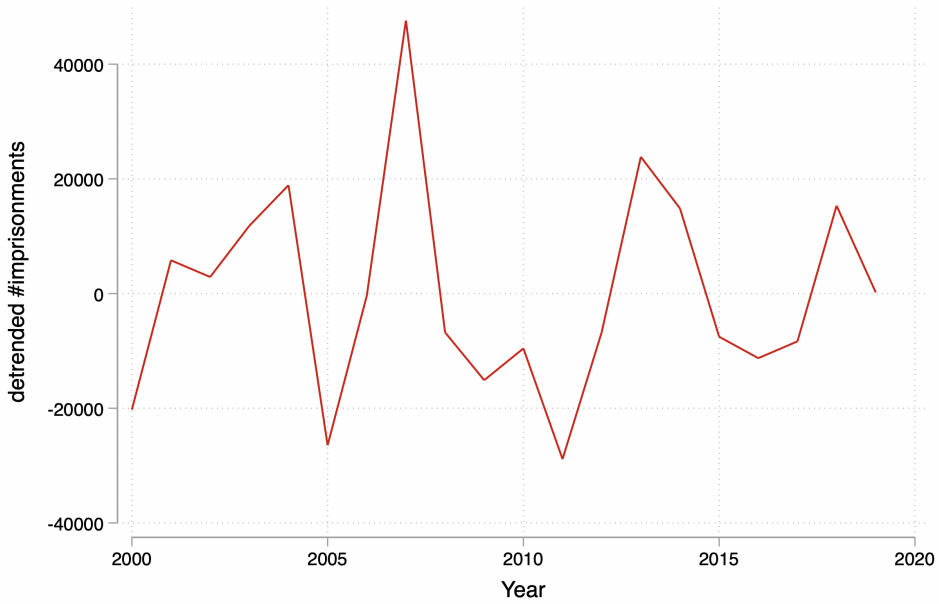

Figure 5: Imprisonment in Turkey Quadratic Trend Removed

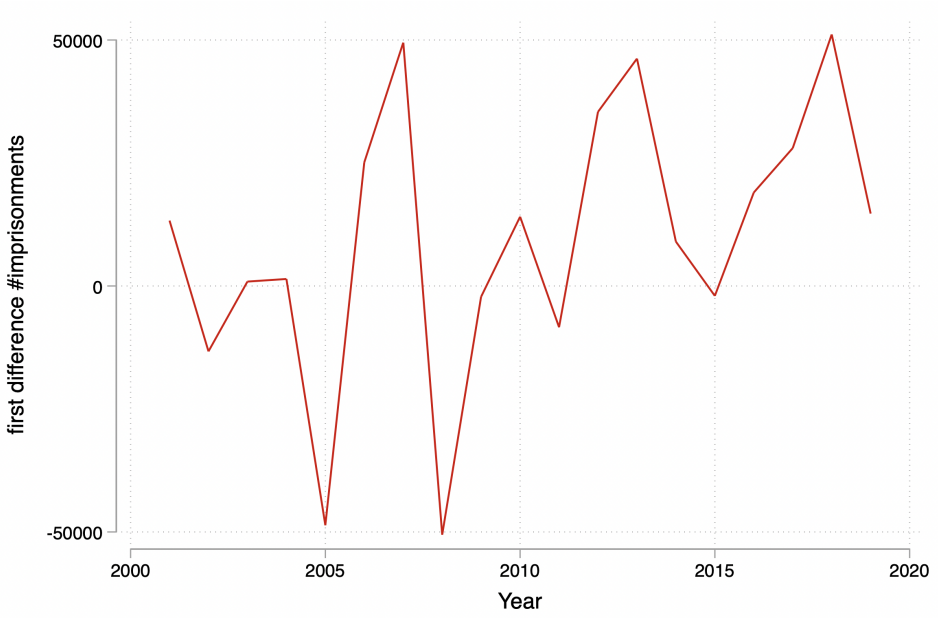

Figure 6: Imprisonment in Turkey First Difference

- The first difference captures the mass imprisonment of political opponents followed by 2011-2012 Kurdish Protests and 2016 coup attempt.
- Perhaps these rises are captured as part of the quadratic trend hence not showing up in figure 17.
- There seems to be some seasonality. I tried to see if it was related to election cycles but did not turn out significant nor add any explanatory power.

1.0.4 ACF/PACF command and output

```
. corrgram total_dtd2, lag(7)

                                          -1       0       1 -1       0       1
 LAG       AC       PAC      Q     Prob>Q  [Autocorrelation]  [Partial Autocor]
-------------------------------------------------------------------------------
1        0.0278   0.0279   .01796  0.8934
2       -0.4526  -0.4707   5.0255  0.0810
3       -0.0623  -0.0092    5.126  0.1628
4       -0.1879  -0.5561   6.0971  0.1920
5        0.1066   0.2717   6.4304  0.2666
6        0.3217  -0.2143    9.683  0.1387
7       -0.1510  -0.1442   10.455  0.1642

. corrgram tot_diff, lag(7)

                                          -1       0       1 -1       0       1
 LAG       AC       PAC      Q     Prob>Q  [Autocorrelation]  [Partial Autocor]
-------------------------------------------------------------------------------
1        0.0043   0.0042   .00041  0.9839
2       -0.2768  -0.3142   1.7985  0.4069
3        0.3418   0.4332   4.7111  0.1942
4       -0.0929  -0.2951   4.9406  0.2935
5       -0.0120   0.5003   4.9446  0.4227
6        0.3936   0.2894   9.7005  0.1378
7       -0.0520   0.3419   9.7905  0.2008
```

Figure 7: Auto Correlation in Imprisonments

- Whether looking at the de-trended series of the series of first differences, the series seem to have a negative auto-correlation with its second and fourth lags.
- It might be an AR(2) process with coefficients 0 and -0.3.