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The distribution of power in the Council of the European Union

Carin van der Ploeg
BWI-werkstuk, 1273647
cevdploe@few.vu.nl
Vrije Universiteit Amsterdam, 2008

vrije Universiteit *amsterdam*

Abstract

Prominent in this research is the Council of the European Union, the central decision making organ within the European Union. The ever growing union is continuously struggling with its democratic face. This paper addresses an issue that is two-folded and deals with some elements of the problem of the democratic deficit. The main topic that is being addressed is the equal distribution of power in the Council of the European Union in the past, the present and the future situation within the proposed treaty of Lissabon. The contribution of this paper covers both the field of empirical research and the field of mathematical research. Especially the combination of both fields is of interest.

The first part of this paper consists of an empirical analysis which is done using the theoretical perspective on voting power distributions. Three case studies provide answers to the fairness of the voting procedures and the applicability of the Square Root Law of Penrose, and will contribute to the debate on the voting power approach within the field of political theory. The argument made in this paper is that the Ideal Type voting procedure of Weber is equivalent to the Square Root Law of Penrose. All the voting procedures that are used in the past, as well as the current voting system and the proposed system for the future have been evaluated from an empirical political theoretical point of view.

The second part of this paper deals with the mathematical point of view. Three objective criteria derived from different literature sources form the basis for the assessment of the different voting rules found in literature. The three criteria for the determination of the best usable voting power index are: equity, efficacy and comprehensibility. Analysis shows that the Jageliellonian compromise with a threshold of 61.4% scores the most points in terms of the objective criteria. Because of the many options in this field of research and importance this paper will provide further basis for new research.

Keywords: **Council of the European Union, power distribution, voting procedures, Square Root Law approach, intergouvernmentalism**

Contents

1. Introduction: statement of research problem

The "Treaty establishing a constitution for Europe" was adopted by the Heads of State and Government at the Brussels European Council on 17 and 18 June 2004 and signed in Rome on 29 October 2004, but it was never ratified. The goals of this constitution were (Regering.nl, 2004):

- More integration between the European Union (EU) and its citizens;
- Preparation of the EU to extend from 15 to 25 member states;
- A stronger position of the EU in the World.

Most of the constitution consisted of formalizing the rules and procedures, which were already employed for years, into a single document. The Dutch and French 'no' caused a stalemate within Europe and was eventually the death-blow for the constitutional treaty. The French referendum on may 29 2005 had a turnout of 70%, where 45% voted for and 55% against the European constitution. Three days later the Dutch electorate followed with 38% of the population being for and 62% against the treaty. The turn-out was a bit lower (63%), but enough to let the Dutch parliament follow this result (NOSJOURNAAL: Dossier Grondwet Ja/Nee, 2005).

In June of 2007 a "new" agreement was made by the European government leaders. The 'Treaty of Lissabon to alter the treaty regarding the European Union and the treaty to establish the European Community' was signed in Lissabon on 13 December 2007. It will have to be ratified by all 27 member states before the next European Parliament Elections of June 2009. The objectives of this new treaty are to make the EU more democratic, meeting the European citizens' expectations for high standards of accountability, openness, transparency and participation; and to make the EU more efficient and able to tackle today's global challenges such as climate change, security and sustainable development (Europa.eu: treaty of Lissabon, 2007).

The most controversial elements of the constitution were removed, but most essentials remained in the new treaty of Lissabon. Significant changes in the distribution of power were proposed in the constitution, primarily focusing on different voting procedures. Those proposed changes have not been amended. These voting procedures have been subject of extensive debates, mainly between social scientists and mathematical scientists. There are two strict mathematical approaches to be mentioned:

- The Voting Power Approach states that the power distribution for decisions of the Council should be equal for every citizen in the EU, regardless of which country he or she lives in.
- The one-man-one-vote Approach states that every citizen has one vote; this implies that inhabitants in larger countries have more power then the ones living in smaller countries.

A lot of research is done on what the best approach should be. As I will show, more research is still needed to verify these approaches. The reality might be too complex to capture all aspects in a single mathematical approach.

Another important aspect of my research is the political theoretical approach. This contains many theories about European integration, and is much more complex than the mathematical approach. A large number of different factors play a role in deciding on the final voting system. This approach potentially leads to other voting distributions than the mathematical approach. There are several theories that try to explain and understand these voting procedures within social science, whereas the mathematical science is more descriptive. The theory of intergouvernmentalism is central to the political theoretical approach. The dissimilarities between these two approaches will also be discussed in this paper.

1.1 Institutions in the EU

The most important institutions of the EU are:

- the European Parliament (EP), which represents the EU's citizens, and is elected directly by them;
- the Council, which represents the individual member states;
- the European Commission, which is meant to uphold the interests of the Union as a whole.

In principle, the Commission proposes and applies policies and laws. The parliament and Council adopt the laws and policies. Other important institutions are the Court of Justice and the Court of Auditors which is the controlling organ on EU finances (George and Bach, 2001).

The focus of this paper will be on the Council of the European Union. The Council of the European Union, formally known as the Council of Ministers, is the most intergovernmental Council organ within the Union. The Council of the European Union will be noted as the EU Council in this paper.

This institution is chosen because:

1) It is one of the most disputed and debated institutions, especially in the debate of the formation of a European Constitution (Cameron, 2004; Kirsch et al, 2004, p.1);
2) The council of the European Union is the main decision making organ of the EU (Council, 2006);
3) Transparency of the most influential institution of the EU is crucial for its citizens and also for new member states (Kirsch et al, 2004, p.1).

1.1.1 Research question

The contribution of this research will have an academic and social relevance. The first notion is that the focus of social scientists is different than that of mathematicians. This research will also be embedded in a deeper ontological structure. Highlighting discrepancies and differences in both approaches may lead to a new paradigm. Within this paradigm researchers can develop new theoretical frameworks for understanding, explaining and possibly predicting developments. The opportunity to add to the knowledge on using existing theories will also be a contribution. Beside the mentioned academic relevance, the democratic deficit is an important issue with social relevance due to the growing influence of the EU. A result of this research may lead to a contribution in the debate about the distribution of power within the EU Council.

This paper addresses a twofold topic. The main issue focuses on the equal distribution of power in the Council of the European Union in the past, the present and the future situation within the proposed treaty of Lissabon. This poses the central problem concerning what is meant by equal, and what should be the voting system that contains this equality.

First, the ideal type of the voting procedures in the EU Council is formulated; this formulation will be embedded in the democratic structure. The ideal type is the formula of the Square Root Law by Penrose. The voting rules which have been used in the EU Council will then be tested against this ideal type, resulting in an estimate of how these voting rules relate to it. It also tries to clarify the realizations of the voting distributions through time using the theory of intergouvermentalism. This will be done by describing three case-studies. Second, using the objective criteria of equity, efficacy and comprehensibility are the voting rules found in the literature tested.

This leads to the following research question:

To what extent is equal distribution of power represented in the Council of the European Union in the past, the present and the future situation within the proposed treaty of Lissabon?

The main reason for this research is the growing influence of the EU, which is becoming larger and larger over time. Sound decisions have to be made about the distribution of power within this union to remain democratic. This can only be achieved by looking at various insights into this subject and by basing the decision about it on every known aspect. The mathematical and political theoretical views are two dominant ways of looking into the distribution of power and will therefore be researched in this paper.

The acquired knowledge of this research will be an insight as to why the approaches to the distribution of power are so different. This is done by viewing the mathematical ideal point of view and the political theoretical point of view. Gaining this insight may assist in further research of the development of a new constitution. This research may open possibilities in trying to define a new paradigm which can be beneficial for further theoretical development. Research into power distributions can also be extended to more institutions of the EU if positive results are shown.

According to Wiener and Dietz three main functions of theory formation can be distinguished (Wiener and Dietz, 2004, p.31-33):

1) Theory as explaining or understanding. This concept will be further elaborated within this paper, but an explaining and understanding stance is presented in this research.
2) Theory as description and analysis. Concept formation and analysis is the basis upon which events can be explained and understood, which is extensively explained in this study.
3) Theory as critique and normative intervention. This function of critical questioning of the advances and normative theorizing in recent developments is also an important issue.

Theories will play a central role in this paper and according to Wiener and Dietz have a rightful place within research. This study does not have the intention to develop nomothetic insights and stresses

more the idiographic aspects. Still, promising results from this paper could lead to more nomothetic models.

The structure of this paper is as follows:
First, a general overview of existing research will be given. In the third chapter the theoretical framework will be emphasized, including further coverage of operationalization and methodology. In this chapter a detailed description of the research design is presented. The quantitative and qualitative analysis play a central role in this chapter. Then there are two chapters which deal with the political theoretical angle and present a mathematical comparison. After these chapters the results of this research are given and the conclusions and further research are presented.

This paper will provide answers but also poses more questions and can therefore be a start for further research. In this introduction it already becomes apparent that very important issues will probably remain:

- Why is the ideal type of voting not used within the EU Council?
    - o An analysis of integration theories and public files of the negotiations play a central role in answering this question.
- Is it realistic and desirable to have an ideal type voting procedure?
    - o The various variables which play a role in the decision making processes for determining voting procedures within the EU are investigated. This should be done by conducting an extensive analysis of the three case studies. In this analysis models about voting distributions can be taken into consideration when necessary.
- Is it possible to develop a new voting method?
    - o In answer to this final question the ideal type should be the basis of analysis. The development of a new method approximating the ideal type should be the central issue.

2. Review of the State of the Art

The EU has been subject of extensive research. The EU is a very interesting topic for research in many disciplines such as mathematics, politics, and sociology. For the purpose of this research a division is made into the following themes:

- Research of the development of the EU, focusing on the EU Council and on the theory of intergouvermentalism;
- Research of the distribution of power in other sciences, focusing on mathematical papers.

In the first paragraph a description of the Council is given. Then some views on the development of the EU Council are very shortly described and a description of the theory of intergouvernmentalism is given. Then the literature from a mathematical viewpoint is examined. Some of the methods and criticisms on the Square Root Law approach are described with a focus on game theory. Other relevant contributions will also be discussed.

2.1 The Council

The Council is a hybrid institution that appears in several different manifestations. Decisions by the Council are taken by the Ministers from the Member States. Depending on the subject or treaty provisions three types of voting are employed (Council, 2006):

- Simple majority for procedural decisions;
- Qualified majority, which is a weighted voting system based on the populations of Member States and is used for many decisions concerning the internal market, economic affairs and trade;
- Unanimity, which is used for decisions about foreign policy, defense, judicial and police cooperation, and taxation policies.

The council is a special case because of several reasons. The council is a form of indirect democracy, because national representatives take place in this institution. These national representatives, ministers of the member states, are installed on the basis of national elections. So there is double indirect democracy. The council consists of a heterogeneous set of countries with different sizes. Because of these different sizes is it not possible to assign equal voting weights for every country. Furthermore, because of the heterogeneity within the countries distortions can arise in the way that the single vote of the representative can represent the constituency. These representatives have one vote per person but different weights assigned to them.

The European Council

This is the institution of heads of State and government (i.e., presidents and/or prime ministers) of all the EU countries, plus the President of the European Commission. The European Council meets, in principle, four times a year to agree on overall EU policy and to review progress of implementing the

EU policies. It is the highest-level policy-making organ in the EU, which is why its meetings are often called "summits".

The Council of the European Union (EU Council)

Formerly known as the **Council of Ministers**, this institution consists of government ministers from all the EU countries. The Council meets regularly to take detailed decisions and to pass European laws (European Eurojargon, 2006). This organ meets in nine different configurations. At first there were 22 configurations in the nineties. This was reduced to 16 in 2000 and finally to 9 in 2002 (Council, 2006).

COREPER

This committee of permanent representatives (COREPER) prepares and coordinates all the work of the Council. It consists of permanent representatives of the member states (Council, 2006). Furthermore this body negotiates on so called A and B-points. According to several researchers the COREPER has developed into a *de facto* decision-making body. According to some sources 85 to 90% of the Council decisions are made by so called A-points which are already agreed upon and are passed through the Council without any discussion (Lewis, 1998, p.483).

Technical commissions

The COREPER itself is again supported by a little over 250 committees and working groups who prepare the work of the COREPER. These committees and working groups consist of delegates from the member states (Council, 2006). According to Hayes-Renshaw and Wallace about 70% of the Council agendas are agreed upon in the working groups and 15 to 20% in the COREPER (Hayes-Renshaw and Wallace, 1997, p.78). This would mean that the influence of these working groups is very large and even larger than the COREPER's influence. Still it is difficult to make accurate estimates since only in 1994 the agendas became available. These agendas have not been studied recently so better estimates of the real influence of these commissions are not available.

2.2 Political theoretical research

Only a small part of the research on the EU is relevant for my research topic. Only a few authors such as Cameron combine the subject with political theory. In most cases political theory is only superficially discussed.

2.2.1 Theory of intergouvernmentalism

Intergouvermentalism is a large theory within the research field of European integration. Stanley Hoffmann poses three criticisms on the neo-functionalist theory, which is another important theory (Neo-functionalists argue in contrast with the realists that the international activities of the states are the result of pluralistic political processes. Supra-national institutions of the EU are the driving forces behind the European integration and will take the lead in further integration):

1) European integration should be evaluated from a worldwide context.
2) National governments are powerful actors in the process of integration.
3) The integration process will not spread to high policy areas such as national security and the army.

Hoffmann rejects the image of the neo-functionalists that governments will succumb under the pressure of elite interests groups to integrate. National governments are the deciding factor when it comes to important decisions. States are independent actors but national governments are bound to the position they have in the international system. Integration is mostly based on national political and economic subjects, which are on the agenda. Governments determine the level and pace of integration (George and Bache, 2001, chapter 1 of Van der Ploeg, 2005).

2.2.2 Other political theoretical insights

Cameron combines a case-study with theory. The case-study on the stalemate of Brussels mentions theory but does not systematically uses theories of integration to answer the question of the voting distributions. Cameron does however provide good insight in the current European situation and shows how power relations relate to each other (Cameron, 2004).

Egeberg on the other hand does analyze identity and role perceptions of national officials, but does not sufficiently investigate the voting distributions. In his paper he states that intergouvermentalism is transcended in two ways:

Firstly, national elites may shift their loyalty from a national to a supra-national level. This is part of the neo-functionalist theory. This is caused by the effect of EU institutions such as the Council.

Secondly, he notices that functional role orientations, which are acquired in ministries and agencies at the national level are sustained in other interactions across the border in their role as national officials. (Egeberg, 1999)

Another interesting development is the evolution of the COREPER. Lewis states that the COREPER operated successfully through a process of compromise and community. As a result they maintained the performance of the Council itself. He also argues that the decision-making process within the Council itself has become nothing more than rational calculus and role call analysis[1], defining and defending self-interests. Voting procedures in his analysis do not play a very big role in the EU-decision making (Lewis, 1998).

The paper of Mattila describes an empirical analysis with promising results about what influences voting behavior. Instead of applying theory on European integration he uses certain states which he considers to be pro-integration. In this analysis he shows that these states are the least likely to obstruct a majority within the Council. Right-wing Eurosceptic governments appear to be the most likely to vote against the majority. Large countries are also more likely to show this behaviour than small countries. These are interesting aspects and can be taken into account when the theories of European integration are tested and when the reason why countries are perceived in a certain way in the Eurobarometer is analyzed (Mattila, 2004).

Another significant contribution is that of Albert. According to Albert the papers regarding voting power such as the Square Root Law are generally regarded as scientific theory. This is a part of probability theory and therefore not part of political science. Albert also lists some other general ideas about the Voting Power Approach:

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[1] Roll call votes are called for on strategical reasons of the political actors involved. From these voting rounds are the political party, name and the actual vote are recorded. For a extensive analysis on roll call voting and voting behavior in the European Parliament see the masterthesis of Van der Ploeg (2007).

- As political theory it would not be very successful because it assumes simple random voting by the actors, while in practice this does not occur.
- As probability theory simple random voting is used to define voting power. The probabilities for voting in favour or against are considered 50/50.
- As political philosophy rationality or moral issues are used to assume simple random voting. This is an argument in favour of an equal distribution of power.

Albert strongly disagrees with the first statement and questions the second and third statements. Instead he opts for an approach that takes the actual empirical reality of voting into account (Albert, 2003). However, this idea is not further investigated in his paper, so there are no results available. List disagrees partly with Alberts work by stating that political science should not ignore those theories, that could be very useful tools in research regarding voting games (List, 2003).

2.3 Mathematical approach

Numerous scientists have written about the distribution of power within the EU Council, especially around 2004. Many of these researchers prescribe how the voting should take place. In its origin it is a zero-sum-game: More power to one country means less power to another country. There is a common consensus represented by many papers. This review of existing literature will only sum up most of the work on that consensus. In general five types of voting indices are described:

1) Penrose measure (Penrose, 1946),
2) Banzhaf-index (Shapely & Shubik, 1954);
3) Shapley-Shubik index (Dubey & Shapley, 1979);
4) Deegan-Packel index (Deegan and Packel, 1978, 1982);
5) Holler-index (Holler, 1982).

Even though the other indices are mentioned in several papers, the Penrose measure, especially the Square Root Law of Penrose, is mostly proposed as a fair voting system (Kirsch et al, 2004; Zyczkowski and Slomczynski, 2004; Koornwinder, 2005; Leech, 2001; Sutter, 2000).

The "Scientists for a democratic Europe" (2007) propose the Square Root Law as the ideal voting rule for the council. A key paragraph in their appeal (Scientists for a democratic Europe, 2007):

"The basic democratic principle that the vote of any citizen of a Member States ought to be worth as much as for any other Member State is strongly violated both in the voting system of the Treaty of Nice and in the rules given in the draft Constitution. It can be proved rigorously that this principle is fulfilled if the influence of each country in the Council is proportional to the square root of its population. This is known as 'Penrose's Square Root Law'. Such a system may be complemented by a simple majority of states."

Some researchers combine the Square Root Law with an addition how high the threshold for qualified majority voting should be (e.a. Felsenthal and Machover, 2003). For example, Felsenthal and Machover propose that the voting weights of each country must be proportional to the square root of its population and the voting weights of the countries in favour must add up to at least 60% of the total weight.

In general the arguments presented in favour of this approach are (Kirsch et al, 2004, p.1):

1. It is based upon the fact that all citizens have equal voting power.
2. It is a purely scientific method with no political influences.
3. It is easy to apply in case of any further enlargements of the EU.
4. It is a compromise between states favouring Nice and states favouring the draft Constitution.

In the next few subsections is a description presented of five power indices, with subsequent examples.

2.3.1.1 Description of square root law
Penrose's Square Root Law can be described as:

Equitability is achieved by making the voting power of each member in the council proportional to the square root of the size of the member's constituency.

The formulae of voting power ψ of the Square Root Law is given by

$$\psi_i := \sqrt{N_i} \qquad (1.1)$$

This states that the distribution of power is fair in a heterogeneous voting system, with *i* being a council member and N_i the population of the state which is represented by *i*.

This very simple formula can be supplemented with the Jagelonian rule developed by the two scholars Slomczynski and Zyczkowski. The quota q is given by formula:

$$q := \frac{1}{2}\left\{\sum_i w_i + \sqrt{\sum_i w_i^2}\right\} \qquad (1.2)$$

In which w_i is the weight of member-state *i* (Slomczynski and Zyczkowski, 2004).
A simple example will show what this formula does. Suppose that there are three constituencies A, B and C with sizes 1, 4, and 25. In a normal relation a person living in country C will only have 1/25 of the voting power of a person living in country A. The same holds for country B, since a person living in A will have four times as much voting power as the person living in country B. When the Square Root Law is applied it is clear that country B must have twice the voting power of country A and country C five times the voting power of country A (Felsenthal and Machover, 2003, p.22-23).

2.3.2 Description of the Banzhaf-index
The Banzhaf-index is calculated using game theory. It calculates the number of swing possibilities of each country. A swing possibility is the number of times that a representative can have a pivotal position. This means that if the representative leaves the winning coalition side, the remaining coalition becomes a losing coalition. It considers each coalition equally likely:

$$\bar{\beta}_i = \frac{\sum_{S \subseteq N}[v(S) - v(S \setminus \{i\})]}{\sum_{j \in N}\sum_{S \subseteq N}[v(S) - v(S \setminus \{j\})]} \qquad (1.3)$$

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Where $\begin{cases} v(S) = 1, \text{ if } S \text{ is winning} \\ \quad v(S) = 0, \text{ otherwise} \end{cases}$

v(S) is any coalition of players.

i stands for actor *i*

To illustrate this formula a simple example is given. Suppose we have three countries A, B and C. Country A with voting weight 4, country B with voting weight 3 and country C with voting weight 2. The threshold to accept a proposal is 6. This means that there are three winning coalitions (A,B), (A,C) and (A,B,C). The second step is to determine the critical players in the winning coalitions. We can easily see that country A is critical in all three coalitions, whereas countries B and C are only critical in one coalitions. This leads to a total of 3+1+1=5 times that all players are critical. The last step is to determine the individual power distributions or Banzhaf-index. Country A = 3/5, country B =1/5 and country C = 1/5 (Nurmi and Meskanen, 1999).

2.3.2.1 Shapley-Shubik index

The Shapley-Shubik index differs from the Banzhaf-index that the order in which the representatives join a coalition matters. It deals with so called sequential coalitions. Coalitions (A,B) and (B,A) are not the same and the order in which the votes are casted is of importance. This index shows the fraction of the coalitions in which an actor is pivotal. A pivotal actor is the first voter whose vote makes a coalition a winning coalition.

$$\phi_i = \frac{(s-1)!(n-s)!}{n!}[v(S) - v(S \setminus \{i\})] \qquad (1.4)$$

Where the number of actors in *S* is defined as *s*, and *n* the number of actors (Nurmi and Meskanen, 1999).

Consider our previous example and count the number of times that all countries are pivotal. This means (A,<u>B</u>), (A,<u>C</u>), (B,<u>A</u>), (C,<u>A</u>), (A,<u>B</u>,C), (A,<u>C</u>,B), (B,C,<u>A</u>),(B,<u>A</u>,C), (C,<u>A</u>,B) and (C,B,<u>A</u>). Then count the number of times A, B and C are pivotal voters and divide each number by the total 10. This then shows that the Shapley-Shubik power index for country A =6/10, country B = 2/10 and country C = 2/10.

2.3.2.2 Deegan-Packel index

The Deegan-Packel index only looks at the minimal winning coalitions and attributes no value to the likelihood of the coalitions to be formed. The most striking differences with the Banzhaf-index are next to fact that it only views minimal winning coalitions it weighs the swings by the inverse of the number of members within the coalitions.

$$DP_i = \frac{\sum_{S^* \subseteq N} 1/s[v(S^*) - v(S^* \setminus \{i\})]}{\sum_{j \in N} \sum_{S^* \subseteq N} 1/s[v(S^*) - v(S^* \setminus \{j\})]} \qquad (1.5)$$

Where *s* is the number of members in minimal winning coalition S^* (Nurmi and Meskanen, 1999).

Translating this into our example we can see that the total minimal winning coalitions in our example is only 2. This index shows that country A is needed in 100% of all minimal wining coalitions and that

country B and C are only necessary in 50% of the minimal winning coalitions. Showing that country a is extremely powerful.

2.3.2.3 Holler-index

The Holler-index is a small alteration of the Deegan-Packel index. The holler-index does look at the likelihood of every coalition.

$$H_i = \frac{\sum_{S^* \subseteq N} [v(S^*) - v(S^* \setminus \{i\})]}{\sum_{j \in N} \sum_{S^* \subseteq N} [v(S^*) - v(S^* \setminus \{j\})]} \tag{1.6}$$

The Holler-index is also known as the public good power index because the pay-off of forming a minimal winning coalition is equal for every member in the coalition and no member within this coalition can be excluded from this pay-off (Nurmi and Meskanen, 1999).

2.3.2.4 Other insights

It is however interesting to mention that there are some other insights who have appeared more recently, criticizing the unquestioningly assumption that the approach of the Square Root Law is the best approach.

Criticism on the Square Root Law is provided by Thomas (2007). He proposes the use of Voting Theory for Democracy as a base for a voting system. Using the principle of one man one vote he proposes a system purely based on voting theory. He criticizes the Penrose Square Root Law stating that they have a normative principle from which they derive their equal vote idea. The author completely neglects the fact that the principle of voting theory (one man one vote) is also a very normative notion. According to Thomas only Voting Theory is sufficiently equipped to deal with the real world complexity and no mathematical solution can deal with this difficulty. The author doesn't propose a voting system other than a system based on just the population, which according to him is the only way to correctly and democratically represent the people. The arguments presented by the author are still very weak and not suitable for this discussion. By addressing arguments that are applicable for voting systems within countries he doesn't support his case (see Thomas, 2007, p.12). The only valid argument that is left and which applies in both theories is the principal-agent problem. How can representatives represent all the different interests of the citizens.

In their research Beisbart et al. (2005) reject the Square Root Law of Penrose. They state that not the voting power approach, but the maximalization of the expected utility for all people should be the goal of a mathematical distribution of power. They propose an utilitarian framework in which they employ probability theory to determine expected utilities for the member states. They propose a method that is beneficial for the greatest number of people. The aim of this model is to maximize the welfare of the states. Their research is connected to the study of Mattila. Matilla has promising results with an empirical analysis on the influences on voting behaviour (Mattila, 2004). Different situations lead to different preferences and therefore generate either lower or higher utilities.

The authors propose a decision rule that maximizes the expected utility per average person in the EU. The proposed model needs to be improved, since some of the assumptions in their model are still very

unrealistic. Furthermore, they fail to propose a voting system that satisfies the constraints of their model (Beisbart et al., 2005).

2.4 Summary

The research of voting distributions has been significant. Most studies consider the Square Root Law approach or an equivalent approach as the solution to the voting power problem. However, authors as Beisbart and Albert oppose to this by proposing alternatives. Beisbart *et al.* propose a utilitarian approach which they work out as model and test it with the current situation in the EU. They also state the following: "Thus we will leave it open whether equalizing voting power or maximum welfare is the more valuable desideratum" (Beisbart *et al.*, 2005, p. 416). Albert poses serious criticisms to the voting power approach and also proposes to use empirical information for voting systems. He however does not pose a complete alternative approach how to use this (Albert, 2003). Studies of other significant elements of the EU Council can certainly not be ignored. The role of the COREPER, individual actors, voting behavioural patterns and power relations are important when looking at the integration process, and the development of voting rules in the EU. The theory of intergouvermentalism in combination with the above mentioned elements can contribute to answering the research question. Because of the fact that multiple problems arise from this review it is necessary to investigate the voting procedures within the EU Council further. The problem that becomes apparent here is the lack of effort to try to combine this scientific approach as the mathematicians call it with the theories of European integration. Another problem that was put forward by Beisbart is: which of the both approaches is not only fair but also realistic in relation to European integration? The square root law is fully developed while the utilitarian approach is not. The first approach is therefore developed further in this paper. In this paper it will be the central element to try and find an answer to what indeed is the fair voting distribution for the EU Council.

3. Theoretical framework

3.1 Meta-theoretical orientation

This research needs to be firmly situated within a sound theoretical framework. Ontological, epistemological and methodological methods as well as source claims are proposed within every research and need to be extensively dealt with. Especially for the empirical analysis part it is needed to place the social theoretical theory into a framework.

3.1.1 Ontology

The ontology is based upon a realist framework. This realist framework is combined with idealism. The latter was a reaction on empiricist approaches in social research. Idealists focused upon the important role played by the human mind in the organization and interpretation of observational experiences. Other ontological views are possible as well, but realism has proven to be an adequate view. Ideal types are used in many social science applications including political science. According to Smith an ideal type is "a theoretical device for generalizing beyond a particular situation, but one which accepts the complexity of social relations" (Smith, 2002, p.146). According to Heldring an ideal type is "a coherently thought border case of maximal rational scheduling, with which we can contrast an actually found venture. With an actually found venture we can determine then to what extent to this idea satisfies the ideal type" (Heldring, 2006, p.7). It is possible to formulate an ideal type and compare this ideal type to the real type. This strategy is a means to organize different perceptions on empirical evidence. Therefore, it becomes possible to overcome the differences of both nomothetic and idiographic accounts of social scientific methods. Interpretation of the 'hard' facts in various plausible ways is therefore possible (Smith, 2002, p.151). To determine an ideal type in this instance one can look at the concept of democracy. The EU is trying to be democratic. Therefore it is only reasonable as Kirsch, Koornwinder, Leech, Sutter Zyczkowski and Slomczynski and more scientists state, to let every citizen of the EU have an equal influence on the Council's decisions. As the review is showing, the square root law of Penrose possesses that quality. Furthermore it is very transparent and easy to apply also with future enlargements of the EU. In this research the ideal type approach is the square root law of Penrose. Albert disagrees with this approach because according to him this voting power approach refrains from any speculation concerning human behaviour. He states that the justification of the constitutional choice by arguing in favour of a combination of both rationality and fairness is a veil of ignorance. Knowledge about actual voting behaviour patterns are known and need to be taken into consideration (Albert, 2004). Albert is on very dangerous turf with this idea that voting rules should not resort to simple random voting just because more about reality is known. With this statement he implicates that one should take reality into account. With that notion designing new voting rules becomes highly normative. Dependent of how the researcher perceives values and norms the voting rules can then be changed accordingly. Design of voting systems should not be normative but must be positive. This theory should be testable and in principle value judgments, which are indeed present in voting theories, must not influence this testability.

Beisbart proposes a welfare model. In general is welfare is less quantifiable and more disputable then equal voting power per citizen. States and people may perceive the concept of welfare differently.

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There are financial, social, economical and general welfare perspectives possible. This approach has not been fully developed and still shows various flaws. This is why from the perspective of political philosophy the voting power approach of the square root law of Penrose is adopted.

3.1.2 Epistemology

The research will be from a critical realist point of view. Danermark proposes a critical methodological pluralist approach and makes a claim that it is possible to understand and explain phenomena by using methods from natural sciences (Danermark et al., 2002). There is a distinct difference though between the natural sciences and social sciences; human agency does not exist independently of the concepts / ideas we hold about what we are doing. An understanding or interpretativist dimension has to be included in the explanatory concepts of social sciences. Reality exists independently of our concepts of it. Reality is stratified or layered. These deeper layers form the basis of what can be seen at the empirical level. This is called a depth ontology. There are three layers: the empirical, the actual, and the deep/real. Schematically this can be presented as follows (Apeldoorn, 2006, p.2):
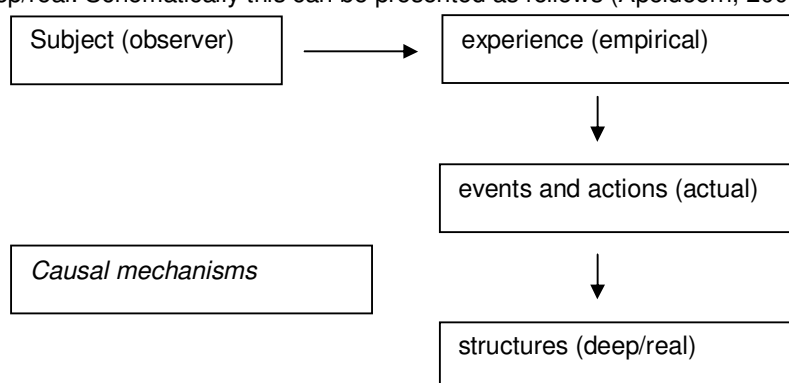
```
┌─────────────────────┐         ┌─────────────────────────┐
│ Subject (observer)  │ ──────▶ │ experience (empirical)  │
└─────────────────────┘         └─────────────────────────┘
                                            │
                                            ▼
                                ┌─────────────────────────┐
                                │ events and actions (actual) │
                                └─────────────────────────┘
┌─────────────────────┐                     │
│ Causal mechanisms   │                     ▼
└─────────────────────┘         ┌─────────────────────────┐
                                │ structures (deep/real)  │
                                └─────────────────────────┘
```

Figure 1. *Layer structure of reality*

The fundamental difference between positivists and critical realists is that the causation is not on the level of correlation but in the layer below. Critical realists emphasize that too much research in social science is being conducted from an empirical perspective and therefore fails to answer the real question. Critical realists reject the Humean concept of causality as empirical regularities in favour of the notion of causal tendencies that may or may not materialize in *open systems.* This means that there are no (universal) social laws, and social science should not pursue the formulation of such laws (Apeldoorn, 2006, p.2-3). In critical reality there is a layer which, whether it is studied or not, is not influenced by the researcher. This is called mind independency. It needs to be noticed that this view might depend too much on theories that describe phenomena that are based on different mechanisms. This would make falsification of theories very difficult. This approach is however still very suitable, because knowledge of the world can be gained without observation and also through logic reasoning. Critical realism rejects both individualism and holism (Danermark et al, 2002). The rejection of individualism poses a problem. The article of Risse-Kappen about explaining and understanding both domestic and international politics during and after the cold war shows that individual actors indeed have a significant influence in international relations.

Therefore not only an argument is made in favour of individualism, but on the other hand the notion of both understanding and explaining experiences is further strengthened (Risse-Kappen, 1994).

3.2 Mathematical research versus social research

At the moment there is no conclusive theory applied to the EU Council binding both mathematics and social science together in a way which is satisfying for both parties. Therefore research into combining these approaches is interesting.

3.2.1 Existing theories

Within this research interesting facts were found. With mathematics there is a single paradigm from which all proofs and rules are deducted. Mathematics will not be any different just because someone is taking notice of it. The mathematics is not changed because of that. For example, 1+1=2 will not become 1+1=3 just because someone thinks or states that it is. This is entirely different from the social sciences in which actors can have a significant influence on the theory and research. In mathematics new insights do occur, but the rules do not change because they are so universally applicable. A professor at the 'Vrije Universiteit Amsterdam' of mine stated this quite interestingly by pointing out that a bomb cannot be manufactured in a different way if the actors perceive the mathematics differently, because if they do this bomb will simply not work. Prediction in this case is possible. When however social insights and theories are available for actors within the social process, their behaviour can be significantly different than before, this makes predicting also very hard.

In social sciences widely used and developed theories are available, such as intergouvermentalism. Unfortunately these theories can be disputed as general explanatory theories of European integration, making the explanatory value of these theories subject of discussion. Therefore the theory of intergouvernmentalism will be applied only to a small part of the EU and their explanatory value is studied purely on the EU Council. Actors can become influenced by theories, just because of their knowledge of them. This is also a point of concern. Therefore it is also important to look at the decisions made within certain developments and their corresponding theories.

Mathematics is a well developed field of research. The techniques available are generally good and robust. It is therefore not in the scope of this research to develop new mathematical techniques into the distribution of power.

The possibility of an ideal type approach is tested against three different cases. The way this is studied is explained later on. The combination of political theory and the ideal type approach will make it possible to answer the main research question. Other researchers, as was revealed in the review, did not use this combination to try to link their perceptions together to find a conclusive answer to the problem. The evaluation of all voting rules on mathematical grounds is based on three objective criteria.

3.3 Variables and bounds

Dependent variables in this research are the different voting procedures within the EU Council. These procedures have been changed multiple times by the member states of the EU. Another dependent variable is the Council of the European Union. The EU Council will be tested within its different configurations. The independent variable is: the Square Root Law. This means that the ideal type is

compared to the different voting procedures through time. The latter can be seen as the dependent variable.

Two very important issues within social science need to be addressed. The terms explaining and understanding are still much disputed. Whereas Hollis and Smith for example make a strict distinction between the two, therefore adopting an idealist approach, Kurzman also makes an argument in his paper of the problems that arise when combining the two, in respect to the Iranian revolution (Hollis and Smith, 1991; Kurzman, 2004).

Explaining refers more to the scientific and modern view. This is the outside point of view. International relations in this analysis are determined, causal and predictable. Behaviour can be predicted and independent actors can be studied.

Understanding is the insider's point of view which is more hermeneutic. History and the interpretative perspective of the individual personalities play a central role. In this approach it does matter which individual is in which specific situation. People have different ideas and reasons of doing things and do not behave according to objective laws. To understand the ideas of individuals one has to go inside their heads. So behaviour is not universal and depends on the context.

Critical realism as already described earlier makes an argument for combining both approaches. This mentioned epistemological approach makes integration between explaining and understanding, as well as qualitative and quantitative research possible (Hollis and Smith, 1991 and Van der Ploeg, 2006, p.4)

The voting procedures need to be explained thoroughly through in-dept analysis of the ideal type and the other voting procedures. From an outsiders point of view all methods are compared. Understanding of the voting procedures within the EU Council is done by theoretical analysis.

The spatial and temporal bounds are essential for the above described process. From the foundation of the EU Council in 1974 until 1 January 2006 the council has dealt with hundreds of cases (Mattila, 2004). Because of the fact that before 1994 the council voting records were not publicly available it is very hard to make a good estimation of the real number of records. The scope of this research is also limited to the EU Council, a part of the Council. Relations to the rest of the international community are also not dealt with in this paper. Moreover, the power relations between the commission and the European parliament are beyond the reach of this investigation. In the negotiations throughout time the distributions of votes in both institutions sometimes had a central place in the debate (Cameron, 2004, p.379). When this is the case it will be mentioned but will not be explored further. The fact that in this research it is not systematically taken into account does not mean that this element should not be taken further into account in other research of the development of a democratic power distribution.

3.3.1 Level of Analysis

The level of analysis in this research is the international relations and formally the governments of the nation states (see for a more extensive explanation appendix B: level of analysis). Again the secrecy in which the EU Council still operates plays a negative role in determining the correct level of analysis. It is therefore not possible to determine if the individual level should also be included. Undoubtedly, the individual level should be included if the role of the individual ministers is a significant one in

determining the legislation. The EU Council operates on the systemic level where the types of decisions made are mostly policy-setting (George and Bache, 2001, p.24).

3.3.2 Data and measurement indicators

Voting cases in the EU Council do not occur that often, because of the fact that most of the cases are handled by the COREPER. Deliberations within this institution are mostly confidential making it very difficult to take this as indicators for measurement.

The measurement indicator for the political theoretical analysis is:

- The Square Root Law approach.

The measurement indicator for the mathematical analysis is:

- The population size of a country.

Experimental research will not be an option within in this research. For this reason a combination of more qualitative and quantitative research was made. First, some representative cases were selected for determination of the voting procedures through time. On the basis of these cases an analysis of the method prior to Nice, the currently used method of Nice, the proposed method of the treaty of Lissabon and the proposed mathematical method of the square root law is done to assess the fairness of these methods. Furthermore these cases present a more empirical insight in the possibility of the implementation of voting rules in the EU.

4. Empirical analysis

This empirical part of this research is composed of:

- a small N case-study with N=3

For this research existing literature and documents are used. The reason why case-studies are so suitable is because of the fact that this type of analysis makes theory formation possible. Not only new theories can be developed, but also the explanatory power of other theories can be proven inadequate. On the other hand comparison is used to test in what way the various voting distributions relate to the ideal type approach. Therefore one can distinguish possible trends within the development of those distributions through time.

4.1.1 Case selection

The cases for the case-study are carefully selected to show the diverse interests in the deliberations for the different voting distributions. The idea was to select cases that were defining cases for the power distributions in the EU Council. These cases also need to present a picture of the whole decision process. However, for the selected cases a difficulty was that the deliberations of the EU Council are confidential. Therefore it is very hard for researchers to gain insight in the procedures and negotiations. This poses a problem for the transparency of the supra-national decision making procedures which adopts legislations that hold for every member of the EU. The latter is adding to democratic deficit. Therefore another approach for the case selection has been adopted. The Intergovernmental Conferences (IGC) are on the super-systemic level and the type of decisions that are made there are so called history making (George and Bache, 2001, p.24). At these conferences the decisions regarding for example voting procedures are made, making it excellent candidates for case-selection. These cases will contribute to answering the main question.

The first case that was chosen is the formal installation of the European council in 1974.

The second case is the reformation of the voting procedures in Nice from 2001.

The third case is the proposed European constitution/treaty of Lissabon of 2007.

These cases are deliberately chosen to construct the design for the testing of the three methods:

- Situation prior to the treaty of Nice
- Current situation with the treaty of Nice
- Treaty of Lissabon
- Mathematical method of the Square Root Law

As Geddes states:

"This is not to say that studies of cases selected on the dependent variable have no place in comparative politics. They are ideal for digging into the details of how phenomena come about and for developing insights. They identify plausible causal variables. They bring into light anomalies that current theories cannot accommodate. In so doing, they contribute to the accumulation of theoretical knowledge."

(Geddes, 1990, p.61)

To prevent further selection bias, all the cases in which the voting procedures changed were taken into account. The cases are not completely equal because of the enlargement of the EU on several occasions. The comparison of the methods will not be influenced by this fact. As already stated a universalist point of view is adapted. A short description of each case is described in the next part.

Case 1 Installation of the European Council of Ministers in 1974
In 1969 president the Gaulle resigned and a change in the government of Germany appeared to clear the way for further European integration. In 1969 the Hague summit was conveyed with all heads of government. In Paris it was finally decided to name the summit meetings, the meetings of the European Council (George and Bach, 2001, p.248). Already before this in 1958, in the at that time called European Economical Community (EEC) the council already agreed upon voting distributions according to the given scheme below:

Table 1. *Voting in the EEC* (Cameron, 2004, p. 379)

Countries	Seats
Germany	4
France	4
Italy	4
Belgium	2
Netherlands	2
Luxembourg	1
Total	17

Voting in the Council required a qualified majority. This consisted of 12 of 17 voting which is 70.6%. It is immediately visible that the voting weights are not proportional to the population size. For instance, the population size of Germany is more than four times bigger then Luxembourg's which is not expressed in the voting weights. The qualified majority threshold defines the voting power as well. Looking at the different possible voting coalitions in the original setting of the six countries, it becomes clear that Luxembourg does not possess a deciding vote. For this case an example is given to illustrate this effect.

Minimal winning coalitions are:

Table 2. *Minimal winning coalitions when 12 out of 17 seats are needed*

Germany	France	Italy	Belgium	Netherlands	Luxembourg	Total
X	X	X				12
X	X		X	X		12
X		X	X	X		12
	X	X	X	X		12

As is shown Luxembourg is never needed to pass a vote. To calculate this in terms of the banzhaf-index one can easily see the power distribution in this situation. The large countries have Banzhaf values of 5/21 each, the medium-size countries 1/7 each, and Luxembourg no voting power at all.

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When on the other hand the threshold would have been 11 or 13 the minimal winning coalitions are:

Table 3. *Minimal winning coalitions when 11 out of 17 seats are needed*

Germany	France	Italy	Belgium	Netherlands	Luxembourg	Total
X	X	X				12
X	X		X	X		12
X		X	X	X		12
	X	X	X	X		12
X	X		X		X	11
X	X			X	X	11
X		X	X		X	11
X		X		X	X	11
	X	X	X		X	11
	X	X		X	X	11

Table 4. *Minimal winning coalitions when 13 out of 17 seats are needed*

Germany	France	Italy	Belgium	Netherlands	Luxembourg	Total
X	X	X	X			14
X	X	X		X		14
X	X	X			X	13
X	X		X	X	X	13
X		X	X	X	X	13
	X	X	X	X	X	13

A similar analysis can be done for other voting weights or thresholds. After enlargements took place the votes were allocated according to this proportional distribution. But when Spain entered in 1986 this posed problems because of the size of this country. It was not immediately apparent how many votes this country should have. With strong support of Germany it got 8 votes in the Council, only two votes less than Germany, France and Italy. Therefore, a summit in Amsterdam was organized to discuss the voting distributions. Amsterdam failed miserably to that account and no agreement on new voting procedures was reached (Cameron, 2004, p.379-380). The large role played by the nation states confirms the theory of intergouvermentalism. The larger countries such as France and Germany both proposed voting schemes in favour of the larger countries. This was also to prevent that after enlargement of the EU with mostly agricultural countries, these countries would have too much influence on agricultural legalization and have the option of shifting the legislation in their direction (Konig and Bräuninger, 2004, p.422).

Case 2 Treaty of Nice in 2001
In the treaty of Nice the following distribution of votes per country including Romania and Bulgaria is established:

Table 5. *Voting distribution according to Nice*

(Koornwinder, 2005, p.5)

Countries	Seats	Countries	Seats
Germany	29	Austria	10
France	29	Bulgaria	10
United Kingdom	29	Denmark	7
Italia	29	Slovakia	7
Spain	27	Finland	7
Poland	27	Lithuania	7
Romania	14	Ireland	7
Netherlands	13	Slovenia	4
Greece	12	Estonia	4
Portugal	12	Cyprus	4
Belgium	12	Luxembourg	4
Czech-Republic	12	Latvia	4
Hungary	12	Malta	3
Sweden	10		
		Total	345

The following thresholds were established (Koornwinder, 2005, p.5):

- Proposals are accepted with at least 72% of the weighted votes.
- The number of inhabitants of the countries who vote in favour of a proposal must be at least 62% of the total population of the EU.
- More than half of the member states need to be in favour of the proposal.

This power distribution is very complicated and non-transparent and the negotiations leading to this compromise may incorporate the intergouvermentalist theory. There appears to be a large influence of various nation states into the development of the following requirements for the voting system:

1) Small states demanded that the simple majority rule remained.
2) France, Poland and Spain demanded reasonable weights in comparison to Germany and resulted in 29 votes for Germany, France, UK and Italy and 27 votes for Poland and Spain. Whereas the latter two countries gain the largest increase in votes.
3) Due to the unification of East- and West-Germany, Germany demanded a larger influence so voting weights should be consistent with the population size.

Simple analyses that were possible with the first voting system are no longer possible because of multiple reasons. Firstly, the enlargement of the union makes many more winning coalitions possible. Secondly the voting system is so complex that this creates again a lot more options. Some researchers even mention that more than 3,3 million options are possible. As Cameron also shows in his paper the four large countries have an unusual large proportion of the votes assigned to them. Still, most of the large countries remain underrepresented relative to the size of their population, especially

Germany. In 2004 this voting system came into existence and will remain until the Constitution or another treaty is approved (Cameron, 2004, p.381-382).

Case 3 Treaty establishing a Constitution for Europe/treaty of Lissabon

Within the treaty of Lissabon the subsequent voting distributions which are given as percentages of the total EU population are established as follows:

Table 6. *Proposed voting distribution according to treaty of Lissabon* (Cameron, 2004, p.383)

Countries	Seat allocation in %	Countries	Seat allocation in %
Germany	17.1%	Austria	1.7%
France	12.3%	Bulgaria	1.6%
United Kingdom	12.2%	Denmark	1.1%
Italia	11.8%	Slovakia	1.1%
Spain	8.4%	Finland	1.1%
Poland	7.9%	Ireland	0.83%
Romania	4.5%	Lithuania	0.7%
Netherlands	3.4%	Latvia	0.5%
Greece	2.3%	Slovenia	0.5%
Portugal	2.2%	Estonia	0.3%
Belgium	2.2%	Cyprus	0.1%
Czech-Republic	2.1%	Luxembourg	0.08%
Hungary	2.1%	Malta	0.08%
Sweden	1.8%		
	Total	100%	

The reason that this distribution is presented as percentages is because of the fact that the relative proportion of the population of a country of the total population of the EU determines the number of votes. Since the total number of votes has not been determined yet, only percentages can be calculated (Cameron, 2004, p.383). In the proposed constitution the following changes to the treaty of Nice are proposed (Koornwinder, 2005, p.5):

- The voting weights are equal to the population size of a country;
- The population size of the countries that vote in favour of a proposal must be at least 65% of the total population of the EU;
- At least 55% of the member states should be in favour of the proposal and furthermore at least 15 states should be in favour;
- If at most four states are not voting in favour of the proposal then this proposal is accepted even if the majority consists of less than 65% of the people of the EU.

New voting arrangements have been agreed. Under the Reform Treaty, a double majority voting will be used in the Council of Ministers at which a qualified majority (QMV) will require 55% of the Member States and 65% of the Union's population. For matters where the Council is acting other than on a proposal from the European Commission, the support of 72% of member States representing 65% of the Union's population will be required.

The new distribution of power shows that Germany gains relative power but Poland and Spain lose relative power. Cameron shows in his paper that especially Spain contributed to the stalemate in Brussels prior to the final agreement of the earlier proposed constitution. Spain was apposed to the new constitution (Cameron, 2004).

Analysis of these cases shows that the protection of power by the current member states plays a significant role in the determination of the voting rules for the EU Council. Also, signs of path-dependency are visible especially if one focuses on the role of the voting distributions of Spain. If this analysis holds, when a thorough case-study into these cases would be conducted, it might favour a more objective move to the more mathematical approach to determine a fair distribution of power within this EU Council in which the prerogative of the eldest and largest members will be less.

4.1.2 Comparison of the voting procedures through time

The following comparative methods are explored to recalculate the outcome of the cases:

- Method 1: voting rules prior to Nice
- Method 2: voting rules of Nice
- Method 3: voting rules of the treaty of Lissabon
- Method 4: voting rules of the Square Root Law (SRL)

The example of the table with the number of votes per country prior to Nice is shown below:

Table 7. *Case 1: voting rules prior to Nice*

Countries	Population size 1973	Prior	Nice	Lissabon	SRL	Banzhaf Prior
Germany incl DDR	78820701	10	10.65	18.95	12.48	0.1116
France	51915873	10	10.65	13.63	10.13	0.1116
UK	56159785	10	10.65	13.52	10.53	0.1116
Italy	54574111	10	10.65	13.08	10.38	0.1116
Spain	34663507	8	9.91	9.31	8.28	0.0924
Netherlands	13387623	5	4.77	3.77	5.14	0.0587
Greece	8920282	5	4.41	2.55	4.20	0.0587
Belgium	9726850	5	4.41	2.44	4.38	0.0587
Portugal	8636600	5	4.41	2.44	4.13	0.0587
Sweden	8129161	4	3.67	1.99	4.01	0.0479
Austria	7566469	4	3.67	1.88	3.87	0.0479
Denmark	5007538	3	2.57	1.22	3.15	0.0359
Finland	4653401	3	2.57	1.22	3.03	0.0359
Ireland	3060800	3	2.57	0.92	2.46	0.0359
Luxembourg	348200	2	1.47	0.09	0.83	0.0226
Total	345570901	87	87	87	87	0.9997*

*Due to some rounding errors there is a slight deviation

This table shows that the larger countries where largely underrepresented in the situation prior to Nice. For the purpose of clarification is in this case also the Banzhaf-index presented. The current situation shows again an underrepresentation of the larger countries and an overrepresentation of the smaller countries compared to the Square Root Law. Still no single member state is predominantly strong in the EU15 situation. Because of the alterations in thresholds not only the passage probability decreased (see chapter 5), but also the smaller countries gained more power. In addition since 1973 there are no dummy countries any more. Only the proposed treaty of Lissabon shows a significant shift of power towards overrepresentation of the larger countries and an underrepresentation of the smaller countries compared to the Square Root Law. For a visual representation of the Nice situation versus the ideal type see figure 1 below.

Table 8. *Case 2: voting rules according to Nice*

Countries	Population size 2000	Prior	Nice	Lissabon	SRL
Germany	82163475	10	29	58.53	33.27
France	60537977	10	29	42.10	28.56
Italy	56923524	10	29	40.39	27.70
UK	58785246	10	29	41.75	28.15
Spain	40049708	8	27	28.75	23.23
Poland	38653559	-	27	27.04	22.82
Netherlands	15863950	5	13	11.64	14.62
Greece	10903757	5	12	7.87	12.12
Portugal	10195014	5	12	7.53	11.72
Belgium	10239085	5	12	7.53	11.75
Czech-Republic	10278098	-	12	7.19	11.77
Hungary	10221644	-	12	7.19	11.74
Sweden	8861426	4	10	6.16	10.93
Austria	8002186	4	10	5.82	10.38
Denmark	5330020	3	7	3.76	8.48
Slovakia	5398657	-	7	3.76	8.53
Finland	5171302	3	7	3.76	8.35
Ireland	3777763	3	7	2.84	7.13
Lithuania	3512074	-	7	2.40	6.88
Latvia	2381715	-	4	1.71	5.67
Slovenia	1987755	-	4	1.37	5.18
Estonia	1372071	-	4	1.03	4.30
Cyprus	690497	-	4	0.34	3.05
Luxembourg	433600	2	4	0.27	2.42
Malta	380201	-	3	0.27	2.26
Total	452114304	87	321	321	321

This table shows again the same pattern as already described above for table 7. But it even becomes more clear that the enlargement of the EU with a lot of smaller member states has strengthened the smaller ones relative to the larger ones.

Table 9. *Case 3: voting rules of the proposed treaty of Lissabon*

Countries	Population size 2004	Method 1	Method 2	Method 3	Method 4
Germany	82531671	10	29	59.06	33.12
France	62251817	10	29	42.48	28.76
Italy	57888245	10	29	40.75	27.74
UK	59699828	10	29	42.14	28.17
Spain	42345342	8	27	29.01	23.72
Poland	38190608	-	27	27.29	22.53
Romania	21711252	-	14	15.54	16.99
Netherlands	16258032	5	13	11.74	14.70
Greece	11040650	5	12	7.94	12.11
Portugal	10474685	5	12	7.60	11.80
Belgium	10396421	5	12	7.60	11.75
Czech-Republic	10211455	-	12	7.25	11.65
Hungary	10116742	-	12	7.25	11.60
Sweden	8975670	4	10	6.22	10.92
Austria	8140122	4	10	5.87	10.40
Bulgaria	7801273	-	10	5.53	10.18
Denmark	5397640	3	7	3.80	8.47
Slovakia	1996433	-	7	3.80	5.15
Finland	5219732	3	7	3.80	8.33
Ireland	4027732	3	7	2.87	7.32
Lithuania	3445857	-	7	2.42	6.77
Latvia	2319203	-	4	1.73	5.55
Slovenia	1996433	-	4	1.38	5.15
Estonia	1351069	-	4	1.04	4.24
Cyprus	730367	-	4	0.35	3.12
Luxembourg	454960	2	4	0.28	2.46
Total	484973239	87	345	345	345

Surprisingly is the Nice rule the closest to the ideal type approach, whereas the Lissabon rule isn't at all. Further analysis provided below shows that the treaty of Lissabon is more fair in terms of one-man-one-vote.

4.2 Summary

It has become quite obvious that at the negotiations during the ICG's, the influence of the member states concerning the voting distribution has been quite large. Especially the overrepresentation of Spain and Poland were large deviations from the ideal type situation. The reason for this divergence is mainly the protection of power by the larger countries and protection of interests regarding agriculture. The fact that 70% of the total EU-budget is agricultural funding creates large interests for all member states. The larger countries wanted to block possibilities for more agricultural countries to get more budget or change policy. The latest negotiations have taken a total different turn in terms of voting distributions. And have gone from a more ideal type situation to a more one-man-one-vote situation.

The analysis of these three cases have shown that it is very difficult and maybe even impossible to implement a mathematical solution based on the ideal type of Penrose Square Root Law. The larger countries have created their own ideal type situation in creating a one-man-one-vote situation where they have gained the most power. Fortunately for the smaller countries there are some thresholds providing them with some influence.

5. Mathematical analysis

An analysis can also be based purely on mathematical elements. Three objective criteria derived from different literature sources form the basis for the assessment of the different voting rules found in literature.

Three criteria for the determination of the best usable voting power index are:

- Equity: distribution of power in the light of relevant features such as population size (Crum, 2004; Kirsch et al, 2004; Zyczkowski and Slomczynski, 2004; Koornwinder, 2005; Leech, 2001; Sutter, 2000)
- Efficacy: ability to make decisions (Baldwin & Widgren, 2003; Barbera & Jackson, 2006; Hosly & Machover, 2004)
- Comprehensibility: understandable and transparent mechanics of the decision-making process (Crum, 2004; Thomas 2007)

5.1 Short analysis

All voting rules are evaluated and based on the most recent population numbers of 2007 after the last enlargements. Thus in order to make the rules comparable the analysis is based on 27 countries and population size of the EU-27 of 2007. They are compared with each other on the basis of the above three criteria.

The voting rules prior to Nice scores:

- Medium on equity it approaches the ideal type situation of Penrose and the Banzhaf-index;
- High on efficacy because in the first years with only six countries there was a passage probability of 21.9% (Baldwin & Wildgren, 2003);
- Medium on comprehensibility because there were only a limited number of member states and therefore a limited number of win coalitions possible, making it a transparent situation for the actors involved. Because of the secrecy of the meeting the first years it was visible for the public and therefore a non-transparent situation.

The voting rules under Nice scores:

- Low on equity since there is no objective basis for the distribution of voting weights.
- Low on efficacy because of demand of representation of 72% of the countries and 62% of the total population the passage probability has dropped with each enlargement from 8.2% to only 2.1% (Baldwin & Widgren, 2003). By reducing the representation of countries to 66% and the total population representation to 50% would create a passage probability of
- Low on comprehensibility, even in the council in the EU-25 situation 232 votes out of 321 votes are necessary to make a decision, making it both for the actors as the citizens almost impossible to oversee all possibilities.

The voting rules under the proposed treaty of Lissabon scores:

- Medium on equity since it is again dependent on negotiations and is mostly based on one-man-one-vote but not entirely. Where the discrepancies come from is not totally clear. It's equity criterion is totally different from the other ideal type Square Root Law approach.
- High on efficacy because of the change in voting distributions and thresholds it's passage probability will increase to just over 18%
- Medium on comprehensibility for the reason that it is more open for every citizen to view the process, but all the thresholds create more difficulty in understanding the possibilities open for the actors involved.

The voting rules under the Penrose Square Root Law scores:

- High on equity because of its very objective basis;
- High on efficacy but dependent on threshold;
- High on comprehensibility because it is a very transparent voting distribution mechanism.

The voting rules under the Jageliellonian compromise, 61,4% scores:

- High on equity because of its very objective basis and even more equal then the traditional Penrose Square Root Law because of the introduction of a optimal threshold where the voting power of every citizen approaches equality even more closely;
- High on efficacy but again dependent on threshold;
- High on comprehensibility because it is also a very transparent voting distribution mechanism.

A downside is that population sizes change over time making the distribution of seats subject to change. Somehow a criterion should be developed for altering the number of seats of a country according to the change in its population size.

5.2 Mathematical analysis: equal power

The scoring on the three criteria is based on the following more objective measurement criteria:

- Equity: equal voting power with the ideal distribution based on the Penrose Square Root law (Penrose, 1946).
- Efficacy: passage probability based on Baldwin & Widgren (2003).
- Comprehensibility: dependent on number of winning coalitions. Because of the complexity of this issue it was not possible to adequately implement this criterion.

Table 7. Comparison

Countries	Population size 2006	Method 1: Penrose			Method 2: Banzhaf index (Lissabon)		Method 3: Voting under Nice		Method 4: Treaty of Lissabon		Method 4: Jageliellonian compromise 61,4%	
		Distribution penrose in %	Distribution of weigths	Over/Underre presentation	Distribution of weigths	Over/Underre presentation	Distribution of weigths	Over/Underre presentation	Distribution of weigths	Over/Underre presentation	Distribution of weigths	Over/Underre presentation
Germany	82,437,995	9.47	9.47	0.00	11.87	2.40	8.41	-1.06	17.12	7.65	9.54	0.07
France	62,998,773	8.27	8.27	0.00	8.74	0.47	8.41	0.14	12.31	4.04	8.12	-0.15
UK	60,393,100	8.10	8.10	0.00	8.69	0.59	8.41	0.31	12.21	4.11	8.10	0.00
Italy	58,751,711	7.99	7.99	0.00	8.44	0.45	8.41	0.42	11.81	3.82	7.96	-0.03
Spain	43,758,250	6.90	6.90	0.00	6.37	-0.53	7.83	0.93	8.41	1.51	6.79	-0.11
Poland	38,157,055	6.44	6.44	0.00	5.89	-0.55	7.83	1.39	7.91	1.47	6.50	0.06
Romania	21,610,213	4.85	4.85	0.00	4.22	-0.63	4.06	-0.79	4.50	-0.35	4.91	0.06
Netherlands	16,334,210	4.21	4.21	0.00	3.51	-0.70	3.77	-0.44	3.40	-0.81	4.22	0.01
Greece	11,125,179	3.48	3.48	0.00	2.88	-0.60	3.48	0.00	2.30	-1.18	3.49	0.01
Portugal	10,569,592	3.39	3.39	0.00	2.80	-0.59	3.48	0.09	2.20	-1.19	3.39	0.00
Belgium	10,511,382	3.38	3.38	0.00	2.80	-0.58	3.48	0.10	2.20	-1.18	3.38	0.00
Czech	10,251,079	3.34	3.34	0.00	2.78	-0.56	3.48	0.14	2.10	-1.24	3.35	0.01
Hungary	10,076,581	3.31	3.31	0.00	2.77	-0.54	3.48	0.17	2.10	-1.21	3.34	0.03
Sweden	9,047,752	3.14	3.14	0.00	2.63	-0.51	2.90	-0.24	1.80	-1.34	3.14	0.00
Austria	8,265,925	3.00	3.00	0.00	2.52	-0.48	2.90	-0.10	1.70	-1.30	2.98	-0.02
Bulgaria	7,718,750	2.90	2.90	0.00	2.49	-0.41	2.90	0.00	1.60	-1.30	2.94	0.04
Denmark	5,427,459	2.43	2.43	0.00	2.19	-0.24	2.03	-0.40	1.10	-1.33	2.44	0.01
Slovakia	5,389,180	2.42	2.42	0.00	2.19	-0.23	2.03	-0.39	1.10	-1.32	2.44	0.02
Finland	5,255,580	2.39	2.39	0.00	2.17	-0.22	2.03	-0.36	1.10	-1.29	2.39	0.00
Ireland	4,209,019	2.14	2.14	0.00	2.02	-0.12	2.03	-0.11	0.83	-1.31	2.09	-0.05
Lithuania	3,403,284	1.92	1.92	0.00	1.96	0.04	2.03	0.11	0.70	-1.22	1.95	0.03
Latvia	2,294,590	1.58	1.58	0.00	1.82	0.24	1.16	-0.42	0.50	-1.08	1.61	0.03
Slovenia	2,003,358	1.48	1.48	0.00	1.78	0.30	1.16	-0.32	0.40	-1.08	1.48	0.00
Estonia	1,344,684	1.21	1.21	0.00	1.70	0.49	1.16	-0.05	0.30	-0.91	1.23	0.02
Cyprus	766,414	0.91	0.91	0.00	1.62	0.71	1.16	0.25	0.10	-0.81	0.89	-0.02
Luxembourg	459,500	0.71	0.71	0.00	1.59	0.88	1.16	0.45	0.08	-0.63	0.70	-0.01
Malta	404,346	0.66	0.66	0.00	1.58	0.92	0.87	0.21	0.08	-0.58	0.66	0.00
Total	492,964,961	100.00	100.02	-0.02	100.00	0.00	100.00	0.00	100.00	0.00	100.00	0.00

The table provides an interesting overview of the most important voting rules at hand. The situation prior to Nice couldn't be represented because of the absence of data for the member states from Eastern Europe. All the values are based on the population size of 2006 and the 27 member states now residing in the EU. Again the benchmark of the Square Root Law is chosen to present the under- and overrepresentation of each voting rule. This time is also the more used banzhaf-index provided. In terms of the Banzhaf-index one can see that Germany is underrepresented under the Nice rule and overrepresented under the proposed treaty of Lissabon. The last column presents the compromise of Slomczynski and Zyczkowski (2004) also called the ageliellonian compromise. It consists of giving each member state a voting weight based on the Penrose Square Law. It also presents an optimal quota based on formula 1.3. They show that with this rule that the Banzhaf-index is almost proportional to the square root of its population (Slomczynski and Zyczkowski, 2004).
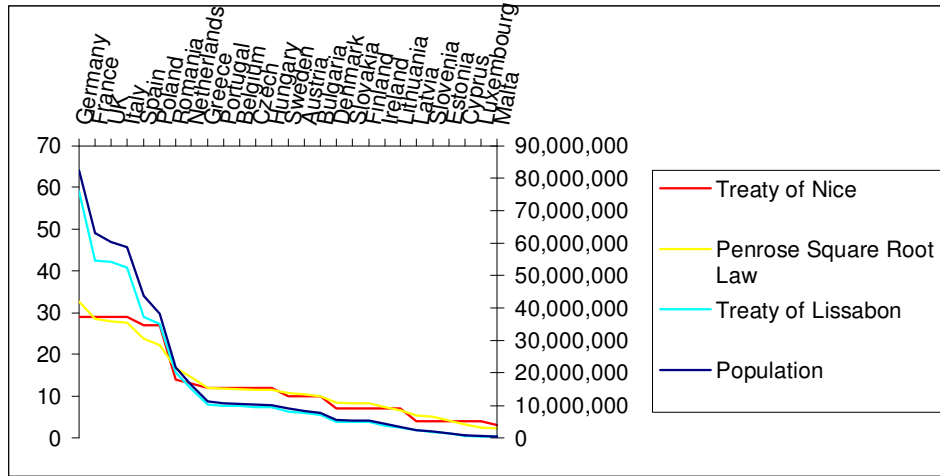
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Figure 1. *Population versus the Nice voting rule, Treat of Lissabon and Square Root Law*

This figure shows that the treaty of Nice followed the more or less the Square Root Law, with the big exceptions of Spain and Poland. Whereas on the hand the treaty of Lissabon shows a distribution largely following the population sizes of all member states.

Analogous to Algaba et al. (2007) an analysis is made comparing the ideal voting distribution with the voting rules under Nice and the proposed treaty of Lissabon.
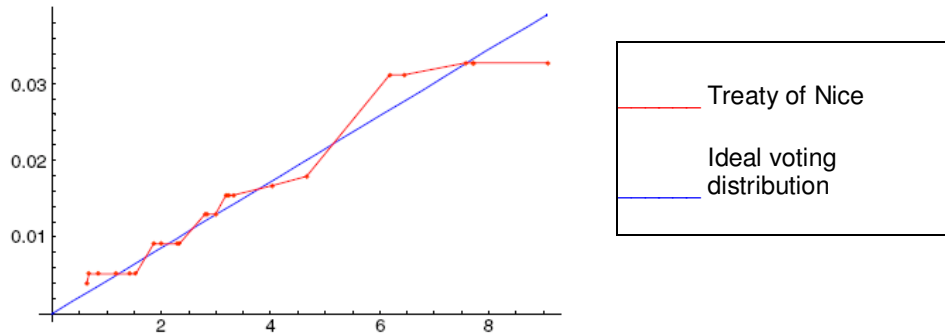
Figure 2. *Voting during Nice in EU27*

The red line shows the Banzhaf-index of the Nice treaty. Again one can see that even in the equal distribution for every citizen situation, Germany is underrepresented in the Council. Spain and Poland are to be found above the straight line and France and the UK are on top of the line. The other countries hover around the line some being somewhat more powerful then they should be and others somewhat less powerful.
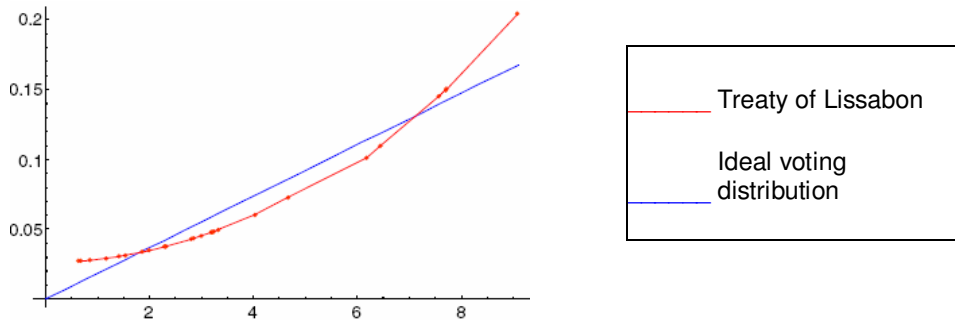

Figure 3. *Voting proposed treaty of Lissabon*

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A whole different picture is visible when looking at the proposed treaty of Lissabon. Germany will receive too much power in comparison to the ideal power distribution based on one-man-one-vote. Also the French, Italians and British get too much power. The smallest six countries are also not well represented and should even get less power then currently proposed. This all goes at the expense of the inhabitants of the remaining countries.

5.2.1 Passage probability

First, all possible coalitions among EU members, being every possible combination of 'yes' and 'no' votes by EU members (there are 134 million coalitions in the EU27) is calculated. This is equal to the formula of 2^n.

Passage probability is ratio of two numbers:

$$\text{Passage IP} := \frac{\text{total number of winning coalitions}}{\text{number of coalitions}} \qquad (1.7)$$

For every coalition it can be verified if it is a winner under the different voting systems; this is done using each member's actual weight on the three criteria (votes, members, population) and the applicable thresholds. The passage probability tells us what fraction of these coalitions are winning coalitions. It is called the passage probability because it is the likelihood that a random proposal would attract a winning coalition, assuming all coalitions are equally likely.
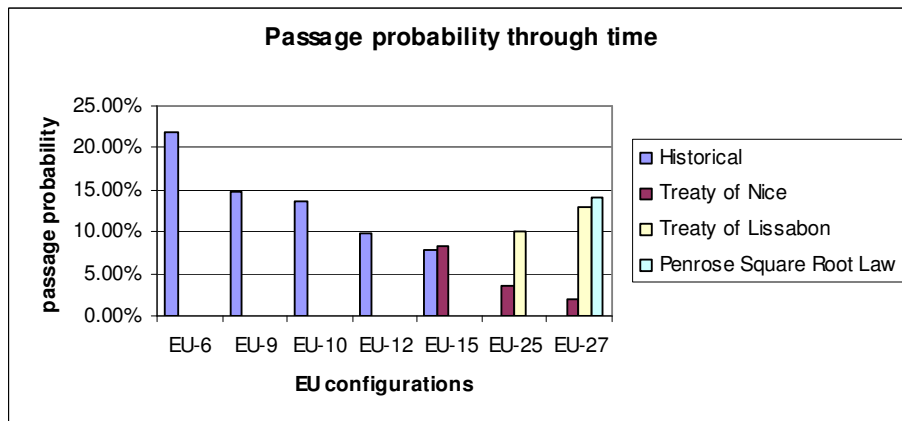

Figure 4. *Passage probability through time based on (Baldwin & Wildgren, 2003)*

The passage probability is in its current situation very low and makes it rather difficult to make decisions. It is quite clear that the treaty of Nice is not able to handle 27 member states and the council has become powerless.

5.3 Mathematical analysis: one-man-one-vote

As a second benchmark one could consider to use the Banzhaf-index to calculate the seat distribution in such a way that the population of a country, relative to the total population of all member states in the council, is reflected in the percentage that this country has a critical contribution to an arbitrary coalition. Normally one calculates the Banzhaf-index from the given seat distribution. Here however, the opposite is proposed. The relative population of the member states is a given (at a moment in time), which should be equal to the calculated Banzhaf-index. One would have to re-allocate the number of seats of the member states in order to fulfill this restriction. However, that is certainly not

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straightforward, and it is questionable that it would even be possible for a set of 27 states with a more or less arbitrary population distribution. It may be possible to use an iterative algorithm that approximates the desired seat distribution, recalculating the Banzhaf-indices until (most of) the restrictions are (more or less) met. Figure 5 shows the complexity of such a process, even for 9 states (Wolfram Mathematica, 2007). Certain is that with this seat distribution the larger states only obtain more power, even more than with the equal distribution method. This is surely not desirable.
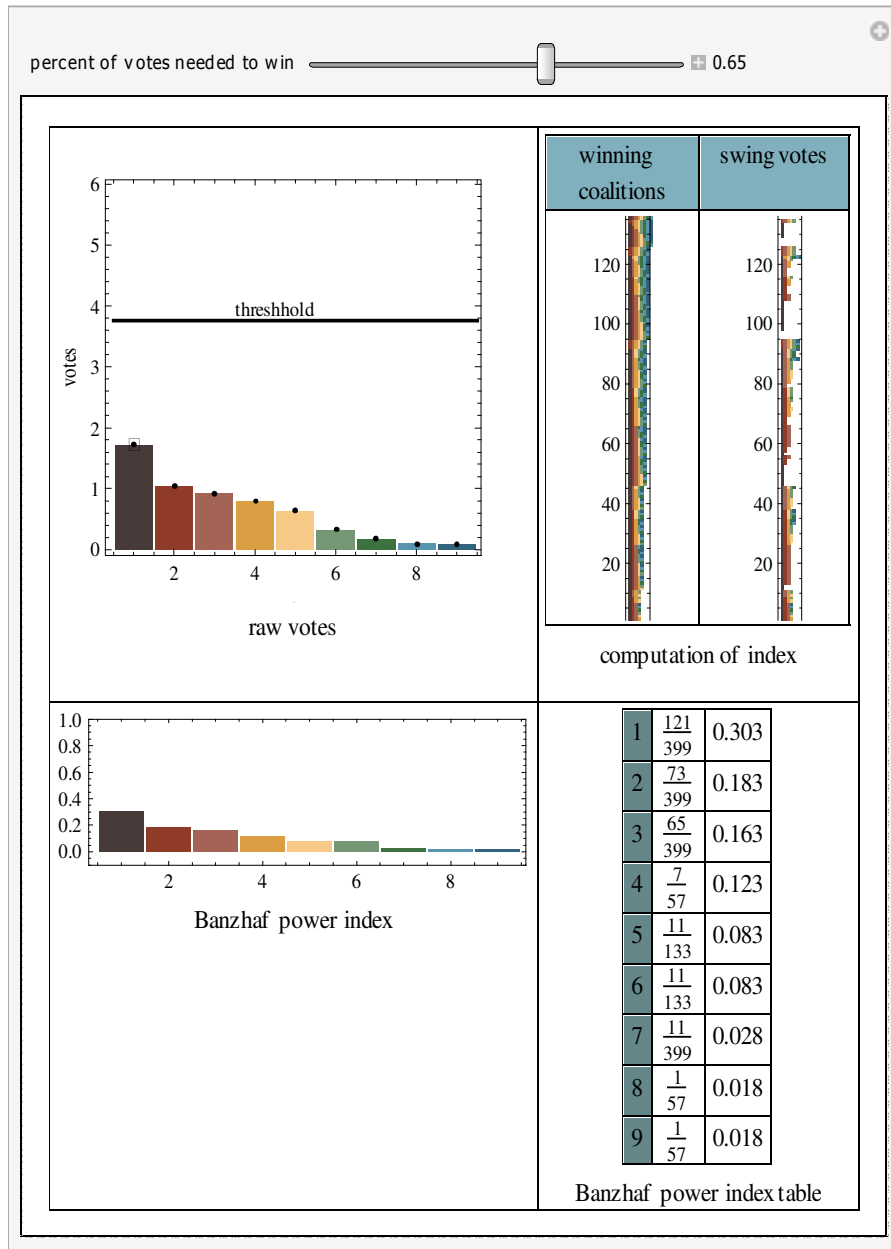

Figure 5. *Banzhaf-index for 9 countries*

This figure made using the program Mathematica. With the code it is possible to change the number of countries and vary with all sorts of parameters. It shows the swing votes and winning coalitions. In the situation of 9 countries it is still achievable to visualize all possibilities. With the increase in the number of countries and possibilities, this in not the case anymore.

6. Conclusions and further research

The main research question that has been central in this paper:

To what extend is equal distribution of power represented in the Council of the European Union in the past, the present and the future situation within the proposed treaty of Lissabon?

With every adaptation of a mathematical method it assumes too little in terms that it only takes constitutional aspects into consideration, and too much in terms that each voter alignment or permutation is equally likely. Discussions based on more philosophical and normative grounds such as Albert (2003), Felsenthal et al. (2003) and Thomas (2007) do not provide solutions to solve this element but only introduces more possibilities.

Two approaches of ideal voting distributions have been central in this paper to answer the research question:

- The Voting Power Approach where the power distribution for decisions of the Council should be equal for every citizen in the EU, regardless of which country he or she lives in. This approach was implemented using the ideal type approach of the Square Root Law.
- The one-man-one-vote Approach states that every citizen has one vote; this implies that inhabitants in larger countries have more power then the ones living in smaller countries. This approach was implemented using the relative population sizes and the Banzhaf-index.

The normative arguments that can be provided in favour of both approaches will always remain and it is not probable that a solution will be presented in the near future.

Interpretation of the data remains quite difficult. The variety of cases makes it also complicated to extract the relevant data in the theoretical analysis. When determining the variables that are to be studied it may be problematic to perform the necessary uniformization on those variables. With the interpretation of the results it remains important to take the different compositions of the EU and its applied voting schemes into account. There is a probability that not all axioms from the qualitative research can be satisfied because it is not possible to unify everything into one power distribution method. Results of the research of both the mathematical and political theoretical approaches do make it apparent that improvement is possible.

The first stage of research emphasized on the theoretical political research part. There has been lack of research into European integration theories concentrating on the formation of the Council and its voting procedures. Therefore, a general description of the theories has been presented along with a few other interesting insights into the EU Council. The theory of intergouvernmentalism can be largely confirmed and the influence of the member states concerning the voting distribution has been quite large. Most obviously are the overrepresentation of Spain and Poland in the current situation and the overrepresentation of Germany in the future situation in terms of deviations from the ideal type

situation. The latest negotiations have taken a total different turn in terms of voting distributions. And have gone from a more ideal type situation to a more one-man-one-vote situation. It may therefore be impossible to implement a mathematical solution based on the ideal type of Penrose Square Root Law. By creating a one-man-one-vote situation the larger countries will even become more powerful in 2014 when the treaty of Lissabon is effectuated. Fortunately for the smaller countries there are some thresholds providing them with some influence.

The second stage showed the more mathematical line of research. Based within a firm ontological and epistemological framework the ideal type Square Root Law was explained. A comparison of all the various voting systems was made including the ideal type method. Analysis shows that no method is equal to the ideal type. The ideal type approach is also prone to possible small changes. Combining this approach with qualified majority voting, or the demand of an agreement of a majority of the states, it can make a big difference to the composition of winning coalitions and therefore on the influence of a country (Kirsch et al, 2004, p.1). The comparison of two "ideal" types showed that the complexity combined with politics will make the implementation of pure mathematical based voting rule very difficult. It should however be the goal of the EU to create an equal, effective and comprehensible voting system and mathematics can successfully assist.

Further research is needed to investigate the extent of equal distribution of power with the ideal type and to investigate the theoretical side. More research could have an important contribution to the power distribution debate. Other research fields such as the empirical analysis of Mattila or the COREPER analysis of Lewis are also important. When combining all these investigations with this research a more complete picture can be drawn of the EU Council in relation to integration and democratization.

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8. Appendix A: Definition of concepts

The universalist position, the relativist position and the middle position are the most well known positions (Landman, 2003, p.44). In this research the middle position is adopted. This is done with the notion that in my opinion the goal of research should be the universalist position. Social science should work into that direction to gain more explanatory power and to have universal concepts as is possible in mathematics. The reason why in this research the middle position is adopted is because of the fact that the currently available concepts do not possess this quality. It is not in the scope of this research to develop concepts that do possess this quality. The used concepts in this research are still very generally defined so that they are widely usable and are not too restricted:

Axiom: In epistemology, an axiom is a self-evident truth upon which other knowledge must rest, from which other knowledge is built up (Axiom-Wikipedia, 2006).

Council: This concept has been explained in the review.

Equal distribution of power: The ideal type in which the square root law is determined as the equal distribution of power in which the vote in every member of the EU contains the same weight.

European integration process: This differs within the various integration theories and is explained in the review.

Democratic deficit: In the process of European integration the democratic institutions of national parliaments have lost powers that have been insufficiently compensated by the powers of the representative institutions at the European level, the European Parliament in particular (Crum, 2005, p.454).

Integration theory: The field of theorizing the process and outcome of (European) integration (Wiener and Dietz, 2004, p.6).

Institution: Institutions are organizations, or mechanisms of social structure, governing the behaviour of two or more individuals. Institutions are identified with a social purpose and permanence, transcending individual human lives and intentions, and with the making and enforcing of rules governing human behaviour (Institution-Wikipedia, 2006b).

9. Appendix B: Level of analysis

Not only are temporal and spatial bounds important to distinguish, also the level of analysis needs to be conceptualized. This has been disputed within social science. In Hollis and Smith for example a very state centric vertical level of analysis is employed. They describe the international system, nation state, bureaucracy and individual (Hollis and Smith, 1991, p.9). Whereas other forms of analysis also take the horizontal level into account. Transnational organizations for example are more and more able to bypass the national or bureaucratic level. In general the following levels are distinguishable within the level of analysis:

- Global system which is composed of nation-states, NGOs, and other actors
- International relations between nation-states
- Nation-state defined as a closely associated number of people in a defined territory ruled by a common sovereign
- Government of a nation-state
- Interest Groups which are organized interests in the nation-state
- Individuals consisting of specific actors
- Society a culture, population(s), etc. within a nation-state