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# Electoral Systems and their Influence on Economic Growth

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# Index

# Chapter 1. Introduction

## Section 1.1 The government in an economy

Politicians, philosophers and economists have been arguing about the role of the government in a country's economy for centuries. The government is an important economic agent, and it is the only agent whose actions can be controlled to some extent; it would be impossible to 'control' all consumers or firms in an economy. The government spending is decided upon by a relatively small group of people, but the economic impact of that spending is quite large (Galí et al., 2007; Cogan et al., 2010**)**. Therefore, the way the government should spend money is a widely researched topic. Most high school economics students know Keynes' anti-cyclical budget policy (Keynes, 1933**)**, and the field of policy economics has established itself as an important field within the economic science. This is understandable; if there is a governmental policy that can achieve a certain goal that we have in mind for our economy, then it might be a good idea to implement that policy. But what if we would take one step back? What if we could change the way an economy works, simply by changing the way we elect our politicians?

## Section 1.2 Electoral systems

Most democratic countries have a government consisting of chosen politicians, and some form of either a unicameral or bicameral parliament. The way in which politicians are chosen into a parliament differs vastly among countries. However, a consensus exists between political economists, that there are three important electoral systems. Firstly, political economists distinguish a proportional representation system (often abbreviated as PR), in which, in its purest form, a certain percentage of votes yields the same percentage of seats in the representative house (Aboal, 2009; Shepsle, 2010).

Secondly, they distinguish a majoritarian system, in which a country is often divided into a large number of districts. A district chooses one or a few representatives, which leads to overrepresentation of the party with the most votes (Aboal, 2009). For example, if a party receives 50% of the votes in 50% of the districts, that party holds 50% of the parliamentary seats, while it has only received 25% of the total votes. A majoritarian electoral system often

leads to two large parties, while a PR system leads to multiple smaller parties. This concept is also known as Duverger's Law (Shepsle, 2010).

Some countries have chosen a mixture of these two systems. Representatives are first chosen in a majoritarian system. Then, extra representatives are added in a proportionate, list-wise election (Karp & Banducci, 2008). Some countries use this proportionate part of the election to correct for any disproportionality in the election outcome. Other countries have not designed this PR part to make the election more proportionate. These forms of mixed systems, along with the PR and majoritarian system, will be elaborated upon in Chapter 2.

## Section 1.3 Choosing a system

Obviously, there is no consensus about which political system is 'better'. When choosing between electoral systems, countries face several trade-offs, and an important one is that between 'representation' and 'governance'. Pure PR systems make sure that a parliament represents all political movements within a country, and more specifically, also represents minorities. On the other hand, in countries with PR systems, there is hardly any party that holds a majority, which means that coalitions have to be formed. That means that they have to negotiate, and get along with each other. In majoritarian systems, one party often holds a majority, which means that it can start governing right away, and that it does not have to take other parties into account (Shepsle, 2010). Parties that form a coalition tend to disagree more than one-party governments. Because of this, coalition governments tend to fall earlier. This is also seen in the average government length; the average length of government in Canada, which uses a majoritarian system, is 3 years, 10 months and 14 days (Parliament of Canada, 2014); in Belgium the average length is 1 year, 7 months and 7 days, and in The Netherlands, it is 2 years, 4 months and 27 days[1]. These countries both use a PR system.

These arguments are of a political and ethical nature. As mentioned earlier, this thesis will investigate whether there is actually an economic argument for either system. Economists have philosophized about the way an electoral system changes policy outcomes, but they

[1] In all Belgium and The Netherlands, the constitutional term length is 4 years. In Canada

have not performed an experimental research. For example, Aboal (2009) has developed a model with three classes; rich, middle and poor, and he compares the outcome of economic policy between a PR and majoritarian system. He finds that a PR system leads to 10% more economic growth over one generation, or alternatively 0,14 percentage point GDP growth extra per year. Persson and Tabellini (2003) develop a model with three types of governmental benefits: those that benefit many citizens, those that benefit few citizens, and those that benefit politicians. They argue that in majoritarian systems, parties know that they will win for sure in some districts, and therefore they focus their campaign on other districts. Therefore, the policies that they propose are targeted at those pivotal districts, thus benefiting especially those citizens. They argue that countries with PR systems lead to policies that target a large group of citizens. This leads to smaller government spending and lower taxes in majoritarian systems (Milesi-Ferreti et al., 2002). Also, rent seeking is minimized as district size grows (Myerson, 1993).

## Section 1.4 The existing literature and research question

So, looking at the existing literature, some theoretical research and arguments exist, claiming that there might be a difference in impact on economic growth between electoral systems. Persson, Roland and Tabellini (2003) have constructed a model concerning the relationship between electoral systems and government spending, but this is only part of economic performance. It would be interesting to see whether there is actually an economic argument for one of the three systems (PR, majoritarian or mixed) for countries to choose one of these. It might look irrelevant to debate about choosing electoral systems; most countries have already designed their electoral system, and for them it might feel like they are set in stone. However, in 1993 New Zealand held a referendum among citizens in which they could, more or less, choose between changing into a PR system, of retaining the existing majoritarian system. The majority of citizens chose to change the system in to PR (Vowels, 2005**)**. Not only the opportunity to vote in a referendum about which electoral system is used in a country is noteworthy, New Zealand's economic growth was also significantly larger after 1993 than before.

Because of the theoretical research suggesting a different effect on a country's economic performance, the research question that this thesis seeks to answer is:

**How does economic growth differ among electoral systems?**

It could be very difficult to examine such a difference; GDP data is often measured in local currency, and is very difficult to compare between countries. GDP growth data is more comparable between countries, but still there is much variation each year in growth data. It would be better to estimate some sort of average growth number for each country, so that only long-term effects are captured, and thereby political effects become more visible.

## Section 1.5 Natural growth and data

Economists sometimes use the term 'natural' growth, which is often described as the growth that an economy on average, intrinsically experiences; it is the growth that it can achieve with its existing production factors, leaving out growth shocks and cyclical effects (Lippi, 1999; Barro, 1991**)**. It would seem logical to assume that it is this growth that does capture long-term, integrated effects such as a political system. Therefore, it would be plausible to use this variable, natural economic growth, to study any difference among political systems.

Lippi (1999) tried to establish a model to study the effect of monetary policy on a country's economic growth. He regarded nominal economic growth in a year as the result of monetary policy, which could either result in inflation or real economic growth. Of course, monetary policy is targeted at real economic growth. So, Lippi sought to measure how effective monetary policy was in affecting real economic growth. However, in establishing his model, he studied the Philips curve, and described a way to calculate natural economic growth, using nominal and real GDP growth data. This model will be described in Chapter 2.

Clearly, not all existing countries have a democratic, political system that can be placed in one of the three categories mentioned earlier. Countries that have a dictatorial form of government, in which elections are not held or in which elections are manipulated, are not relevant for this research. This research tries to find an economic argument for democratic

countries in choosing between these electoral systems. Therefore, this research will focus on the countries that are a member of the OECD, the Organisation for Economic Cooperation and Development. This provides a number of advantages; the OECD measures economic growth, both nominal and real, for all its member countries, so that the data on economic growth is all derived from the same source. Also, all member countries have been included in lots of research. Both (Karp & Banducci, 2008; Lijphart, 1999) have tried to 'label' (most of) these countries as PR, majoritarian or mixed. So, using these labels, the natural growth data of OECD countries can be grouped into one of these systems. Some countries are not give a label in Karp & Banducci's nor in Lijphart's research. According to the characteristics of the different systems, described in Chapter 2, those countries are given a label in this thesis.

After reviewing Lippi's model, it is applied to all 34 countries in Chapter 3. Where problems arise, they have been taken care of. Further methods used to evaluate the results are discussed there as well. After the model has been estimated for all countries, it is used to calculate natural growth rates for each of them. The countries are then grouped into either PR system, majoritarian or mixed, according to Lijphart and Karp & Banducci. Five OECD countries have not been researched by either of them, so they are given a label according to the criteria described in Chapter 2.

## Section 1.6 The analysis

The natural growth data was grouped into one of three possible groups: PR, majoritarian and mixed. After checking the assumptions of ANOVA analysis for the data, the ANOVA test will be performed, to analyse whether natural growth differs significantly among groups. The ANOVA analysis will reveal that this is not the case; the natural growth does not differ significantly among groups; in fact natural growth rates lie very close to each other in the three different groups. This thesis will therefore not be able to establish a significant effect of the electoral system on the natural growth of a country.

# Chapter 2. Theoretical Framework

## Section 2.1 Electoral systems defined

In Chapter 2, the existing electoral systems in the world were grouped into three countries: Proportional Representation, Majoritarian and Mixed. As these three groups will be used later on in Chapter 3 and 4 to compare natural growth data, they will be elaborated upon and made more precise.

The system that is used in most mainland European countries is the Proportional Representation (PR) system, also called the Consensus model. Lijphart (1999) has intensively researched both this system and the Majoritarian system. As the term PR already implies, this system focuses on proportionate representation of cultural and political groups in the representative house. This is to make sure that minorities are also represented, and to make sure that a majority in the house is not easily obtained by one party (Lijphart, 1999). This leads to a few consequences; PR systems are characterized by multiple parties that themselves do not hold a majority. This creates a need for them to share the executive power of government in a coalition. Both the government itself and the majority of the house that supports the government thus consist of multiple parties, creating a balance between the executive and legislative power (Baron & Diermeier, 2001). If one of the coalition parties is displeased with the behaviour of the other(s), both the house majority and the government fall apart. Parties therefore have to cooperate and negotiate before taking any steps. Another element of the consensus model is that it has strong bicameralism. One house, often the House of Representatives, is the house in which the citizens are represented proportionally, while in the other house, often called the Senate, the different groups (language groups, ethnicities, religious groups) are represented equally. Think for example of the European Union; the European Parliament represents each country proportionally, while the European Council has one representative for each European country. Because of the importance of minority groups and local interests, the Consensus model often sees a strong division between centralized and decentralized government.

Almost contrary to the Consensus model, most Anglo-Saxon countries use a Majoritarian system, sometimes called the Westminster model (Lijphart, 1999). The main characteristic of

this system is that representatives are chosen in a disproportional way. The country is divided into districts or constituencies, and each constituency elects one or more representatives (Wilson, 1994). The more constituencies there are, and the fewer representatives each constituency elects, the more disproportionate the election results become. If a party is rather popular in at least half of the constituencies, it can easily obtain a majority of the representatives. The Westminster model often leads to two large parties who compete for the majority, and with a threat of a third party entering, they will locate at either side of the median voter; this is also called the Downsian model (Downs, 1957). Because either one of the parties holds the majority, the government also exist of only that party, and there is little need for a separation of the legislative and executive power. Therefore, in the Westminster model, the members of the government are often also members of the parliament, unlike in the Consensus model. The Westminster model often has a unicameral system or a bicameral system with a 'weak' senatorial house, with little legislative power.

Lijphart himself also acknowledges that there is hardly any country that has an electoral system that perfectly fits the characteristics of these two models. However, most countries can be labelled as either one of these, and Lijphart has done this for thirty-six countries, twenty-eight of which are OECD countries. Some countries have a rather difficult system which carries elements from both systems. It might therefore be a good thing to take these countries apart and regard their system as a mixed system.

Karp and Banducci (2008) mention that countries like Germany may not fit either model described above; in the German system, half of the members are chosen in a majoritarian way, but the voters also get a 'national' list vote (a 'Zweitstimme'). The chosen constituency representatives are then complemented with additional representatives to fit the distribution of national votes. This system can therefore be regarded as a majoritarian system with corrective features. Karp and Banducci also distinguish systems in which some members are chosen as constituency representatives, while others in the same house are chosen in a PR system; these systems however do not use the PR part as corrective. The countries that use a mixture of both majoritarian systems and PR systems, either corrective or non-corrective, are regarded as having a 'Mixed' system in this thesis. If they would be

grouped in either corrective mixed or non-corrective mixed, there would be groups with only two or three countries, which would give statistical difficulties. This will be elaborated upon in Chapter 3, however. For now, countries that use both systems are regarded as mixed countries.

## Section 2.2 Estimating natural growth

The purpose of distinguishing different electoral systems is to investigate whether some countries actually perform better economically than others. It is difficult however, to have a good measure for economic performance. GDP or GDP growth is often taken as a measure of economic performance, but this is mostly yearly data. It is better to take a look at a long-term economic indicator to see whether that actually differs among systems. Taking the average GDP growth of each country for a period of say, 30 years, would take into account short-term, cyclical, demand-related effects too. However, as this thesis tries to explore a relationship between electoral systems and economic growth, it is better to use long-term, supply-related GDP growth. Lippi (1999) has, be it for other purposes, established a model that describes the relationship between real output growth on the one hand, and nominal output growth and inflation on the other hand.

In this model the real output is described by

$$y_t = \alpha_1 + \alpha_2 time + \alpha_3 y_{t-1} + \tau \Delta x_t + \epsilon_t \quad (1)$$

$y_t$ is the logarithm of the real output, and *time* is defined as the current year of the observation, so if t=1998, then *time* is equal to 1998. $\Delta x_t$ is the change in the logarithm of nominal output, so basically the nominal GDP growth. τ measures how much of nominal GDP growth results in real GDP growth, and as

$$\pi_t = \Delta x_t - \Delta y_t \quad (2)$$

(1 − τ) measures how much ends up in inflation (π measures inflation). When $\tau = 1$ the complete nominal output growth ends up in the real output growth (with zero inflation), and with $\tau = 0$ all nominal output growth ends up as inflation, leaving a real output growth of zero. Lippi stresses that several authors have added different economic interpretations to equation 1; Lucas (1973) has provided a ration-expectations interpretation, Ball, Mankiw and Romer (1988) use a New Keynesian interpretation and Schultze (1984) uses a Keynesian interpretation.

Looking at natural growth, we are interested in the long run. As $\Delta x_t$ is a short-term variable, the long-run relationship is:

$$y_t = \alpha_1 + \alpha_2 time + \alpha_3 y_{t-1} \quad (3)$$

and obviously $y_{t-1}$ is

$$y_{t-1} = \alpha_1 + \alpha_2 (time - 1) + \alpha_3 y_{t-2} \quad (4)$$

As mentioned, time is the year of the current observation. So if t=1998, then time is 1998, and when looking at $y_{t-1}$ in equation 4, time would then be 1997. Therefore it is notated as (time-1).

Subtracting (4) from (3) yields

$$y_t - y_{t-1} = \alpha_2 time - \alpha_2 (time - 1) + \alpha_3 y_{t-1} - \alpha_3 y_{t-2}$$

$$\Delta \mathrm{y_t} = \alpha_2 \big(\mathrm{time} - (\mathrm{time} - 1)\big) + \alpha_3 (\mathrm{y_{t-1}} - \mathrm{y_{t-2}})$$

$$\Delta y_t = \alpha_2 + \alpha_3 \Delta y_{t-1} \quad (5)$$

As this is long term growth, $\Delta y_t = \Delta y_n$; so $\Delta y^n$ denotes natural growth

$$\Delta y^n = \alpha_2 + \alpha_3 \Delta y^n$$

$$\Delta y^n - \alpha_3 \Delta y^n = \alpha_2$$

$$\Delta y^n = \frac{\alpha_2}{1 - \alpha_3} \quad (6)$$

$\alpha_2$ and $\alpha_3$ are derived from equation 1, and are then used to calculate natural growth for each country, using equation 6. Lippi uses an additional variable, measuring relative oil prices, which represents supply shocks. However, Ball, Mankiw and Romer, whose model Lippi uses, have not added this variable. They point out that problems could occur if nominal GDP is correlated with supply shocks, which occurs if aggregate demand is not unit elastic; or if inflation is correlated with supply shocks. This could cause bias in the estimation of τ. However, they point to research that suggests that unit elasticity of aggregate demand is realistic (Mankiw & Summers, 1986). They also explain that monetary policy, implemented in response to supply shocks, may reduce or even eliminate its effect on nominal GDP. Furthermore, in an effort to reduce bias in τ, Ball, Mankiw and Romer use a dummy representing oil prices, which is +1 in years of major oil price increases and -1 in years of major decreases. This had little effects on the results. Because modelling supply shocks is

rather difficult, and because its effect on the estimations of the model is little, this variable is not inserted in equation 1.

Seeing the model described above, and more specifically equation 1 and 6, it will be used in the next Chapter to estimate natural growth data for all OECD countries. The countries will then be grouped into either PR, majoritarian or mixed according to the studies cited above. The results of this analysis will be discussed in Chapter 4.

# Chapter 3. Data and Methodology

## Section 3.1 The data source

The data concerning nominal and real GDP from all 34 OECD member countries has been retrieved from the OECD database. The datasets contain yearly GDP data, with the real GDP data using 2005 as a reference year. This is yearly data. The available data differs per country; for most countries, data was available starting in 1970. If available, data was retrieved from 1970 until 2013 (as 2014 data was still an estimation). However, for Chile, the Czech Republic, Estonia, Greece, Hungary, Israel and Slovenia data was only available starting in 1995, for Germany starting in 1991 (due to Germany's reunification), for Ireland and Poland starting in 1990, and for the Slovak Republic starting in 1993.

## Section 3.2 Calculations

First, the logarithms from both nominal and real GDP growth have been calculated. Also, the first difference of the logarithm of nominal GDP has been calculated. These correspond to the variables introduced in equation 1; $y_t$ (logarithm of real GDP), $y_{t-1}$ (lagged logarithm of real GDP) and $\Delta x_t$ (first difference of logarithm of nominal GDP) were calculated for all countries. Also, an extra variable called YEAR, corresponding to *time* in equation 1, has been added to all datasets, representing the year of each observation. So, if the year of the observation is 1990, the value of YEAR is 1990. Using these data, for each country, equation 1 has been estimated. The results are reported in table 1 in the Appendix. Ideally, the variables $\alpha_2$ and $\alpha_3$ can then be used, following equation 4, to calculate natural growth of each country.

Upon estimating equation 1 for all 34 countries, the model was free of problems for 28 countries. A significance level of 5% has been used, unless otherwise specified. Most estimations, 27 out of 34, featured significant autocorrelation of the first order. The Durbin-Watson statistic (Durbin & Watson, 1950) for each estimation has been included in table 1. This is the Durban-Watson statistic before correction for autocorrelation. If needed, an AR(1) term was included. Including this term corrected the autocorrelation in all cases.

## Section 3.3 Countries with difficulties

Six countries produced results where either no or only one variable was significant. Countries with difficulties were France, Hungary, Italy, Japan, Korea and the Slovak Republic. The models for these countries produced very insignificant variables; because two of the variables are used to calculate natural growth data, it is important that they are estimated carefully.

When looking at France, inflation was rather high between 1970 and 1987; varying between 6% and 13%. After 1987 inflation returned to lower values between 0,5% and 3% (see Graph 2 in the appendix). Performing a Chow-breakpoint test revealed a significant break in 1987. When a Chow-breakpoint test (Chow, 1960) has been performed in this section, the results of that test are reported in table 2 of the appendix.

A same image exists for Hungary; inflation was high from 1996 to 2003, and then dropped to much lower values (see Graph 4 in the Appendix). A significant break exists in 2003. The model produces better results when it is estimated for 2003-2014, though it is based on data only 11 data points.

The model regarding Italy featured a significant break in 1991. When looking at the graph of inflation, Italy's inflation was rather high in the 1970-1991 period, with inflation rates over 10% (even more than 20% in 1984), while inflation was much lower in the 1991-2013 period (see Graph 1 in the Appendix); Estimating the model for Italy for the 1991-2013 period yielded significant results for all variables.

A similar image exists for Japan, as this has a peaking inflation in 1970-1983, with a significant break in 1983 (see Graph 3 in the Appendix). Estimating the model for 1983-2013 yields problem-free results.

South Korea is no different either. It faced high inflation in 1969-1982, with rates much higher than 10% (see Graph 6 in the Appendix). From 1983 onward, inflation varied between 0% and 10%. A significant break exists in 1983; so the model was estimated for 1983-2013 as well.

The Slovak Republic is the only country where there is no apparent break in the data; inflation was really high upon its formation as a country in 1992. It has decreased to lower values, but it is still very volatile (see Graph 5 in the Appendix). The model for Slovakia was therefore not adapted, making its estimation of natural growth less reliable.

After the model was estimated for all countries, with adaptions made as described above, the natural growth was calculated for each country, following equation 6. The outcome of these calculations has been reported in the Appendix in table 3. The highest value was 7,8% for Italy, and the lowest was 0,4% for the Slovak Republic, though it should be noted that this estimation may not be accurate.

## Section 3.4 The labelling of countries

The countries were grouped into either PR, majoritarian or mixed following Lijphart (1999) and Karp & Banducci (2008). Lijphart labels 23 of the OECD countries, leaving 11 of them unlabelled. Karp and Banducci also label 23 OECD countries, six of which are not included in Lijphart's research. Moreover, they label Germany as a mixed system, while Lijphart calls Germany's system PR. Because the German system possesses qualities of both a PR and majoritarian system, as discussed in Chapter 2, and because Karp and Banducci's research is more recent, Germany's systems will be regarded as mixed in this thesis. Furthermore, as mentioned in Chapter 2, there are two types of mixed systems distinguished by Lijphart. There are mixed systems that use the PR part to correct the disproportionality of the majoritarian election, but there are also countries that do not use the PR part to correct disproportionality. Germany and Mexico have designed their system to correct disproportionality, while the Hungarian, Japanese and Korean system is purely mixed. These 5 countries are considered one group, however, because otherwise there would be two separate groups with only 2 and 3 observations in it.

Combining both researches leaves four countries unlabelled: Chile, Estonia, the Slovak Republic and Turkey. See table 4 in the Appendix for the exact labelling that Lijphart and

Karp & Banducci apply. The remaining four countries will be given a label depending on the qualities of their electoral systems.

Information on the Estonian, Slovakian and Turkish electoral system has been retrieved form the European Election Database[2]. Valenzuela and Scully (1997) have described the electoral system in Chile and the way it has changed in the last decades.

In Chile, a bicameral parliament exists, with 120 seats in the Chamber of Deputies, and 38 seats in the Senate. 60 constituencies each elect two representatives in the Chamber of Deputies, and the country's 19 senatorial districts each elect 2 senators. Since 1990, when the current electoral system was implemented, two large parties have dominated national politics: Nueva Mayoría and Alianza. A president is elected every 4 years, with a two-round runoff election. Members of the cabinet are not part of the congress. Because of the two-party tendency, relatively large amount of districts and presidential system, Chile is here regarded as having a majoritarian system.

Estonia has a unicameral parliament. It has 12 constituencies with each electing 6 to 13 seats. The voting is largely proportional, though it features a 5% threshold and a slightly modified d'Hondt method, making it somewhat less proportional. No party holds a majority; three or four parties generally hold 10 to 30% of the votes each, and some other minor parties make up the rest. The head of government is the prime minister; the president mainly has a symbolic role. Based on the rather proportional voting system and multi-party existence, the Estonian system is regarded as PR.

The Slovak Republic uses a proportional system to elect all members of the National Council, the unicameral parliament of Slovakia. The whole country acts as one constituency, just like in The Netherlands and Israel. There is a 5% threshold for all parties. Since its separation from the Czech Republic in 1992, five national elections have been held, and no party has held a majority. 6 or 7 parties have made up the National Council. The president has a

[2] http://www.nsd.uib.no/european_election_database/index.html

largely symbolic role. Because of the system's resemblance to the Dutch and Israeli system, it is regarded as PR.

In the Turkish system, the 550 members are chosen from 85 electoral districts. A rather high threshold of 10% applies on a national level. One party has held a majority for the last three assemblies. In the 2002 election, only two parties gained more than 10% of the votes, and in the 2007 election only 3 parties cleared the threshold. The president has a largely symbolical function. The system bears some resemblance to the Italian system, which features a 10% threshold for coalitions and a ceremonial president. Therefore, the Turkish system is regarded as PR.

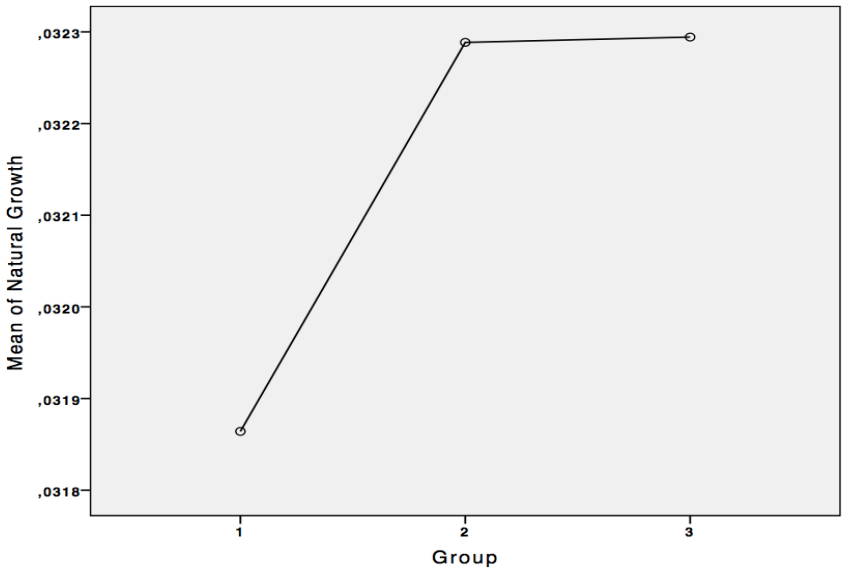
Table 4 in the Appendix depicts the grouping made by Lijphart, by Karp and Banducci and the labelling of the five countries as mentioned above. Also, a final list of labels that is used in this thesis is provided there.

The data regarding national growth of all 34 OECD countries is now ready to be used in an ANOVA analysis. 22 countries are in the PR group, 5 countries have a mixed system, and 7 countries make up the majoritarian group.
In the next Chapter, the results of this ANOVA analysis will be discussed.

# Chapter 4 Results

## Section 4.1 Overview

This Chapter will review the results from the ANOVA analysis performed on the natural growth data of the OECD countries. In this section, a 5% significance level is used. The natural growths of the countries are grouped into either PR, majoritarian or mixed. This results in three groups with respectively 22, 7 and 5 observations. The data in each group produces an average natural growth for that group. The average natural growth of the countries with a majoritarian system was 0,031864, or 3,18%; the average natural growth of all PR systems was 0,032289, or 3,23%, and the average natural growth of all countries with a mixed system was 0,032202, or 3,22%. A plot of these means is as following:




*Graph 4.1 – Means of electoral systems*

Group 1 is majoritarian, group 2 is PR and group 3 is mixed. These means are rather close to each other. There is little difference between the PR and mixed group, and the difference between PR and majoritarian is only 0,04 percentage point.

## Section 4.2 Checking the assumptions

When performing an ANOVA analysis, several assumptions are made (Field, 2009; Moore et al., 2011). First, it is assumed that the samples of each group are independent of each other,

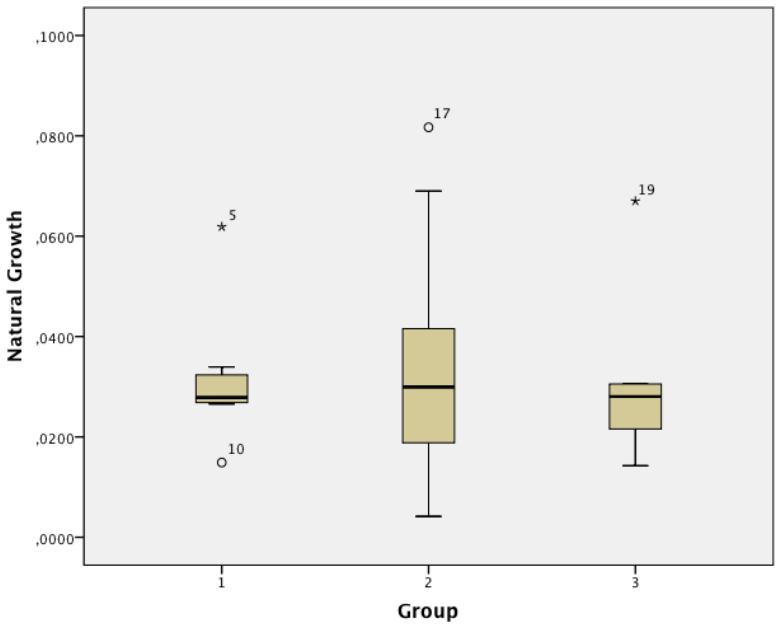
and secondly that every sample is selected randomly form each group. These are mostly theoretical assumptions, and there is no apparent reason to think that they are violated in this research; the whole 'population' of countries with a democracy have been taken in into account in this thesis, or at least as much as possible. The third assumption is of more importance: normal distribution in each group. A Shapiro-Wilk test has been performed to test for normality in each of the three groups. The output is as following:

| Group | Shapiro-Wilk statistic | Degrees of Freedom | p-value |
|---|---|---|---|
| **1 (M)** | 0,813 | 7 | 0,055 |
| **2 (PR)** | 0,916 | 22 | 0,063 |
| **3 (Mix)** | 0,832 | 5 | 0,143 |

*Table 4.1 – Results of Shapiro-Wilk tests*

For each group, the null hypothesis of a normal distribution cannot be rejected, given a 5% significance level. Group 1 and 2 may raise doubt about normality, as the p-values of these groups lie close to 5%. However, the Shapiro-Wilk is biased against small sample sizes (Field, 2009), so there seems no need to worry about this assumption.

A fourth assumption when performing ANOVA analysis is equal variances of the groups.




*Graph 4.2 – Boxplot of system groups*

When looking at the boxplot of the data, depicted in the Graph above, some suspicion may arise considering the equality of variances. Group 2 seems to be differently distributed than group 1 and 3.

The following table depicts the means and standard deviations of the 3 groups:

| Group | Mean | Standard Deviation |
|---|---|---|
| **Majoritarian** | 0,031864 | 0,0144908 |
| **PR** | 0,032289 | 0,0181545 |
| **Mixed** | 0,032294 | 0,0203985 |

*Table 4.2 – Means and standard deviations of system groups*

To get rid of any doubt about the variances, a Levene's test of equal variances was performed (Levene, 1960). Levene's test returns a Levene Statistic of 0,385. With a p-value of 0,683, the null hypothesis of equal variances cannot be rejected.

## Section 4.3 The ANOVA test

The table below reports the outcome of the ANOVA test performed.

| | Sum of Squares | df | Mean square | F-statistic | p-value |
|---|---|---|---|---|---|
| **Between groups** | 0,000 | 2 | 0,000 | 0,002 | 0,998 |
| **Within Groups** | 0,010 | 31 | 0,000 | | |
| **Total** | 0,010 | 33 | | | |

*Table 4.3 – Results of ANOVA test*

The ANOVA F-statistic is 0,002. With 2 and 31 degrees of freedom, the corresponding p-value is 0,998. This means that we cannot reject the null hypothesis of equal means. So, the natural growth does not differ significantly between the electoral systems.

# Chapter 5 Conclusions

## Section 5.1 Summary and answer to research question

This thesis has tried to establish whether the electoral system of a country actively influences economic performance of that country. To do so, three different electoral systems were identified: proportional representation, majoritarian and mixed. To measure long-term economic performance, natural economic growth was calculated using Lippi's model (1999). Subsequently, an ANOVA analysis has been performed to see whether the natural economic growth differed among electoral systems. As the ANOVA test revealed no significant difference between the groups, this was not the case.

As established in Chapter 4, this thesis has not been able to find a significant influence of the electoral system on the economic performance of countries. In fact, when looking at the natural growth of countries, the average natural growth was quite similar in the three different groups. The difference in economic performance between electoral systems, suggested by the theoretical research mentioned in Chapter 1, was not observable in this data. The effect of an electoral system is either negligible or non-existent, at least in the data used in this thesis.

## Section 5.2 Limitations and recommendations

The natural growth, which was calculated for all OECD countries, was, at best, based on the nominal and real GDP growth of 34 years. Ideally, more data would be used to establish the model discussed in section 2.2. In some cases, like Germany and Slovakia, data was only available for about 10 years. That is very little to base a regression on. One could try and calculate the economic growth for Germany before 1990 by using GDP data on West and East Germany, but the political system of these countries were very different than after the unification – posing problems when grouping Germany. The same holds for Slovakia. Not only was the Slovakian model based on little data, but the model also produced rather insignificant variables. This means that the estimation for the natural growth of Slovakia may not be precise. As there are only 34 observations of natural growth, it is regrettable that the Slovakian model could not be improved, and this may have biased the ANOVA test.

Other countries faced difficulties when establishing the model of natural growth for them. Sometimes, their attitude towards monetary policy had changed, either intrinsically or because of them joining the European Monetary Union. Therefore, the model for those countries was established (in section 3.3) for the period after a break occurred in their models. This of course meant that the amount of data point was further reduced. This could be resolved by adding more variables to the model, but then the natural growth would have been more difficult to estimate; this was of course done using equation 6 from section 2.2. When changing the original model from equation 1, the derivation of equation 6 would change, or even become impossible to measure. The underlying assumption of equation 6 was of course that the growth that countries were experiencing was linear; the natural, yearly, growth was taken to be the same number every year. Developing countries often experience a quadratic or sometimes even exponential growth – for example South Korea. This can easily be modelled by adding a quadratic term, like time squared; but that would mean that natural growth could not be expressed in a single number, posing problems for the subsequent analysis.

To better investigate the relationship between electoral systems and natural growth, one could build a model using more factors, for example continent or type of economic activity (agricultural, industrial or service). This would also capture interactional effects.

Apart from the regressions used to estimate natural growth, there are some limitations to the ANOVA analysis performed in Chapter 4. The amount of data points in each group was rather out of balance; there were 22 countries in the PR group, 7 in the majoritarian group and 5 in the mixed group. This is largely due to the fact that most European countries have some form of a PR system, while few countries have implemented a majoritarian system. This is a difficult problem to solve, as one cannot just take out some PR countries or add some more majoritarian countries. Perhaps in time, when more countries converge to a democratic government, this research could be repeated with more countries.

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# Appendix

Table 1[3]: Estimation equation 1

| Country | C | TIME | LY(-1) | DX | AR(1) | Durbin-Watson |
|---|---|---|---|---|---|---|
| Australia | -23,82013 | 0,020084 | 0,408115 | 0,36773 | 0,550932 | 1,233944 |
| | [0,0006] | [0,0008] | [0,0206] | [0,0000] | [0,0053] | |
| Austria | -3,84731 | 0,007031 | 0,60856 | 0,76553 | 0,932432 | 0,975396 |
| | [0,6696] | [0,1254] | [0,0000] | [0,0000] | [0,0000] | |
| Belgium | -6,288855 | 0,011317 | 0,380596 | 0,634615 | 0,892834 | 1,26424 |
| | [0,2647] | [0,0005] | [0,0023] | [0,0000] | [0,0000] | |
| Canada | -11,42856 | 0,012006 | 0,547925 | 0,476847 | 0,825718 | 0,829668 |
| | [0,0000] | [0,0000] | [0,0000] | [0,0000] | [0,0000] | |
| Chile | -3,30533 | 0,002225 | 0,964038 | 0,409222 | 0,409222 | 1,368565 |
| | [0,7973] | [0,8302] | [0,0020] | [0,0033] | [0,4973] | |
| Czech Republic | -10,13072 | 0,0077 | 0,814728 | 0,740611 | 0,338497 | 1,360597 |
| | [0,1558] | [0,2031] | [0,0015] | [0,0162] | [0,4420] | |
| Denmark | -3,882356 | 0,003721 | 0,871868 | 0,68671 | 0,761769 | 0,917327 |
| | [0,0241] | [0,1992] | [0,0000] | [0,0000] | [0,0001] | |
| Estonia | -11,23037 | 0,007561 | 0,827998 | 0,758431 | 0,27495 | 1,159146 |
| | [0,0076] | [0,0050] | [0,0000] | [0,0000] | [0,0323] | |
| Finland | -9,76365 | 0,009389 | 0,646644 | 0,576079 | 0,807508 | 0,898907 |
| | [0,0011] | [0,0002] | [0,0000] | [0,0000] | [0,0000] | |
| France | -0,406373 | 0,003371 | 0,773842 | 0,755898 | 0,681608 | 1,127230 |
| | [0,7013] | [0,0034] | [0,0000] | [0,0000] | [0,0000] | |
| Germany | 2,595029 | 0,001006 | 0,837511 | 0,929554 | 0,685198 | 0,697311 |
| | [0,2325] | [0,5355] | [0,0000] | [0,0000] | [0,0000] | |
| Greece | 0,536672 | 0,001414 | 0,869527 | 0,775627 | 0,749128 | 0,939016 |
| | [0,9664] | [0,7868] | [0,0000] | [0,0000] | [0,0365] | |

[3] P-values are reported in [brackets]

Table 1 (Cont.)

| Country | C | TIME | LY(-1) | DX | AR(1) | Durbin-Watson |
|---|---|---|---|---|---|---|
| Hungary | -1,093399 | 0,001813 | 0,916005 | 0,878528 | | 0,948584 |
| | [0,7692] | [0,2446] | [0,0000] | [0,0005] | | |
| Iceland | -10,87656 | 0,009798 | 0,682302 | 0,114168 | 0,509806 | 1,095573 |
| | [0,1314] | [0,1338] | [0,0030] | [0,1155] | [0,0702] | |
| Ireland | -1,312757 | 0,000958 | 0,976301 | 0,627094 | 0,390194 | 1,250571 |
| | [0,6887] | [0,6357] | [0,0000] | [0,0000] | [0,1083] | |
| Israël | -23,30579 | 0,017269 | 0,584786 | 0,47986 | | 1,817816 |
| | [0,0068] | [0,0082] | [0,0013] | [0,0015] | | |
| Italy | -2,686131 | 0,001602 | 0,980392 | 1,012674 | | 1,557996 |
| | [0,0033] | [0,0213] | [0,0000] | [0,0000] | | |
| Japan | -1,204094 | 0,001351 | 0,955789 | 0,819712 | | 1,651754 |
| | [0,051] | [0,0039] | [0,0000] | [0,0000] | | |
| Korea | -11,17476 | 0,007476 | 0,888411 | 0,808345 | 0,356607 | 1,685039 |
| | [0,0107] | [0,0129] | [0,0000] | [0,0000] | [0,0185] | |
| Luxembourg | -9,314528 | 0,006399 | 0,853861 | 0,436223 | 0,63997 | 0,860611 |
| | [0,2747] | [0,2858] | [0,0000] | [0,0000] | [0,0080] | |
| Mexico | -9,887043 | 0,010585 | 0,622676 | 0,126165 | | 1,94941 |
| | [0,0424] | [0,0715] | [0,0142] | [0,3319] | | |
| Netherlands | -4,542726 | 0,006045 | 0,71798 | 0,676304 | 0,888377 | 0,628606 |
| | [0,3044] | [0,0131] | [0,0000] | [0,0000] | [0,0000] | |
| New Zealand | -10,23668 | 0,009411 | 0,662017 | 0,435777 | 0,514487 | 1,317715 |
| | [0,0418] | [0,0717] | [0,0037] | [0,0005] | [0,0557] | |
| Norway | -3,41382 | 0,004003 | 0,838474 | 0,095873 | 0,650257 | 0,96786 |
| | [0,5673] | [0,5196] | [0,0007] | [0,0379] | [0,0420] | |
| Poland | -21,57003 | 0,017209 | 0,532297 | 0,201153 | 0,760685 | 0,678256 |
| | [0,0174] | [0,0112] | [0,0336] | [0,0137] | [0,0005] | |
| Portugal | -3,555777 | 0,007046 | 0,588719 | 0,505849 | 0,95252 | 1,054242 |
| | [0,9226] | [0,6745] | [0,0008] | [0,0000] | [0,0000] | |

Table 1 (Cont.)

| Country | C | TIME | LY(-1) | DX | AR(1) | Durbin-Watson |
|---|---|---|---|---|---|---|
| Slovak Republic | -1,467733 | -0,000372 | 1,089223 | 0,789292 | | 1,497227 |
| | [0,8282] | [0,9375] | [0,0000] | [0,0000] | | |
| Slovenia | -11,07508 | 0,006734 | 0,896517 | 0,902394 | 0,299033 | 1,530212 |
| | [0,0368] | [0,0526] | [0,0000] | [0,0001] | [0,4080] | |
| Spain | -8,631558 | 0,007716 | 0,751135 | 0,511072 | 0,872833 | 0,369047 |
| | [0,0046] | [0,0080] | [0,0000] | [0,0000] | [0,0001] | |
| Sweden | -8,639328 | 0,009914 | 0,6086 | 0,621373 | 0,589047 | 0,96642 |
| | [0,0000] | [0,0003] | [0,0000] | [0,0000] | [0,0019] | |
| Switzerland | -3,550726 | 0,006147 | 0,673733 | 0,672394 | | 1,77594 |
| | [0,0000] | [0,0000] | [0,0000] | [0,0000] | | |
| Turkey | -22,75298 | 0,016594 | 0,583685 | -0,003868 | | 1,788286 |
| | [0,0037] | [0,0033] | [0,0001] | [0,9057] | | |
| UK | -11,31423 | 0,011582 | 0,573569 | 0,296478 | 0,763834 | 1,120521 |
| | [0,1501] | [0,2142] | [0,1505] | [0,0251] | [0,0348] | |
| USA | -9,389171 | 0,009154 | 0,70258 | 0,839725 | 0,898094 | 0,645167 |
| | [0,0040] | [0,0007] | [0,0000] | [0,0000] | [0,0000] | |

Table 2: Chow breakpoint tests

| Country | Year of break | Chow statistic | Degrees of Freedom | P-value |
|---|---|---|---|---|
| France | 1987 | 5,147527 | 5; 32 | 0,0014 |
| Hungary | 2003 | 6,447953 | 5; 7 | 0,0149 |
| Italy | 1991 | 14,09219 | 5; 32 | 0,0000 |
| Japan | 1983 | 30,11603 | 4; 35 | 0,0000 |
| Korea | 1982 | 7,3815 | 5; 32 | 0,0001 |

Table 3[4]: Calculation of natural growth

| **Country** | $\alpha_2$ | $\alpha_3$ | $\alpha_2/(1-\alpha_3)$ |
|---|---|---|---|
| Australia | 0,020084 | 0,408115 | 0,033932267 |
| | [0,0008] | [0,0206] | |
| Austria | 0,007031 | 0,60856 | 0,017961884 |
| | [0,1254] | [0,0000] | |
| Belgium | 0,011317 | 0,380596 | 0,018270789 |
| | [0,0005] | [0,0023] | |
| Canada | 0,012006 | 0,547925 | 0,02655754 |
| | [0,0000] | [0,0000] | |
| Chile | 0,002225 | 0,964038 | 0,061870864 |
| | [0,8302] | [0,0020] | |
| Czech Republic | 0,0077 | 0,814728 | 0,041560516 |
| | [0,2031] | [0,0015] | |
| Denmark | 0,003721 | 0,871868 | 0,029040365 |
| | [0,1992] | [0,0000] | |
| Estonia | 0,007561 | 0,827998 | 0,043958791 |
| | [0,0050] | [0,0000] | |
| Finland | 0,009389 | 0,646644 | 0,026570937 |
| | [0,0002] | [0,0000] | |
| France | 0,003371 | 0,773842 | 0,014905509 |
| | [0,0034] | [0,0000] | |
| Germany | 0,001006 | 0,837511 | 0,014280442 |
| | [0,5355] | [0,0000] | |
| Greece | 0,001414 | 0,869527 | 0,006302006 |
| | [0,7868] | [0,0000] | |
| Hungary | 0,001813 | 0,916005 | 0,021584618 |
| | [0,2446] | [0,0000] | |
| Iceland | 0,009798 | 0,682302 | 0,03084061 |
| | [0,1338] | [0,0030] | |

[4] P-values are reported in [brackets]

Table 3 (Cont.)

| **Country** | $\alpha_2$ | $\alpha_3$ | $\alpha_2/(1-\alpha_3)$ |
|---|---|---|---|
| Ireland | 0,000958 | 0,976301 | 0,040423647 |
| | [0,6357] | [0,0000] | |
| Israel | 0,017269 | 0,584786 | 0,041590601 |
| | [0,0082] | [0,0013] | |
| Italy | 0,001602 | 0,980392 | 0,081701346 |
| | [0,0213] | [0,0000] | |
| Japan | 0,001351 | 0,955789 | 0,030558006 |
| | [0,0039] | [0,0000] | |
| Korea | 0,007476 | 0,888411 | 0,066995851 |
| | [0,0129] | [0,0000] | |
| Luxembourg | 0,006399 | 0,853861 | 0,043787079 |
| | [0,2858] | [0,0000] | |
| Mexico | 0,010585 | 0,622676 | 0,028052814 |
| | [0,0715] | [0,0142] | |
| Netherlands | 0,006045 | 0,71798 | 0,02143465 |
| | [0,0131] | [0,0000] | |
| New Zealand | 0,009411 | 0,662017 | 0,027844596 |
| | [0,0717] | [0,0037] | |
| Norway | 0,004003 | 0,838474 | 0,024782388 |
| | [0,5196] | [0,0007] | |
| Poland | 0,017209 | 0,532297 | 0,036794718 |
| | [0,0112] | [0,0336] | |
| Portugal | 0,007046 | 0,588719 | 0,017131839 |
| | [0,6745] | [0,0008] | |
| Slovak Republic | -0,000372 | 1,089223 | 0,004169329 |
| | [0,9375] | [0,0000] | |
| Slovenia | 0,006734 | 0,896517 | 0,06899166 |
| | [0,0526] | [0,0000] | |
| Spain | 0,007716 | 0,751135 | 0,031004762 |
| | [0,008] | [0,0000] | |

Table 3 (Cont.)

| **Country** | $\alpha_2$ | $\alpha_3$ | $\alpha_2/(1-\alpha_3)$ |
|---|---|---|---|
| Sweden | 0,009914 | 0,6086 | 0,025329586 |
| | [0,0003] | [0,0000] | |
| Switzerland | 0,006147 | 0,673733 | 0,018840398 |
| | [0,0000] | [0,0000] | |
| Turkey | 0,016594 | 0,583685 | 0,039859241 |
| | [0,0033] | [0,0001] | |
| UK | 0,011582 | 0,573569 | 0,027160314 |
| | [0,2142] | [0,1505] | |
| USA | 0,009154 | 0,70258 | 0,030778024 |
| | [0,0007] | [0,0000] | |

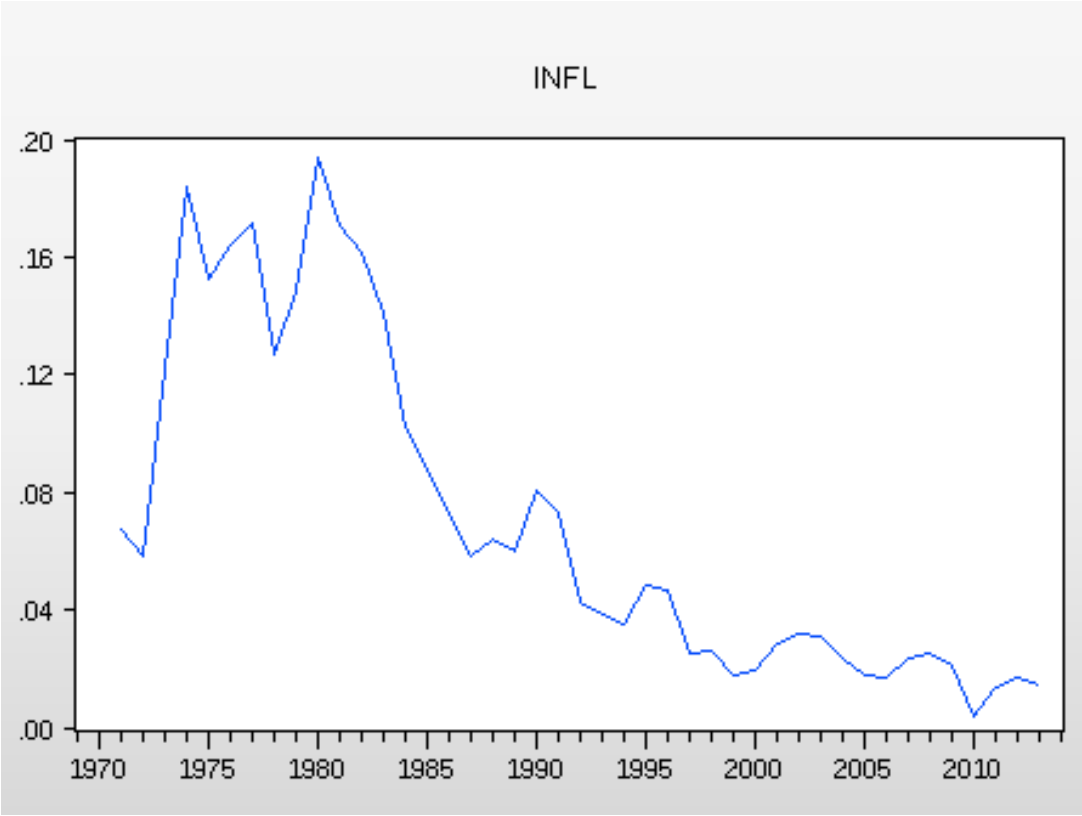
Table 4: Labelling of countries

| Country | Lijphart | Karp & Banducci | This thesis | Final |
|---|---|---|---|---|
| Australia | M | | | M |
| Austria | PR | | | PR |
| Belgium | PR | PR | | PR |
| Canada | M | | | M |
| Chile | | | M | M |
| Czech Republic | | PR | | PR |
| Denmark | PR | PR | | PR |
| Estonia | | | PR | PR |
| Finland | PR | PR | | PR |
| France | M | M | | M |
| Germany | PR | Mix | | Mix |
| Greece | PR | | | PR |
| Hungary | | Mix | | Mix |
| Iceland | | PR | | PR |
| Ireland | PR | PR | | PR |
| Israel | PR | PR | | PR |
| Italy | PR | | | PR |
| Japan | SNTV | Mix | | Mix |
| Korea | | Mix | | Mix |
| Luxembourg | PR | | | PR |
| Mexico | | Mix | | Mix |
| Netherlands | PR | PR | | PR |
| New Zealand | M | M | | M |
| Norway | PR | PR | | PR |
| Poland | | PR | | PR |
| Portugal | PR | PR | | PR |
| Slovak Republic | | | PR | PR |

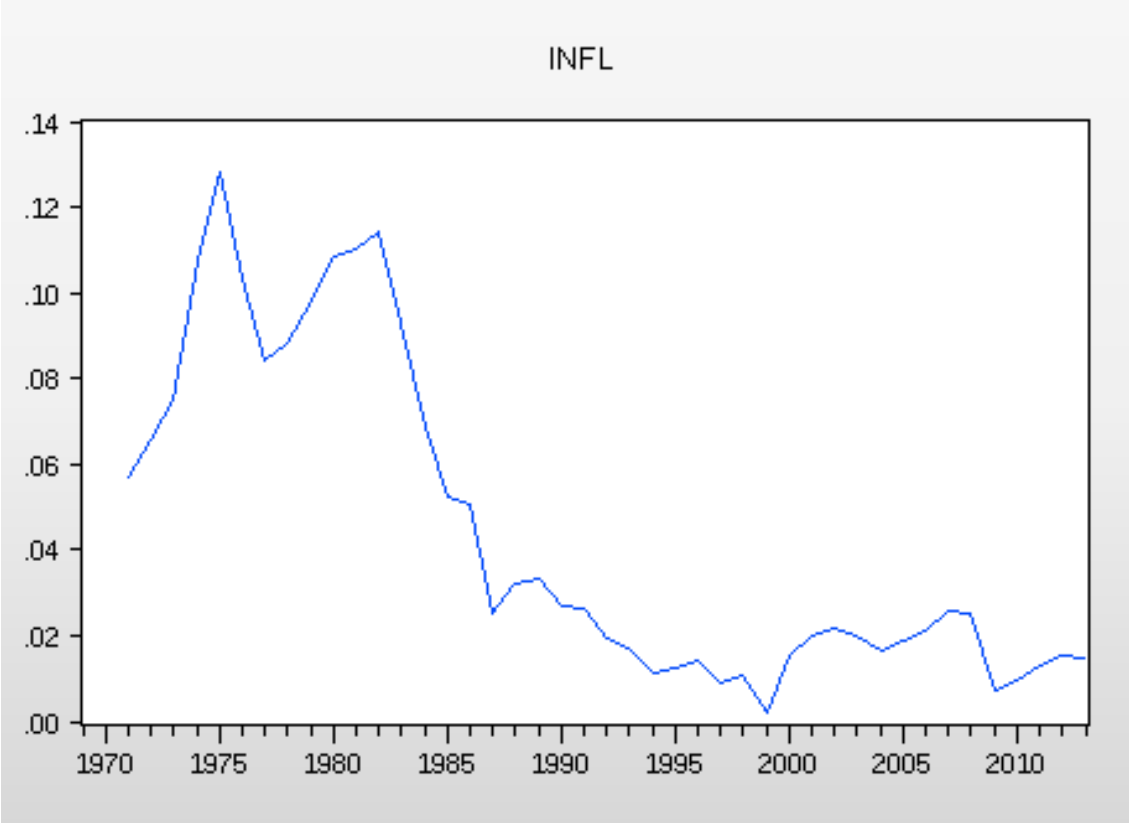
Table 4 (Cont.)

| Country | Lijphart | Karp & Banducci | This thesis | Final |
|---|---|---|---|---|
| Slovenia | | PR | | PR |
| Spain | PR | PR | | PR |
| Sweden | PR | PR | | PR |
| Switzerland | PR | PR | | PR |
| Turkey | | | PR | PR |
| UK | M | M | | M |
| USA | M | M | | M |

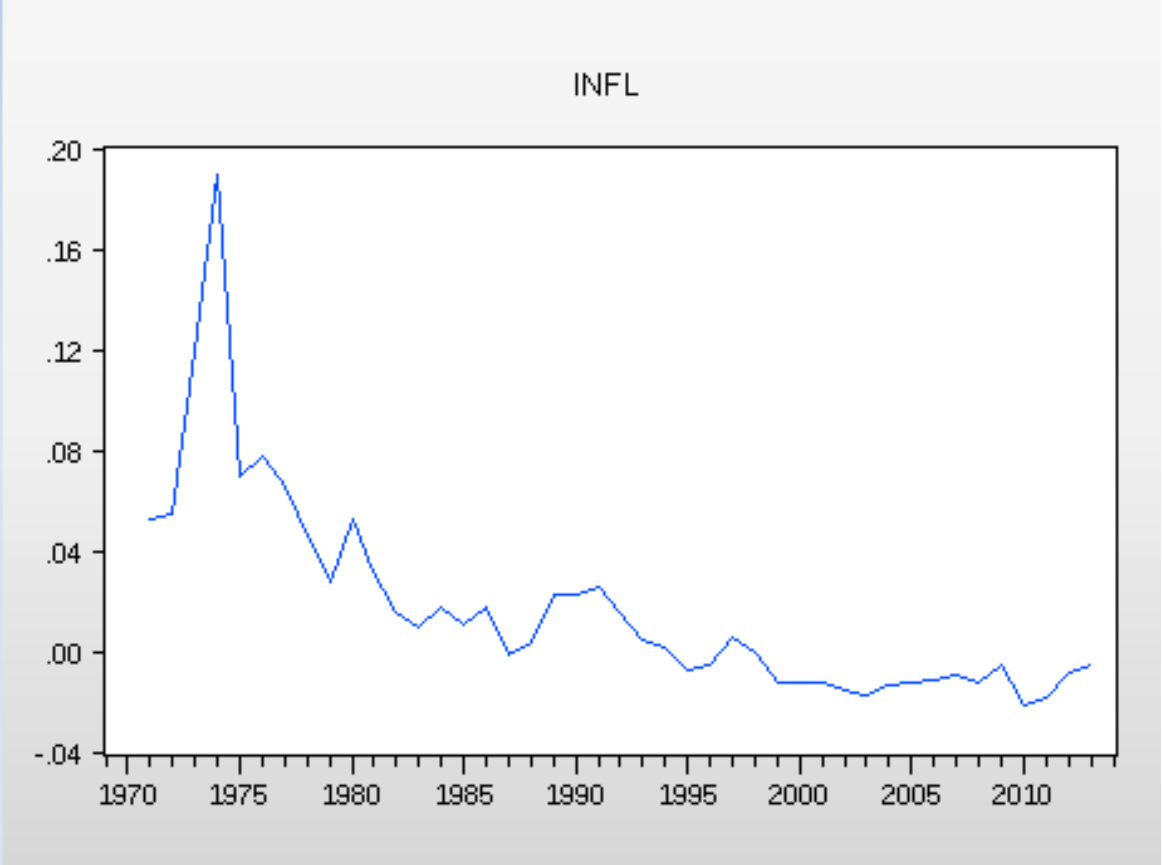
Graph 1: Inflation in Italy



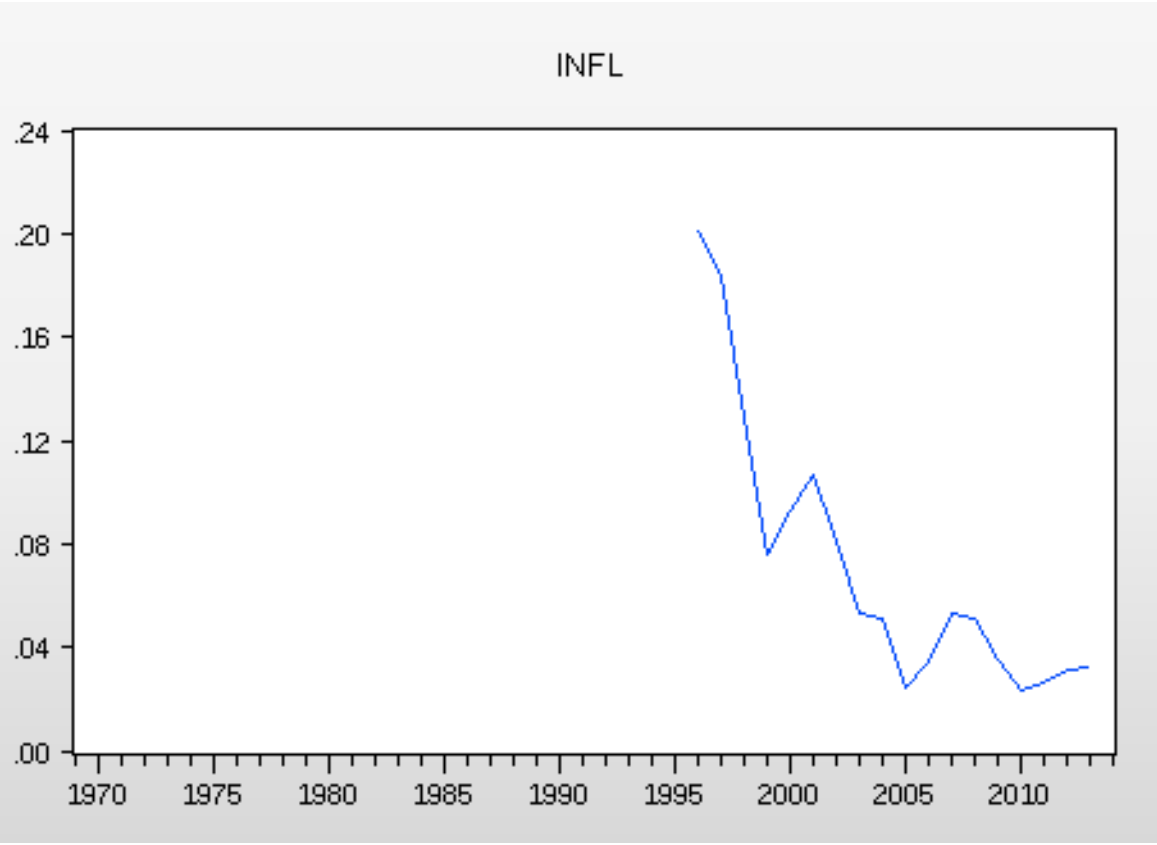

Graph 2: Inflation in France



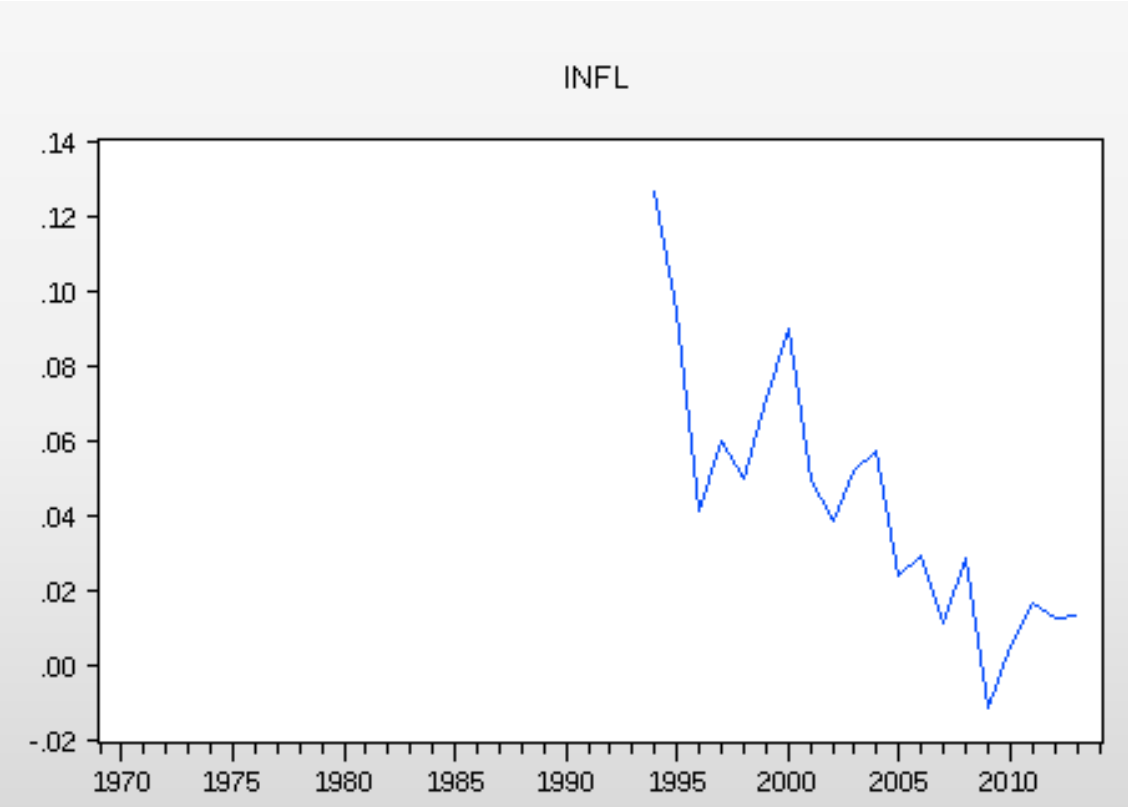
Graph 3: Inflation in Japan




Graph 4: Inflation Hungary



Graph 5: Inflation in Slovakia




Graph 6: Inflation in South Korea