

A STUDY OF SUICIDES THROUGHOUT EUROPEAN UNION

Analysis of Greece

For the last several years suicides in Greece have drawn national and international interest due to the current economic crisis, which has engulfed Europe since 2008. This period coincided with the implementation of fiscal austerity, increase of unemployment rates and negative economic growth, and had severe adverse effects on various aspects of people's daily life and probably on their mental health.

The scope of the project is to use open data to study whether there is an increasing trend for Greece or better whether the behavior of Greece is different than the rest of the Europe.

The datasets that has been collected are:

1. Absolute numbers of suicide for the period 2011-2015 (Eurostat)
2. Suicide rates (in terms of deaths per 100.000 inhabitants for the period 2004-2014 but with some missing values. (OECD)
3. Unemployment rate for the period 2004-2014 (OECD)
4. Total tax revenue as a percentage of GDP for the period 2004-2014 (OECD)

In the first section i will analyze the absolute number of suicide in European countries, then I will given particular attention to the Greece situation and finally I will study the correlation between unemployment and taxation level with suicides in Greece and in Europe.

LEGEND: If a paragraph starts with “ ” it is merely done to improve visualization skills, not for the storytelling of the project.

1. Eurostat Dataset: Absolute number of suicide for the period 2011-2015

The data collect by Eurostat refers to 33 countries. It includes information about countries that are not European countries (Iceland, Norway, Serbia, Switzerland, Turkey) but instead they belong EEA (European Economic Area) and that tried to enter in European Union.

The first plot is an interactive for the year 2015, that shows informations about the absolute number of suicide. A graduate scale of colors show the value registered for each country. In the table on the right side is possible to read the exact value. Should be noticed that Cyprus and Turkey are not plotted by the map due to underlying parameters setting of the “GoogleVis” package.

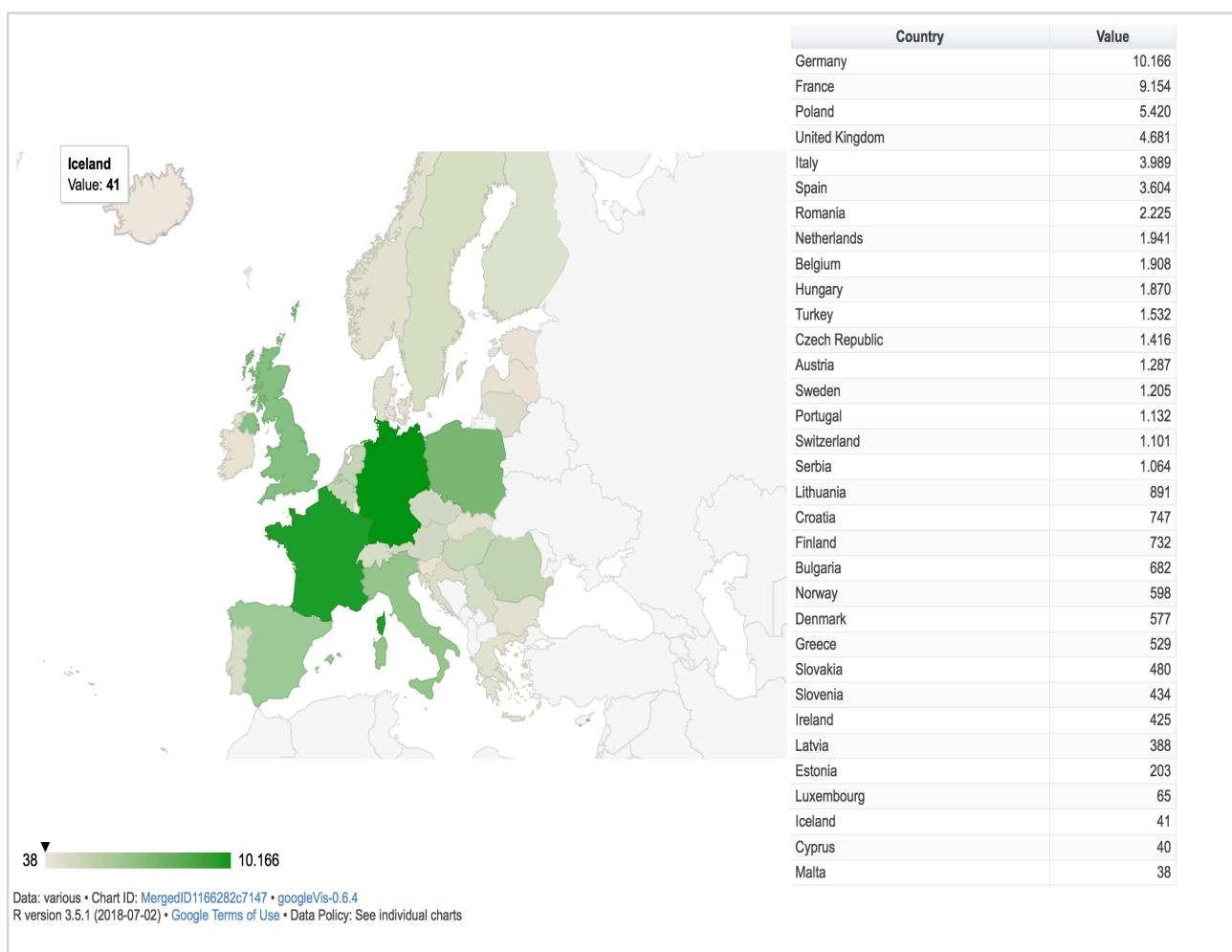


Figure 1: Interactive map (2015) - Absolute Values Suicide



In order to better illustrate the evolution of the number of suicide in Europe it is helpful to plot a map for each year of the period analyzed.

I divided the values of suicide in 9 different equally-sized bins and I assigned a scale of colors to each of them passing from hot (red scale) to cold (light green - dark green scale) depending on the total suicide registered (higher to lower).

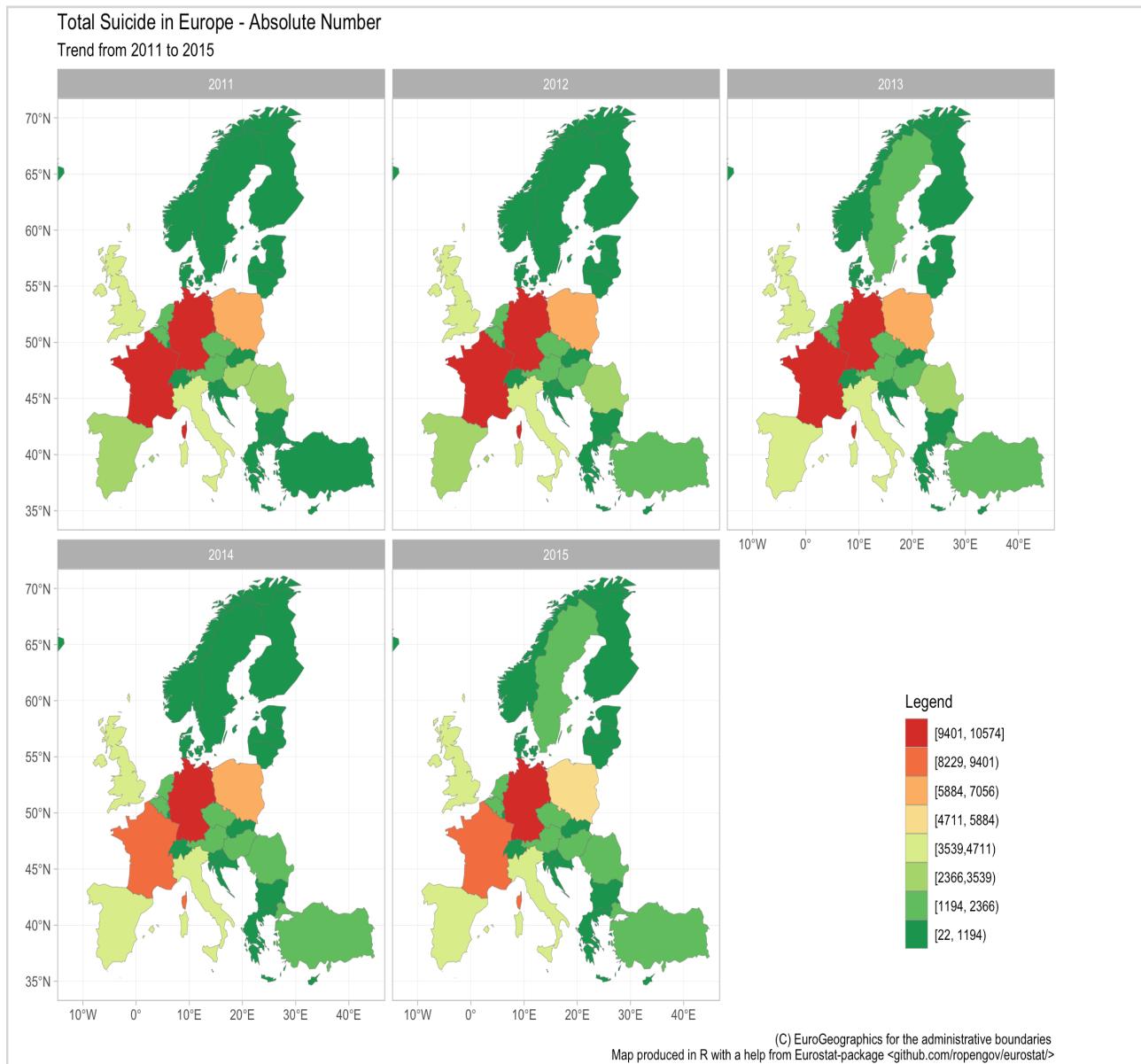


Figure 2: Eurostat Map (2011 to 2015) - Trend of Absolute Values Suicide

The main aim of this plot is two folded: the first is to get a first impression about the trend of suicide in Europe and the second is to visualize the countries where the absolute number of suicide is higher.

Overall it is possible to observe a descendent or flat trend for all the countries. Since the bins are arbitrary, it is possible to understand only the main changes, and a further analysis is needed to have better insights. It is possible to observed:

- Decreasing trend for Hungary in 2012
- Decreasing trend for Turkey in 2012
- Decreasing trend for Spain in 2013
- Decreasing trend for Sweden in 2013 with an increase in 2014 and again a decrease in 2015
- Decreasing trend for France in 2014
- Decreasing trend for Germany in 2014
- Decreasing trend for Romania in 2014
- Decreasing trend for Poland in 2015

“ In Fig.3 i illustrated the trend lines for 4 neighborhood Countries of Greece (Turkey, Bulgaria,Serbia,Romania,Greece). Since to properly compare the value I should have taken into account the population this graphs is merely done for improving visualization skills” .



Figure 3: Greece vs Neighborhood Countries (2011 to 2015) - Trend of Absolute Values Suicide

2. OECD Dataset: Suicide rate per 100.000 inhabitants for the period 2004-2014

Suicide rates are defined as the deaths deliberately initiated and performed by a person in the full knowledge or expectation of its fatal outcome. Comparability of data between countries is affected by a number of reporting criteria, including how a person's intention of killing themselves is ascertained, who is responsible for completing the death certificate, whether a forensic investigation is carried out, and the provisions for confidentiality of the cause of death. Caution is required therefore in interpreting variations across countries.

The original source of the data is the WHO Mortality Database. This indicator analyzed is presented as a total and is measured in terms of deaths per 100 000 inhabitants (total).

In Figure 4 it is illustrated the trend of Suicide Rate in Greece. It can be seen that there is an increasing trend. From 2004 to 2014 it has been registered an increase of 56,7% in suicide over 100.000 inhabitants.

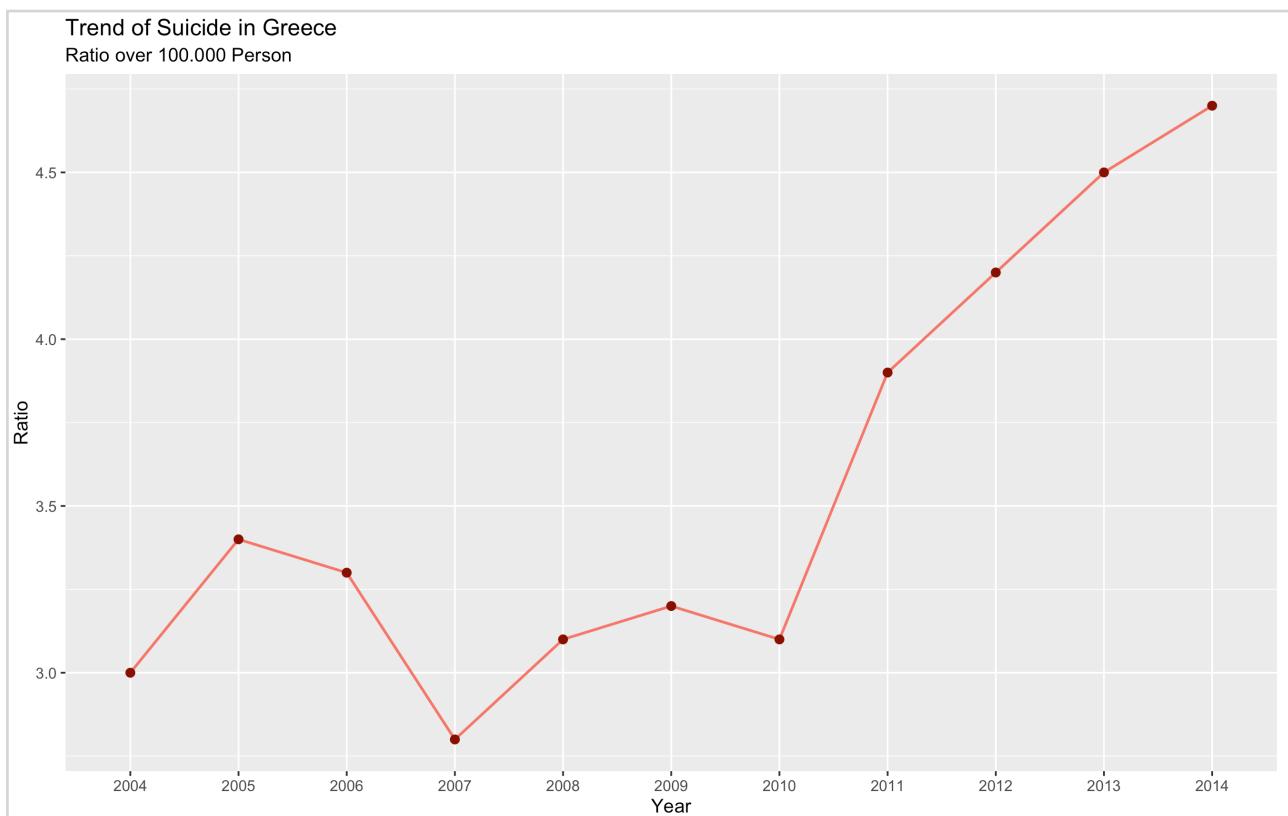


Figure 4: Trend in Greece (2004 to 2014) - Suicide per 100.000 person

"For the scope of the Assignment, in Figure 4,5,6 i analyzed the same information with different graphs style".

In figure 5 it is shown the trend for every country. Due to different levels the indicator most lines seems to be flat but it is not necessary true.

Remembering the result of previous plot, many countries decreased significantly their suicide rate.

A positive trend is registered for:

- GRC (Greece)
- ITA (Italy)
- NLD (Netherlands)
- ESP (Spain) and PRT (Portugal) very small increase

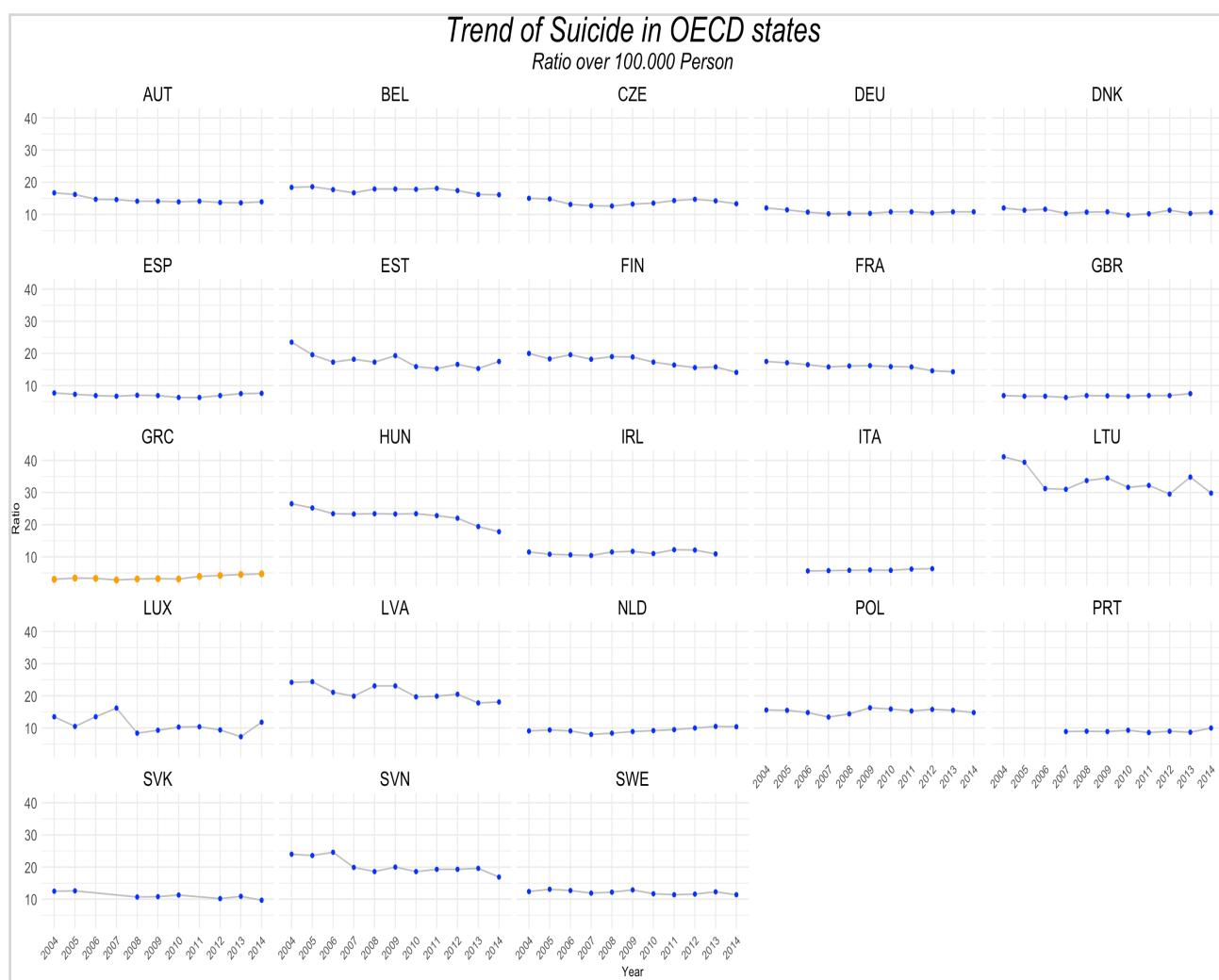


Figure 5: Trend in OECD countries (2004 to 2014) - Suicide per 100.000 person

The next graph (Figure 6) is useful to visualize in one unique plot the progression of the indicator analyzed.

The way in which it will be looked is to first search a country on the left side y-axis and then look its ranking on the right side y-axis. From this graph is easy to visualize that the Country which registered the highest number of Suicide is Lituania, while the Country with lowest rate is Greece.

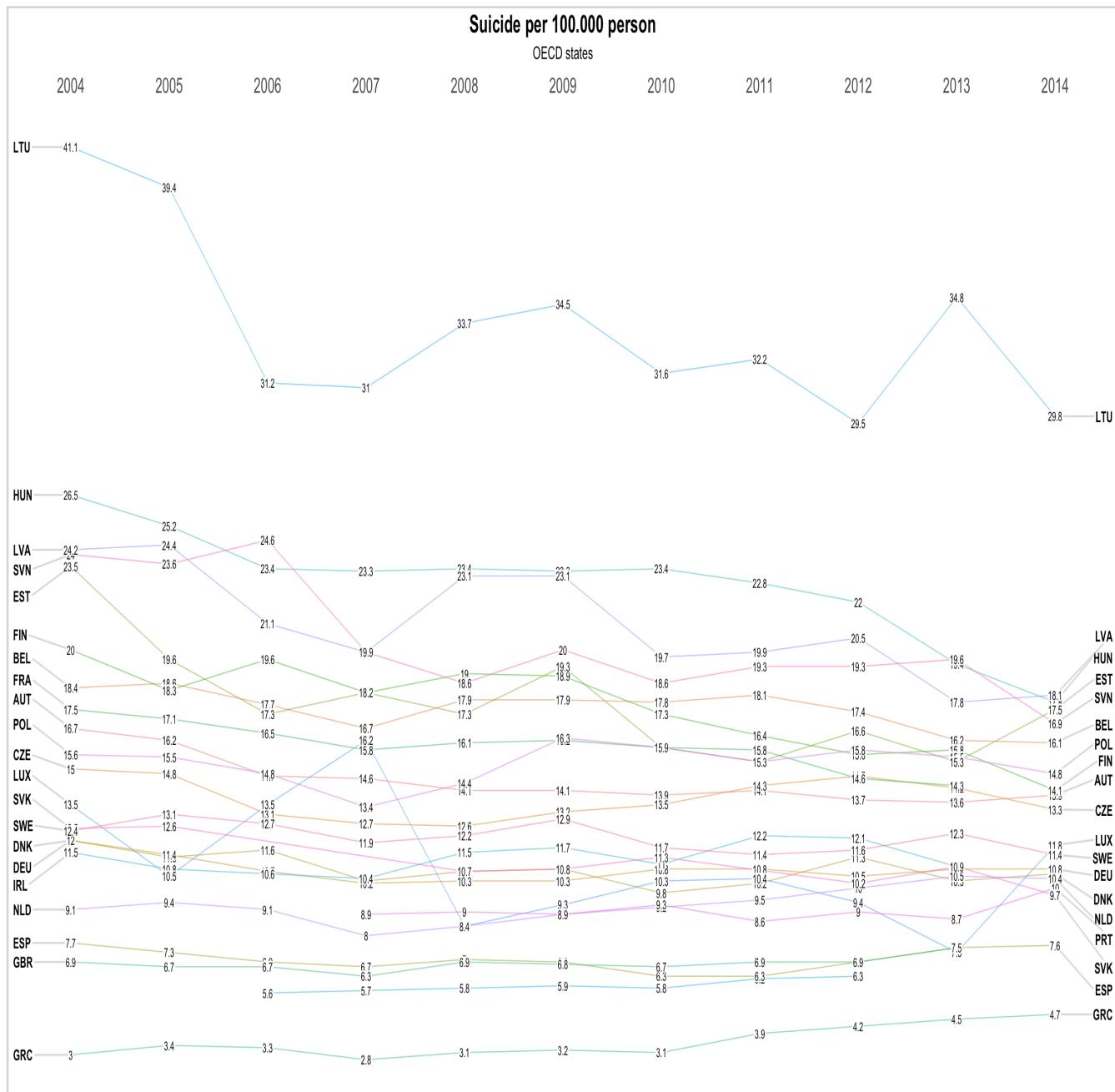


Figure 6: Comparing Trend in OECD countries (2004 to 2014) - Suicide per 100.000 person

In this graph (Figure 7) is again possible the tendency of Suicide Rate over years for each country. Here It is more easy to see (in comparison with Fig.5, Fig.6) that some squares are empty. This means that we have missing informations for that particular country.

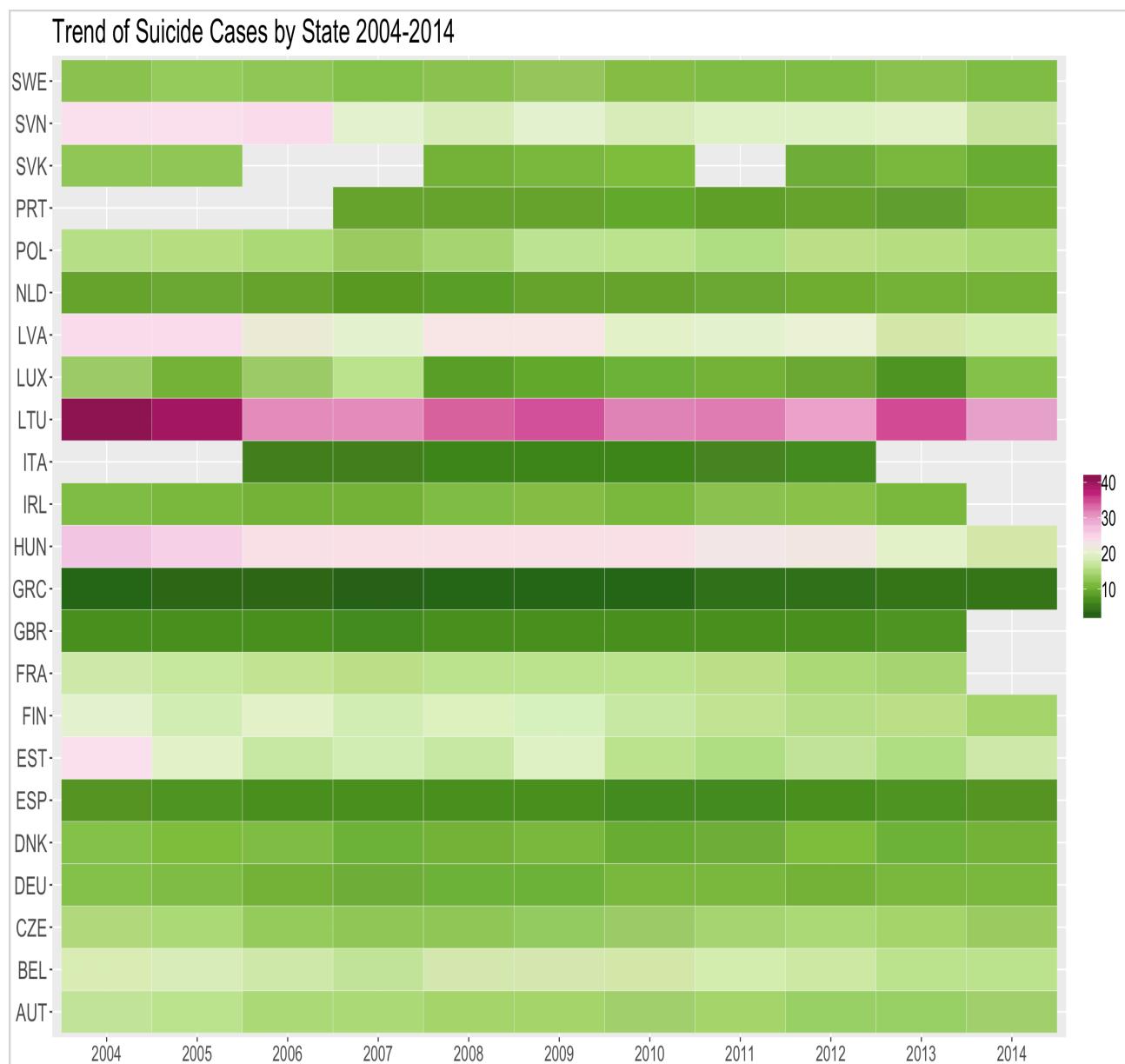


Figure 7: Comparing Trend in OECD countries (2004 to 2014) - Suicide per 100.000 person

To sum up the information in Figure 5-6-7, I decided to plot the value for Greece with respect to the average ratio for all the countries. This can be seen in Figure 8. Regardless the population number (the rate is a simple index number) the value of Greece is much lower than the average in EU. However, while the trend for the EU countries is downward (from 15.56 to 13.01), the one of Greece significantly increased (from 3 to 4.7).

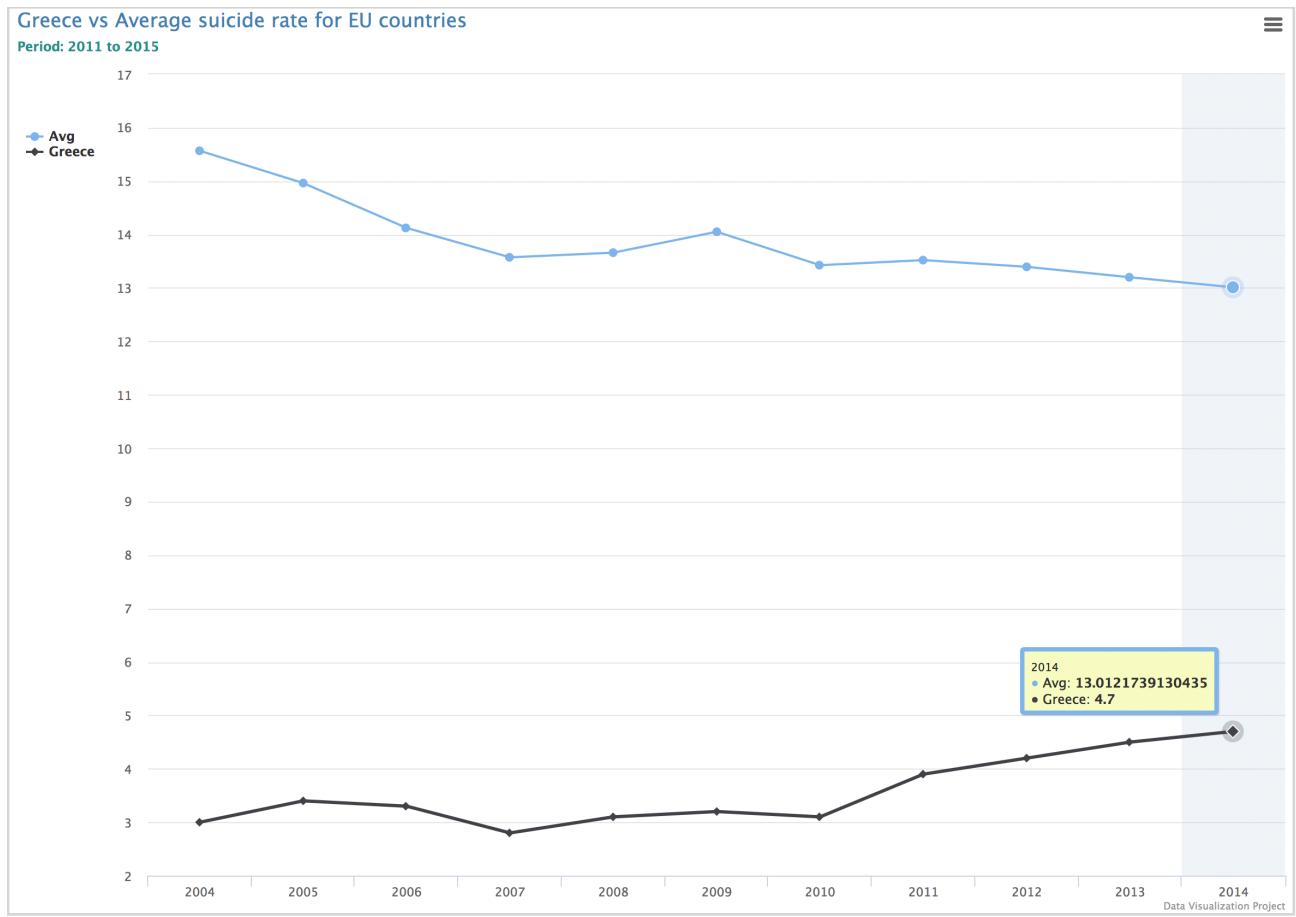


Figure 8: Comparing Trend Greece vs Avg Value EU (2004 to 2014) - Suicide per 100.000 person

HIGHCHARTER

In Figure 9 i firstly imputed the missing values using the mean value over the time series. Then I calculate the EU average among all the States. In this way it is possible to see how each Country is over / under the EU union. Half countries are above the average, while the other half is below. This indicates that the distribution of suicide in Europe is balanced.

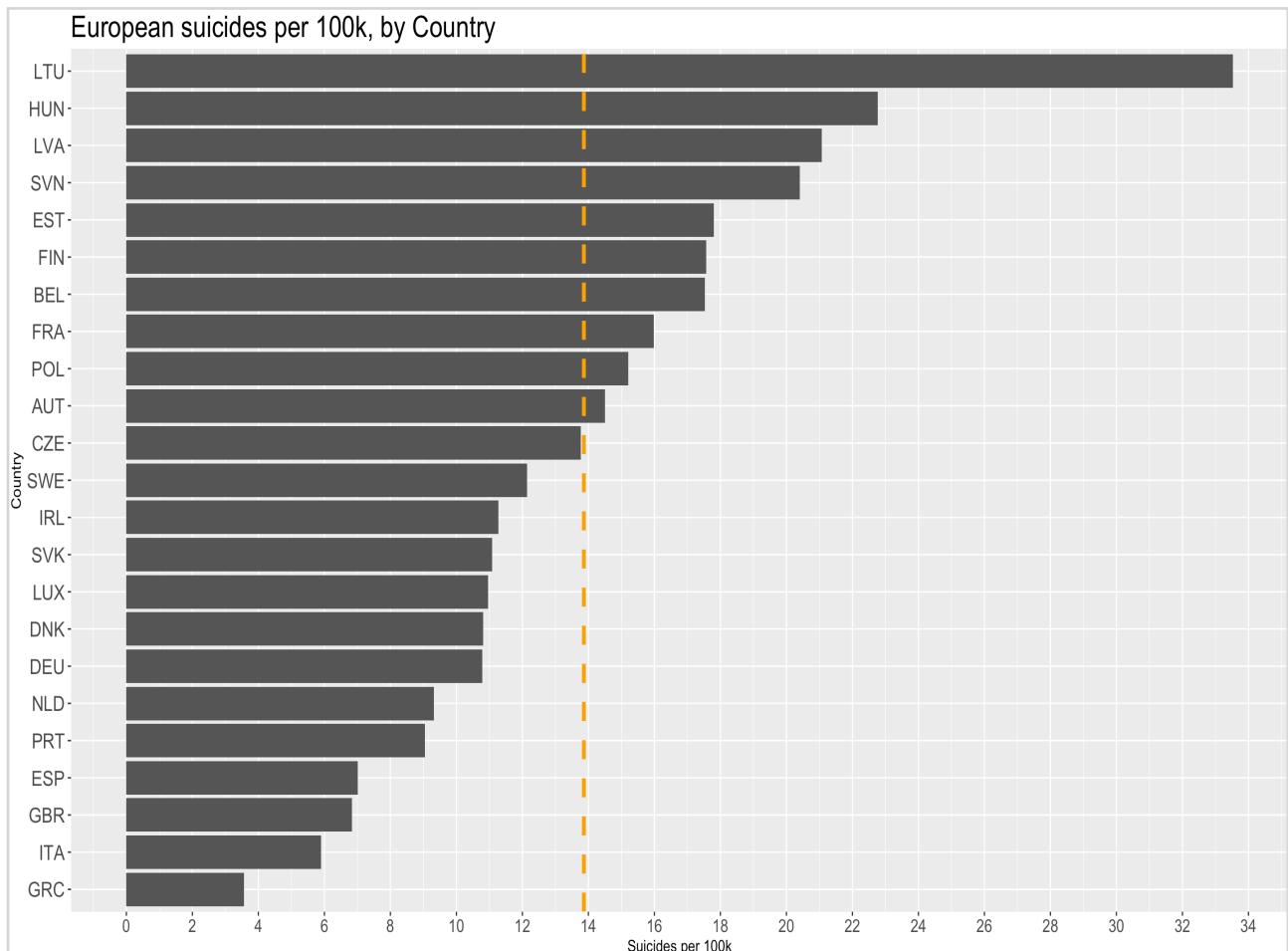


Figure 9: Comparing Avg Suicide Rate in OECD countries (2004 to 2014) - Suicide per 100.000 person

In figure 9 I'm interested in how the suicide rate is changing over time within each country. Instead of visualizing all 23 countries rates across time, I fit a simple linear regression to every countries data. I extract those with a 'TIME' p-value (*corrected for multiple comparisons*) of < 0.05.

In other words: as time goes on, I look for countries where the suicide rate is linearly increasing or decreasing over time. These can then be rank ordered by their 'TIME' coefficient, which would be their rate of change as time goes on.

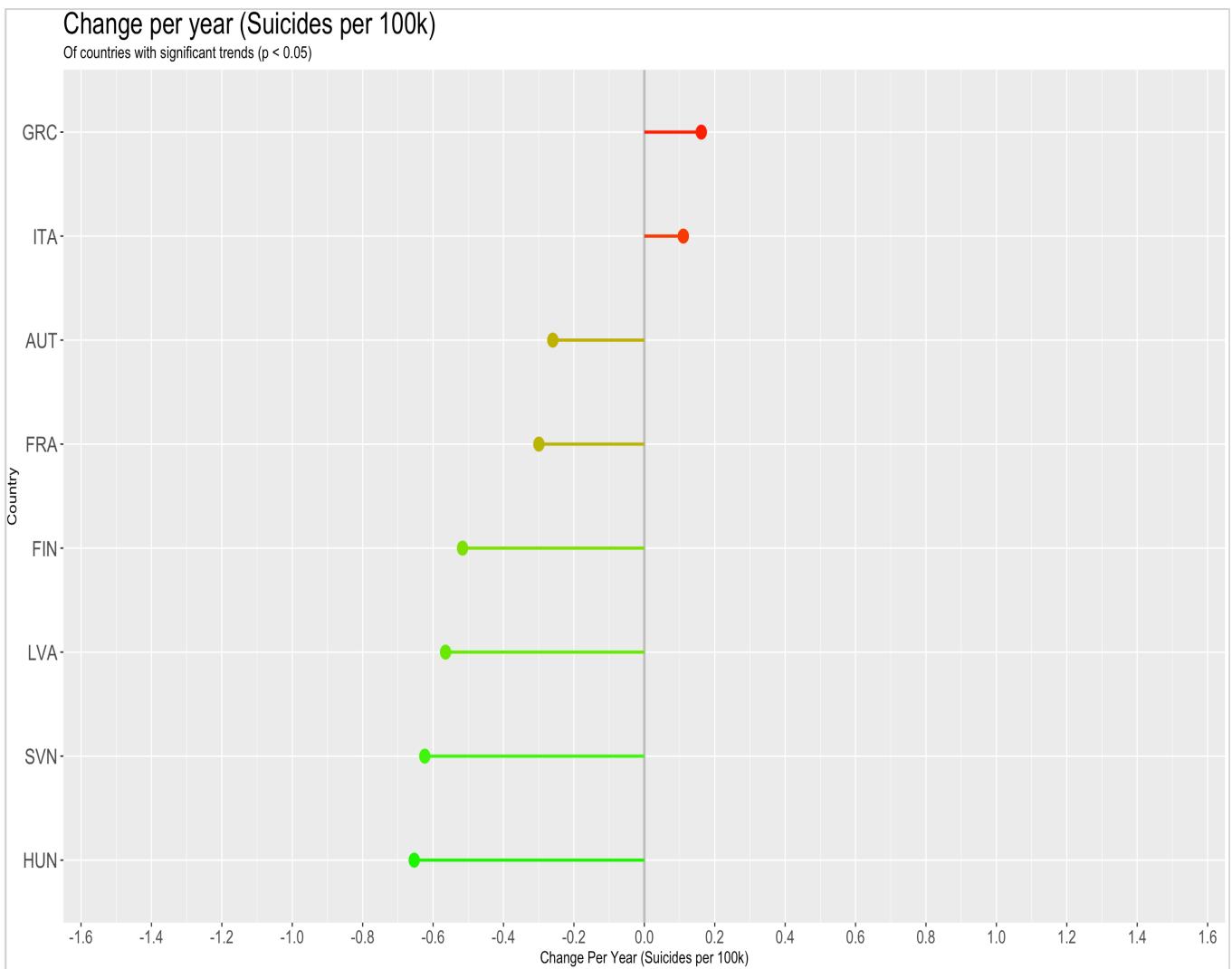


Figure 10 : Significant linear trend (2004 to 2014) - Suicide per 100.000 person

Greece and Italy are the only country which have had a significant positive trend. Even if Greece is the country which have less Suicide over all Europe the tendency seems to be the most likely to increase.

Hungary, Slovenia, Lithuania, Finland have registered a significant decreasing trend over the years studied.

“ The information in Figure 11 is already present in Fig.5 , Fig.6. Here is presented with a different layout style and display only the country with significant a significant increasing / decreasing trend “.

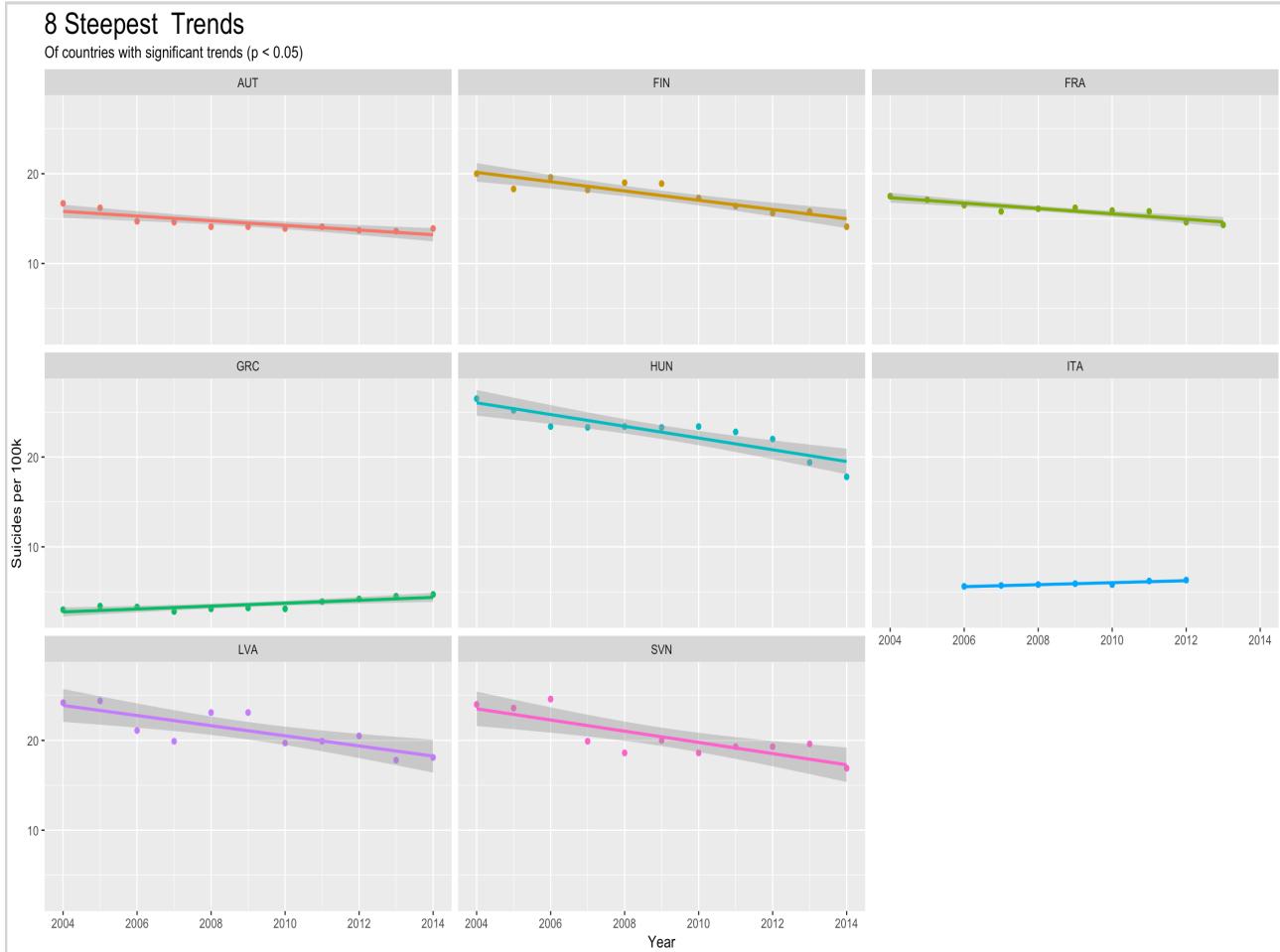


Figure 11: Countries with significant linear trend (2004 to 2014) - GGplot2

The figure 12 show a Dumbbell Plot. It is used to visualize two point in time. Green point represent suicide rate for the year 2004 and violet one for 2014. This means that if we see a violet point on the right side the trend is increased by the length of the segment plot (it is shown also the difference in number)

Again it is possible to see how Greece is the first country which had the greatest increment among the year 2004 - 2014, followed by Netherlands, Portugal and Italy. Should be notice that for country like Italy (which has been before ranked as the second countries with highest steep trend) we don't have information about y2014 (and y2013), then imputing the mean value makes the trend more flat and biased. The reason why Netherland has not be included in the previous plot is because its trend is fluctuating.

Change in the ratio of suicide per 100.000 population

From 2004 to 2014

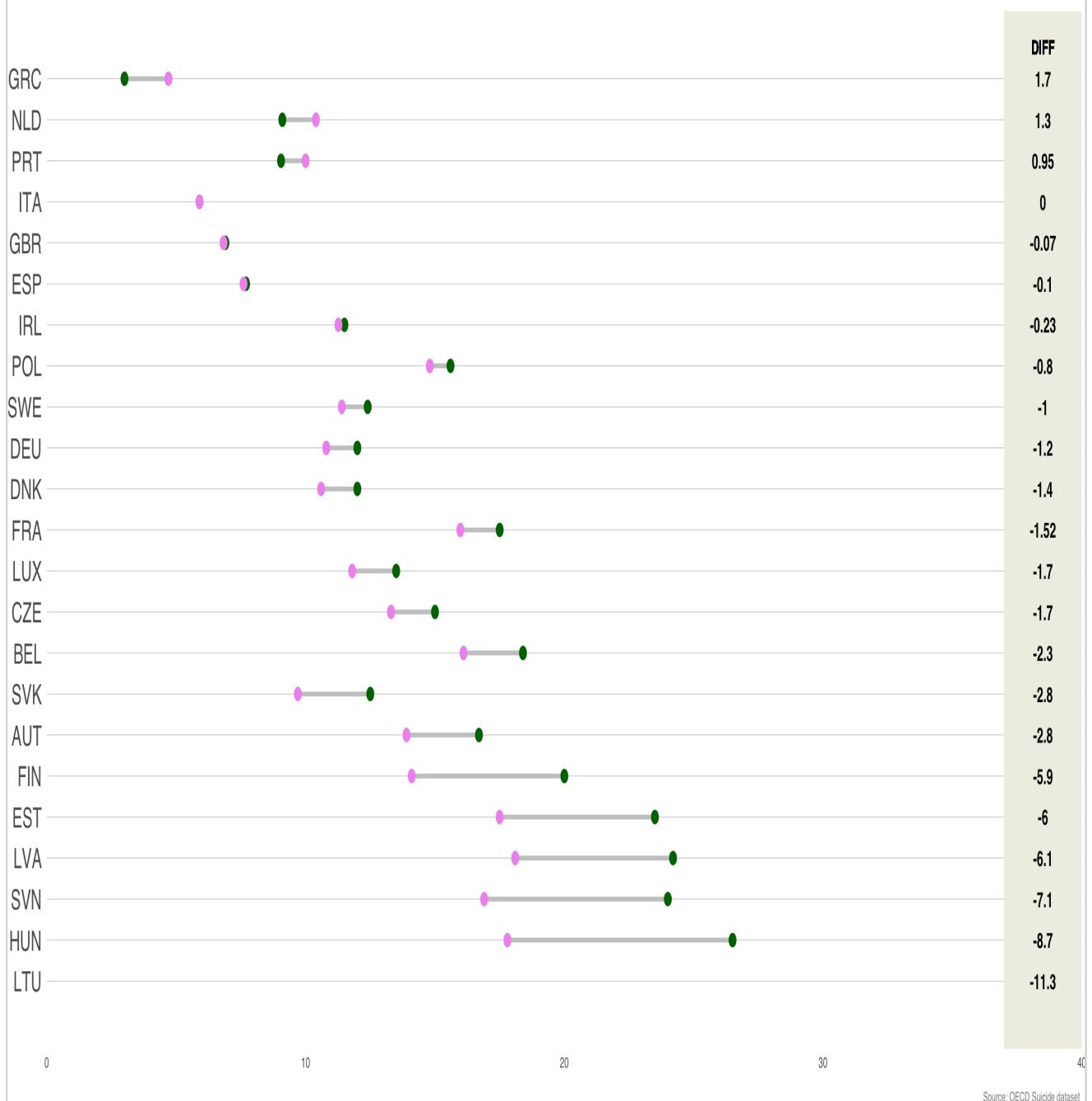


Figure 12: Dumbbell Plot (2004 and 2014) - GGplot2

3. OECD Dataset: Taxation Revenue and Unemployment

Here I'm interested to see if there are relationship between taxation level and unemployment rate with suicide rate. For that reason I collect from the OECD website the following dataset:

- A. Tax revenue is defined as the revenues collected from taxes on income and profits, social security contributions, taxes levied on goods and services, payroll taxes, taxes on the ownership and transfer of property, and other taxes. Total tax revenue as a percentage of GDP indicates the share of a country's output that is collected by the government through taxes. It can be regarded as one measure of the degree to which the government controls the economy's resources. The tax burden is measured by taking the total tax revenues received as a percentage of GDP. This indicator relates to government as a whole (all government levels) and is measured in million USD and percentage of GDP.
- B. Unemployment rate is the number of unemployed people as a percentage of the labour force, where the latter consists of the unemployed plus those in paid or self-employment. Unemployed people are those who report that they are without work, that they are available for work and that they have taken active steps to find work in the last four weeks. When unemployment is high, some people become discouraged and stop looking for work; they are then excluded from the labour force. This implies that the unemployment rate may fall, or stop rising, even though there has been no underlying improvement in the labour market.

Fig.13 and Fig.14 shows the trend for suicide rate, taxation and unemployment rate. The first figure 13 represent the values observed for all European Countries, while figure 14 only for Greece. It can be seen the rise in unemployment rate and taxation (more flat) does not influence, on average, the cases of suicide in Europe, differently from Greece where the strong rise of unemployment and taxation level seems to be a positive effect on Suicide.



Figure 13: Average Unemployment, Taxation and Suicide (2004 and 2014)

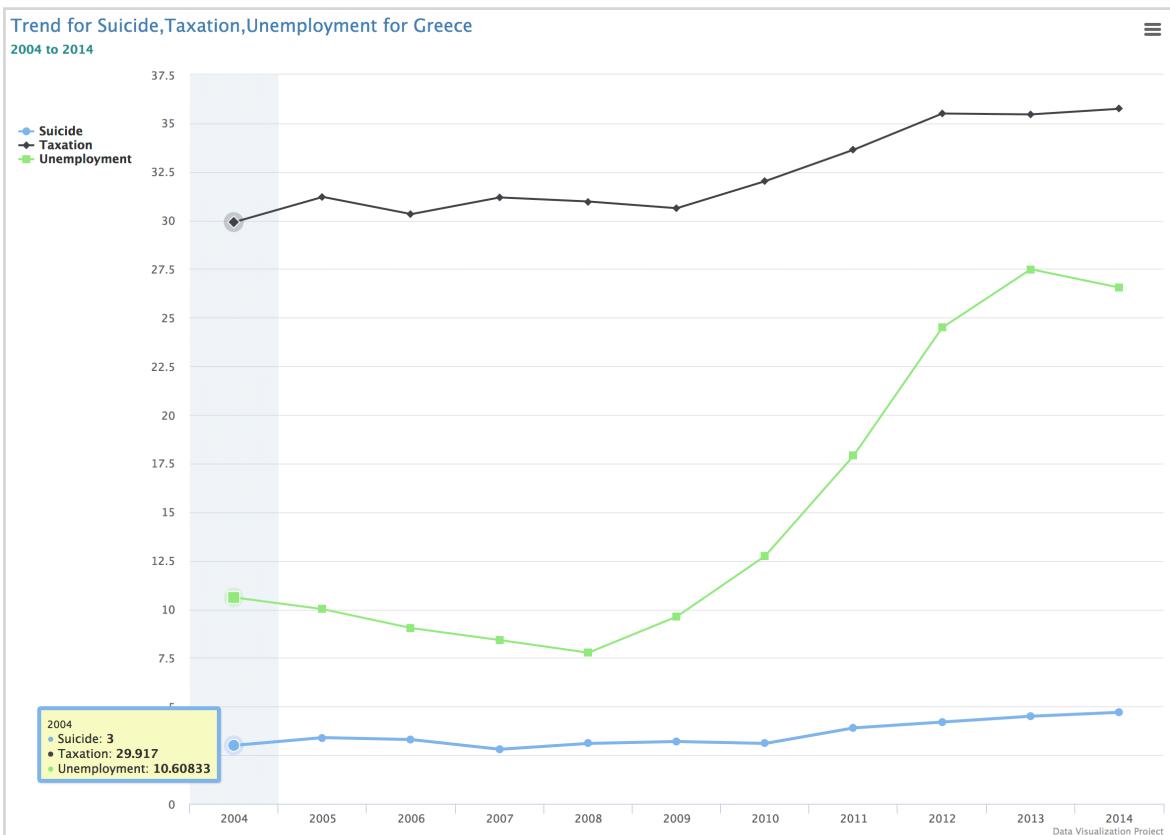


Figure 14: Greece Unemployment, Taxation and Suicide (2004 and 2014)

The figure 15,16 shows a treemap for the new indexes object of study.

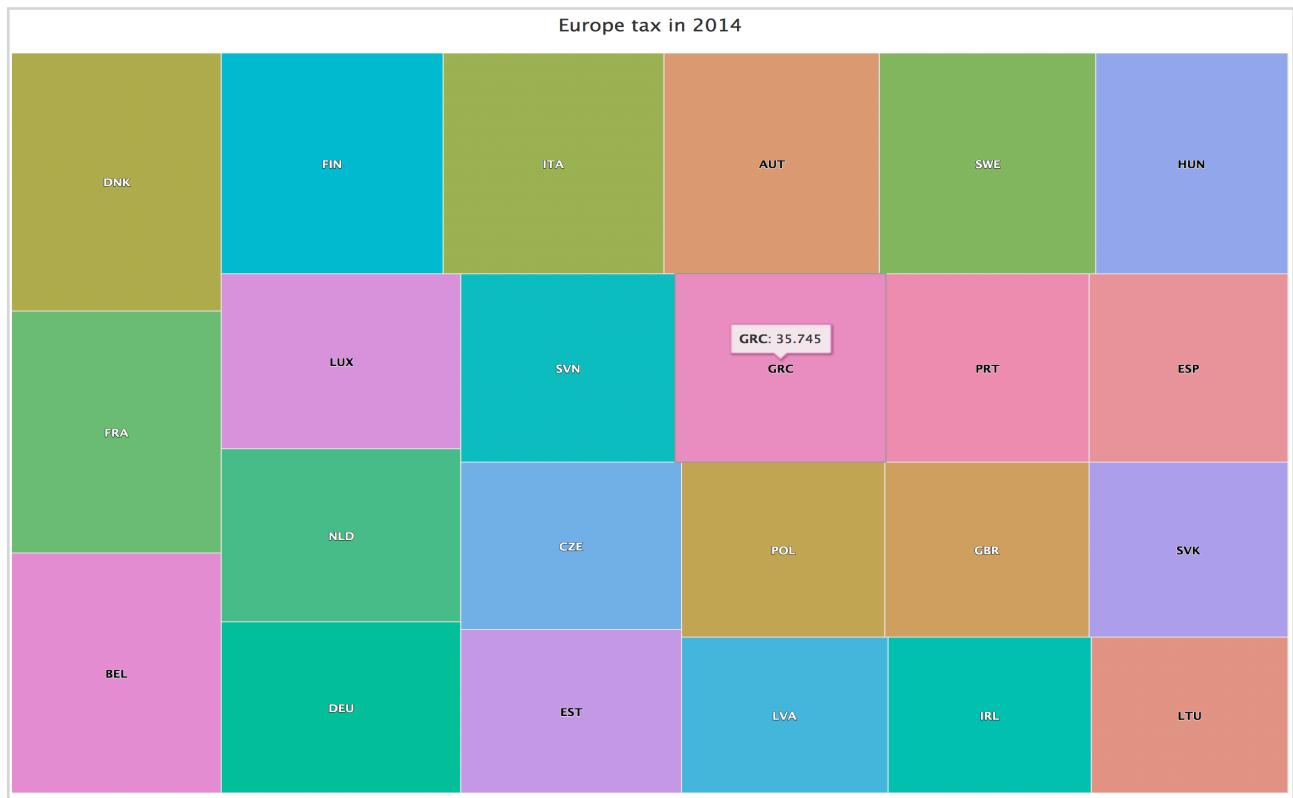


Figure 14: TreeMap for TAX (2014)

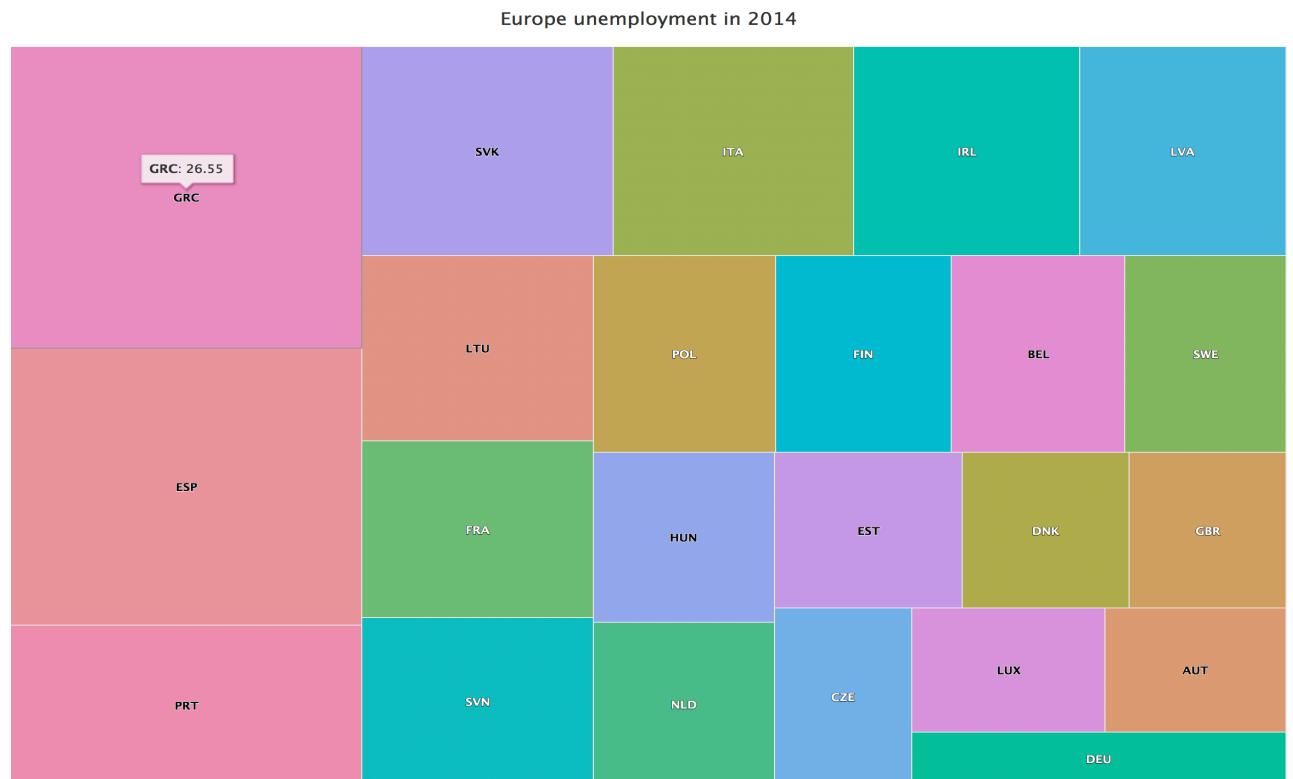


Figure 15: TreeMap for UNEMPLOYMENT (2014)

Fig. 16 and Fig.17 plots the countries in a plane so as we can see how closer are in terms of Suicide rates, Tax revenue and Unemployment. Overall small changes has been observed considering 2004 and 2014.

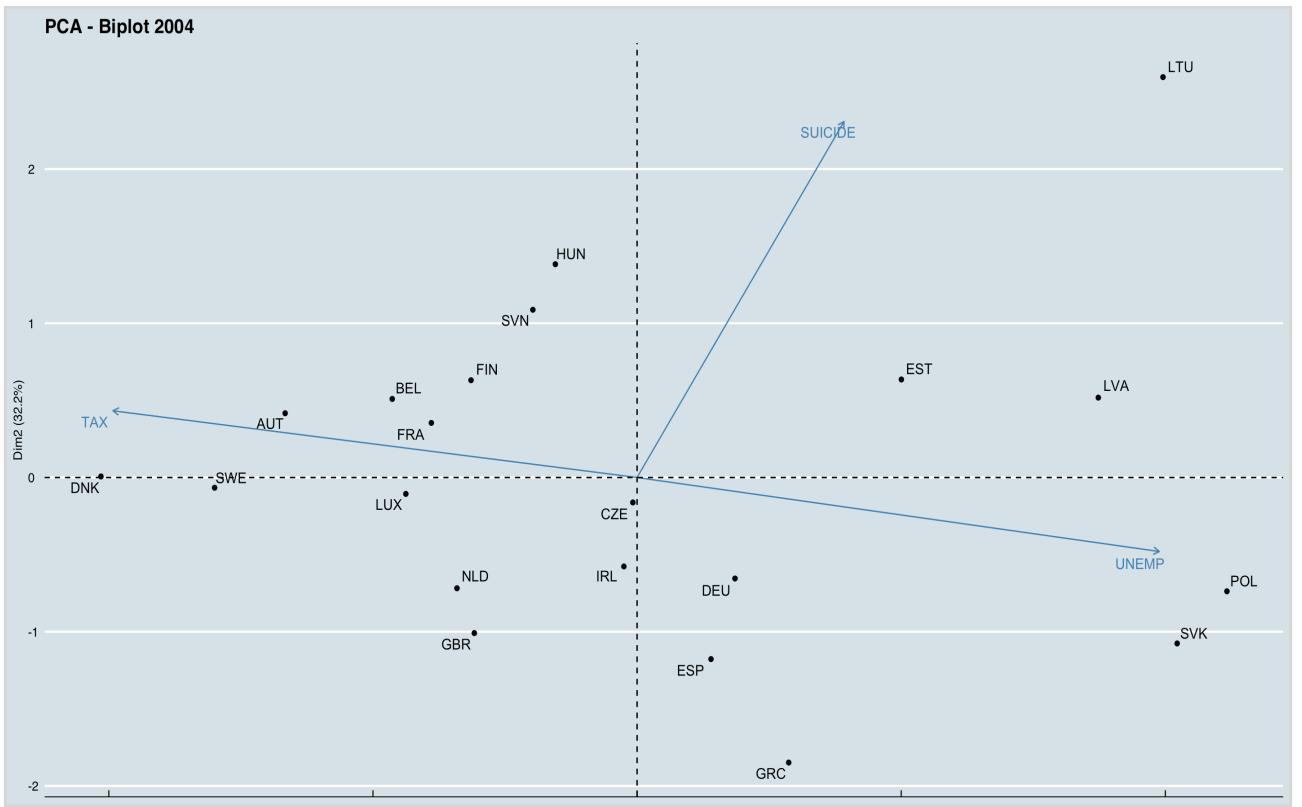


Figure 16: PCA biplot for 2004

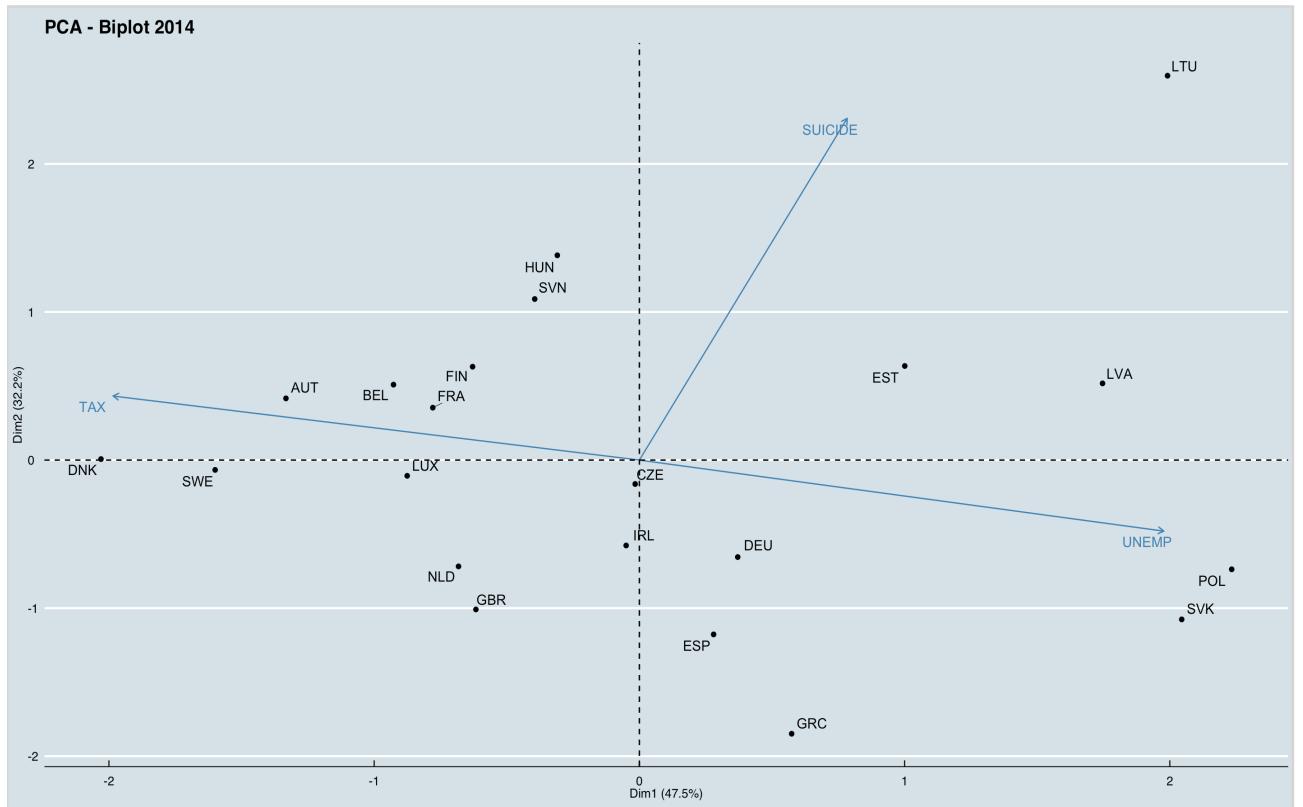


Figure 17: PCA biplot for 2004

In Fig.18 and Fig. 19 it is possible to see the effect of the economic crisis. This raised the unemployment and increased the ratio of suicide in Greece. Horizontally it is displayed the average value for unemployment over EU.



Figure 18: Suicide rate vs Unemployment 2009

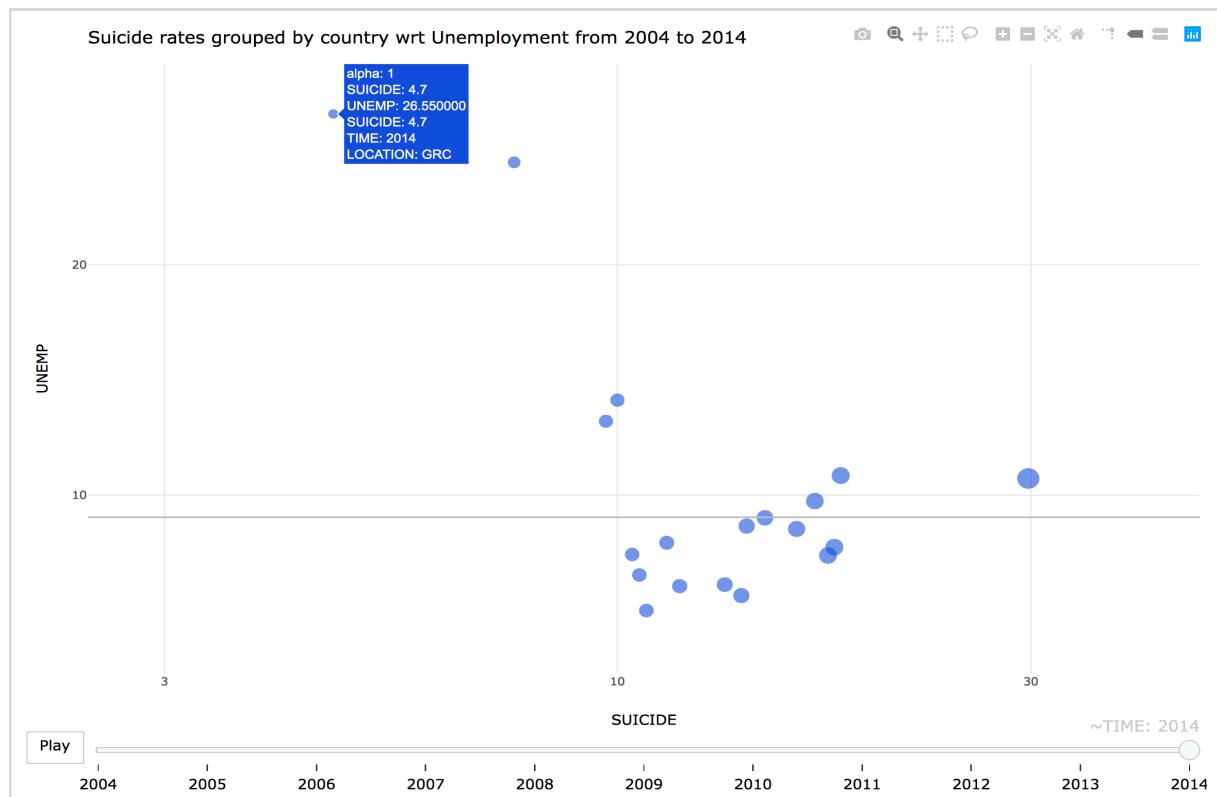


Figure 19: Suicide rate vs Unemployment 2014

