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**WINNERS AND LOSERS UNDER
VARIOUS DUAL MAJORITY RULES
FOR THE EU COUNCIL OF MINISTERS**

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ABSTRACT

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This Paper studies some of the many options facing EU leaders when choosing a viable voting system for the EU25+. It provides quantitative estimates of the efficiency and power distributions of the various EU voting schemes that are being considered. It also provides intuition on how various aspects of voting rules affect decision-making efficiency and the implied power distribution. The paper also argues that the two big mistakes the EU has made with respect to voting reform were both due to last-minute 'surprise' schemes. This time around, EU leaders should limit themselves to choosing among voting systems that have been thoroughly studied and discussed, if they want to avoid a third mistake on this issue.

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Winners and losers under various dual majority rules for the EU's Council of Ministers

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1. Introduction

It has long been known that Eastern enlargement would have dramatic implications for EU decision-making; a structure designed for 6 would simply collapse under the weight of 25+ members.²

This is why EU leaders started the search for a viable voting reform in the 1996 Intergovernmental Conference (IGC). They failed to agree a reform in IGC 1996 and the Amsterdam Treaty, so the task – labelled the Amsterdam leftovers – was taken up again in IGC 2000. This IGC produced a range of workable reforms.³ All such reforms, however, broke the voting power parity between France and Germany. The French – who had the Presidency at the time – decided that this was a deal breaker. At the last minute, they brought out a complex, unstudied system and convinced the EU15 leaders to put it into the Nice Treaty. As subsequent studies showed, the Nice voting system fails to solve the enlarged EU's decision-making problems. EU leaders admitted their mistake by setting up the European Convention and assigning to it what might be called the Nice leftovers; this included the task of finding a viable voting reform for the enlarged EU. The Convention did not openly discuss voting reforms; at the last minute, Valéry Giscard d'Estaing put an unstudied voting scheme into the draft Constitutional Treaty. As subsequent studies showed, Giscard's rule raised French voting power and lowered Spain's, thus breaking the Nice Treaty's near-parity between French and Spanish voting power. The Spanish decided that this was a deal-breaker and the IGC collapsed in December 2003, creating what might be called the Convention leftovers.

This is why EU leaders are still searching for a viable voting system 8 years on. They have given themselves until June 2004 to finish all the Convention leftovers.

This paper studies some of the many options facing EU leaders when choosing a viable voting system for the EU25+. It provides quantitative estimates of the efficiency and power distributions of the various EU voting schemes that are being considered. It also provides intuition on how various aspects of voting rules affect decision-making efficiency and the implied power distribution.

¹ We would be happy to run our numbers of other proposed voting rules that may arise in the discussions.

² See, for example, Baldwin (1994) Chapter 7.

³ See IGC 2000 Working Document, CONFER 4796/00 (9/11/00) and the Portuguese Presidency's June 2000 Report on the IGC progress (CONFER 4750/00 and especially the annexes). See our paper Baldwin et al (2000) for evaluation of these.

1.1. Summary of our results

We have focused on the so-called dual majority schemes, where approval of a measure by the Council of Ministers would require a 'yes' vote from nations that represented at least X% of the membership and Y% of the population; X and Y are called the majority thresholds. The main conclusions from our calculations are:

- Any of the mainstream dual majority schemes – those with thresholds ranging from 50% to 60% – would maintain the enlarged Union's ability to act. Several duals would quite substantially increase the Council of Ministers' decision-making efficiency and would thus shift power to the Commission and the Parliament.⁴
- All the dual majority systems would substantially alter the power distribution implicit in the Nice Treaty's voting scheme. All duals we evaluated would reduce the power of Spain and Poland. Almost all of them would raise the power of members with less than 8 million citizens, again compared to the Nice system.
- The 'even' duals (where the two thresholds are the same) tend to 'rotate' the power curve. That is, they cut the power of biggest nations most and raise the power of the smallest nations most. Germany is an exception; the even duals would have only a small impact on its power. We also find that the power re-distribution effects are similar for all the mainstream even duals (50-50, 55-55 and 60-60).
- The 'uneven' duals can have larger and more varied effects on power than the even duals. Tightening the membership threshold tends to shift power from big to small members; tightening the population threshold tends to shift power the other way.
- The 60% membership and 50% population is the only dual majority system that maintains the near-great power status that Spain and Poland won in the Nice Treaty. Specifically, the 60-50 dual ensures that the French-Spanish power gap remains at the level established in the Nice Treaty.
- The Nice Treaty's flawed voting system could be repaired by changing two of its three majority thresholds. The result would be a respectable level of decision-making efficiency and almost no change in the Nice Treaty power distribution.
- The two big mistakes the EU has made with respect to voting reform were both due to last-minute 'surprise' schemes. A democratic control system that touches the lives of a half billion people should be designed by last minute improvisation. This time around, EU leaders should limit themselves to choosing among voting systems that have been thoroughly studied and discussed, if they want to avoid a third mistake on this issue.

1.2. Organisation of this essay

We start by introducing and briefly motivating the two quantitative measures used in this essay – the passage probability and our measure of power, the normalised Banzhaf index (NBI). The next section provides intuition on how changes in the dual majority rules affect our two measures. After this, we turn to the meat of our essay in sections 4 and 5; the first reviews our results on various dual majority system's impact on decision-making efficiency in the EU25, EU27 and EU27 plus Turkey; the second presents the power implications of the same. Given the pivotal role of Spain and Poland in the IGC discussions, the next section

⁴ See Baldwin and Widgrén (2003a) for the reasoning; the basic logic parallels the way in which changing the dual thresholds shifts power among members. Making the Council's decision making process very efficient tends to make the Parliament's approval relatively more important.

spotlights the implications of the various duals for the gap between French and Spanish power. (Spain and Poland have almost identical power shares under all dual rules; France, Italy and Britain's power shares also move in tandem.) Since it may not be possible to find a dual majority rule that garners support from all nations, the next section covers two 'emergency repairs' of the Nice Treaty's triple majority system that we suggested in 2001. These would maintain the EU27 decision-making efficiency without altering the Nice Treaty's power distribution. The last section presents our concluding remarks.

2. Evaluating dual majority schemes

We focus on two criteria when evaluating voting schemes: (1) the scheme's decision-making efficiency (i.e. the EU's 'ability to act'), and (2) the scheme's power distribution (i.e. the share of decision-making power that each member has under the rules).⁵

2.1. Decision-making efficiency and the passage probability

The most important criteria of any voting reform is its ability to maintain the EU's capacity to act.

It is obvious that the EU's "capacity to act" or "decision-making efficiency" cannot be fully measured by a single number, but even an imperfect number is useful in disciplining discussion of various options.

The measure we focus on – the passage probability (see definition in Box 1) – has been quite successful in the recent past. Following their December 2000 summit, EU leaders claimed that the Nice Treaty's voting scheme would maintain the EU's decision-making efficiency after enlargement. The passage probability demonstrated that this was completely wrong. The Nice system was approximately as efficient as the old system in the EU that the leader new well – the EU15. But for the EU27, the Nice system's passage probability was lower than it would have been without any reform! In short, the passage probability showed that the leaders' claim was false; the Nice voting scheme not only failed to achieve its goal, it actually made matters worse.

We made this point soon after the Nice arrangement was announced and this eventually came to be viewed as the received wisdom (MEI 11, 2001). No one knows whether EU15 leaders would have rejected the strange voting system proposed at the last minute by French President Jacques Chirac if they had known its passage probability was so low. But one thing is sure. At Nice, EU leaders learned that old-fashioned intuition is not good enough when thinking about voting schemes in the enlarged EU. One cannot mentally work through all possibilities in an organisation that has over 100 million possible coalitions (there are $2^{27}=134,217,728$ possible coalitions in the EU27); pretending that only a few dozen of these really matter is an invitation to another failure.

Box 1: What is the passage probability?

The "passage probability" gauges how likely it is that the Council of Ministers would approve a randomly selected issue, where 'random' means that no EU member knows its stance in advance; each

⁵ For background on the mathematics of voting theory, see Felsenthal and Machover (1998); see Banzhaf (1965, 1966, 1968) for the classic treatments, and Widgrén (1994, 1995, 1996), Baldwin (1994), Hosli (1995), Kirman and Widgrén (1995), Laruelle and Widgrén (1998), Felsenthal and Machover (2000, 2001), Napel and Widgrén (2003b) and Widgrén (2004) for applications to Europe

member is equally likely to vote for or against it. Here is the Economist Magazine's explanation of the concept from an "Economic Focus" column that appeared before the Nice summit (25 November 2000):

"What the researchers did was this. First, they asked how many different coalitions can be formed among a union of a given size. (The answer for a 15-member EU is 32,768.) Next, for each system of voting, they asked how many of these coalitions will be winning coalitions: a computer crunched the numbers and gave the answer. If you divide the second of these figures by the first, you get a "passage probability" – the chance, behind a "veil of ignorance", that a random measure will pass. The researchers call this a measure of each system's "efficiency". That, in fact, is not an apt word. More efficiency, other things equal, is always a good thing; ease of approving any given measure is not. It would be better to talk of "ease of action". Note too that this number, whatever you call it, means nothing by itself. The European Commission, unlike the researchers' computer, does not propose randomly selected measures, and coalitions of members do not form randomly around any given proposal. Even so, the results are useful for before-and-after comparisons, because they do suggest how ease of action will change." (The column refers to Baldwin, Berglof, Giavazzi and Widgren, 2000)

2.2. Member's power share as measured by the Normalised Banzhaf index

As with the ability to act, there can be no perfect measure of power. But even imperfect measures are useful when considering complex voting rules. Two good reasons support this assertion. First, a voting scheme's political acceptability turns almost completely on its power implications, so it is critical to think as careful as possible about the power implications; formal power measures are one tool that can help. Second, the power implications are difficult to judge using intuition alone. A classic example of a failure to think things through can be found in the Treaty of Rome (see Box 2).

The measure we use is called the Normalised Banzhaf Index (NBI). In plain English, the normalised Banzhaf index (NBI) gauges how likely it is that a nation finds itself in a position to "break" a winning coalition on a randomly selected issue. Thus, the NBI tells us how influential a country is likely to be on a randomly chosen issue. Of course, on particular issues various countries may be much more or much less powerful – especially if they are part of a like-minded group (see Baldwin, Berglof, Giavazzi and Widgren 2001 for details and simple numerical examples), but the NBI has recently proved its worth.

According to media reports, Spain and Poland were the most vocal opponents to the voting system that Giscard d'Estaing put into the draft Constitutional Treaty. Using the NBI, this stance is easy to understand. As we showed in our 2001 book, Spain and Poland are set to enjoy extraordinarily large power gains from the Nice Treaty's strange voting rules. Maybe this explains why Spain backed French President Jacques Chirac's scheme against the protests of small nations at the Nice summit. If this were the case, it would be easy to understand why Spain would be very unhappy to see the deal un-done by what amounted to unilateral action by former French President Valéry Giscard d'Estaing. (The draft Constitutional Treaty voting rules were never discussed openly and no background studies were published).

Be that as it may, the NBI reasoning allowed us to correctly predict in June 2003 that the final form of the Constitutional Treaty would not include Giscard's voting rule. We wrote:

"The analysis in this policy brief suggests that many of the fights that arose in the last two IGCs (*Amsterdam and Nice*) will re-emerge in the next one. ... Europe needs serious institutional reform if it is to continue to operate efficiently and legitimately after the 2004 enlargement since the Treaty of Nice did not accomplish that task. So it seems almost certain that some Constitutional Treaty will emerge ... The nature of the institutional reform it contains, however, is very

unlikely to resemble the reforms in the June 2003 draft. In short, the IGC that starts this autumn may "discard Giscard" or at least many of the key reforms he put in the draft Constitution." (Baldwin and Widgren 2003a). Words in italics added for clarity.

Box 2: Luxembourg's useless vote, 1958-1973

The 1958 Treaty of Rome laid down the rules for qualified majority voting in the EEC6. The big three – Germany, France and Italy – got 4 votes each, Belgium and the Netherlands got 2 each, and Luxembourg got 1. The minimum threshold for a qualified majority was set at 12 of the 17 total votes.

A little bit of thought shows that the Treaty writers did not think hard enough about this. As you can easily confirm, Luxembourg's one vote never matters. Any coalition (group of yes voters) that has enough votes to win can always win with or without Luxembourg. According to formal power measures, this means that Luxembourg had zero power over issues decided on a QMV basis. As Felsenthal and Machover (2001) write: "This didn't matter all that much, because the Treaty of Rome stipulated that QMV would not be used until 1966; and even in 1966–72 it was only used on rare occasions. Still, it seems a bit of a blunder." All changed from 1973 on when the weights were altered to allow for the accession of Britain, Denmark and Ireland. Indeed, since then Luxembourg's votes have turned out to be crucial in a surprisingly large number of coalitions. Maybe that is why Luxembourg has the highest receipt-per-capita in the EU despite being the richest nation by far.

Source: Baldwin and Wyplosz (2003), Chapter 3.

2.3. A Union of States and peoples: Legitimacy

As far as the voting reform is concerned, the IGC 2004 faces exactly the same problem as the IGC 2000. The Conference must adopt, "reforms which will, in the future, ensure the efficiency of the institutions of the Union while preserving its legitimacy as a Union of States and peoples and the fundamental balances and originality of an enterprise that has shown its worth over fifty years."⁶ Having considered the efficiency and power implications of the various dual majority rules, we turn now to the issue of legitimacy.

The EU's decision-making rules have changed little since 1958. For almost 50 years, EU rules gave more voting weight to large nations but much less than population-proportionality would suggest. This was intentional. Half the original Six were small nations and half were large nations. In the 1950s, "over-weighting" small nations seemed a good idea given the abusive behaviour of big European nations in the preceding 90 years. After all, the "Great Powers" approach and the "Concert of Europe" were exactly the sort of Europe that the Treaty of Rome was designed to replace. For this reason, a deep respect for the rights of small nations is and always has been one of the touchstones of the European Union.

Legitimacy, however, is a slippery concept, so we look first at what legitimacy might mean in this context. This section draws heavily on our book on the Nice Treaty (Baldwin et al, 2001, Chapter 2).

A 2-Union view of democratic legitimacy

Democracy, it has been said, is the tyranny of the majority. To reduce the tyrannical aspects, democracies develop ways of protecting the rights and wishes of minorities. In the EU, the over-weighting of small nations' votes is one such mechanism. For example, equality of power per person would grant Germany 2,000% more power than Ireland; equality per member would grant Luxembourgers 160 times more power per person than Germans. Given the dual-Union nature of the EU, neither extreme is legitimate.

⁶ June 2000 Presidency Report on the IGC.

The basic problem is that it is not easy to apply the equal power per citizen rule. The EU is a *union of states*, so each state is a citizen and should thus have equal voting power. The EU is also a *union of people*, so people are citizens and so each person should have equal voting power. This 2-Union-perspective illustrates clearly the inescapable "legitimacy dilemma" that EU leaders faced in choosing a voting rule. As a matter of pure logic, shifting power in favour of big nations pushes the system towards greater Union-of-People legitimacy, but away from Union-of-States legitimacy. By pure genius or dumb luck, the status-quo qualified majority vote-weighting scheme has – since 1958 – steered between the two extremes. It could do this, however, only because the historical size-profile of EU members was sufficiently compressed to allow one rule to reasonably satisfy two legitimacy criteria. Since enlargement will greatly skew the size profile, the EU will once again have to confront the legitimacy dilemma.

Legitimacy by the numbers

Given our measurement of power (the NBI described above), it is a fairly easy matter to measure Union-of-People legitimacy and Union-of-States legitimacy. An EU that was 100% Union-of-States legitimate would give equal power to all member nations. An EU that was 100% Union-of-People legitimate would give equal power to all EU citizens. The "fair" power distribution for the Union-of-States view is trivial; each member gets an equal power share. For the Union-of-People view, the calculation is more complex.

Fairness and square-ness

Strange as it may seem, ensuring Union-of-People fairness – that is to say, a Council in which each EU citizen has equal power – requires each Council member to have power in Council that is proportional to the square root of her nation's population. The basic reason is that Council decision-making is a two-step procedure:

- Citizens elect national governments, and then
- Governments vote in the Council.

This matters.

In her national election, a typical German citizen has less power than a typical Luxembourger. Each group of voters chooses one government but German voters are 160 times more numerous. Thus in national elections, a German voter has much less influence than as a Luxembourg voter. To ensure that each EU citizen is equally powerful in Council decisions, the German Council representative must have more power than the Luxembourg representative. That much is easy to see, but how much more?

A first guess is that in her national election, a German voter is only 1/160th as influential as a Luxembourg voter is in hers. In this case, making EU citizens equipotent in the Council would require that the German Minister is 160 times more power in the Council than the Luxembourg Minister. It seems right – 1/160th as powerful in the national election and 160 times more powerful in the Council. But this is wrong since it misses a subtlety that requires some mental gymnastics to comprehend.

In national elections, two things change as the number of voters rises. First, the likelihood of being critical in a particular winning coalition decreases and – as intuition dictates – it declines linearly with the number of voters. Second, the number of winning coalitions

increases.⁷ Thus, the German has 1/160th the chance that a Luxembourger does of making or breaking a given winning coalition, but for the German this is applied to many more coalitions. Taking this into account one can see that the German voter's power is less than that of a Luxembourger in their respective national elections, but the figure is not 1/160th as powerful, it is higher. Consequently, the German Minister's power in the Council should not be proportional to the German population; it should be less than proportional. The precise answer is that for all EU citizens to be equally powerful in the Council, their Ministers should have power in the Council that is proportional to the square root of their national populations. This is called Penrose's rule. Admittedly, it is not the easiest concept to grasp, but it is correct and has a cherished position in the mathematics of voting; see Box 3 for an alternate explanation.

Box 3. Fair and square(root): Gestalt of the square root rule

If everything in the Council of Ministers were decided by an EU-wide referendum, proportional representation would clearly provide each EU citizen with equal power. But even ignoring the Commission, decision-making in the EU is a two-step procedure – citizens elect national governments, which then vote in the Council – and this changes everything. In her national election, a typical Frenchman is less likely to be influential than a Dane since each chooses one government but French voters are more numerous. Thus small-nation citizens have a power-edge going into the Council meeting and to even out the power, the votes of big-nation representatives should have more weight in the Council.

But how much more? The formal power measures discussed above yield a simple answer. National power in the Council should increase with the square root of national population. The reason is that power per citizen in national elections declines with the square root of the population, so national power in the Council should increase with square root in order to have a fair system, i.e. a system where each EU citizen is equally powerful in the Council of Ministers.

Where, you may ask, does the square root come from? The answer requires a bit of maths. Consider a randomly selected yes-no issue and suppose that member nations decide their stance on this issue by a referendum; define P_N as the probability that a typical citizen's vote is critical in the referendum outcome. Then the member states vote in the Council and define P_{ms} as the probability that the member state is critical in the Council vote. A citizen's probability of being critical is thus P_N times P_{ms} and our fairness metric requires this to be equal for all member states.

P_{ms} has nothing to do with the number of voters (proxied by population), but P_N falls at the square root of population. This sounds peculiar since most numerate people would think the probability of being critical in a national election decreases in a straight-line relationship with population. But this misses a subtlety. Two things change with the voter headcount. The probability of a typical voter being critical to a particular winning coalition decreases linearly with the headcount, but the number of distinct winning coalitions rises with the number of voters. The probability of being critical falls at a less than linearly pace. The mathematics of combinatorics gives us an exact formula assuming a voter's stance is randomly determined on a randomly selected issue. Taking M as the minimum number of votes in a winning coalition and n as the number of voters, the formula is:

$$P_N = \frac{M}{n(2^{n-1})} \binom{n}{M}$$

The equation is complex, but can be well approximated as the square root of $2/n\pi$, where n is the number of voters (this is Stirling's formula). Hence the square root.

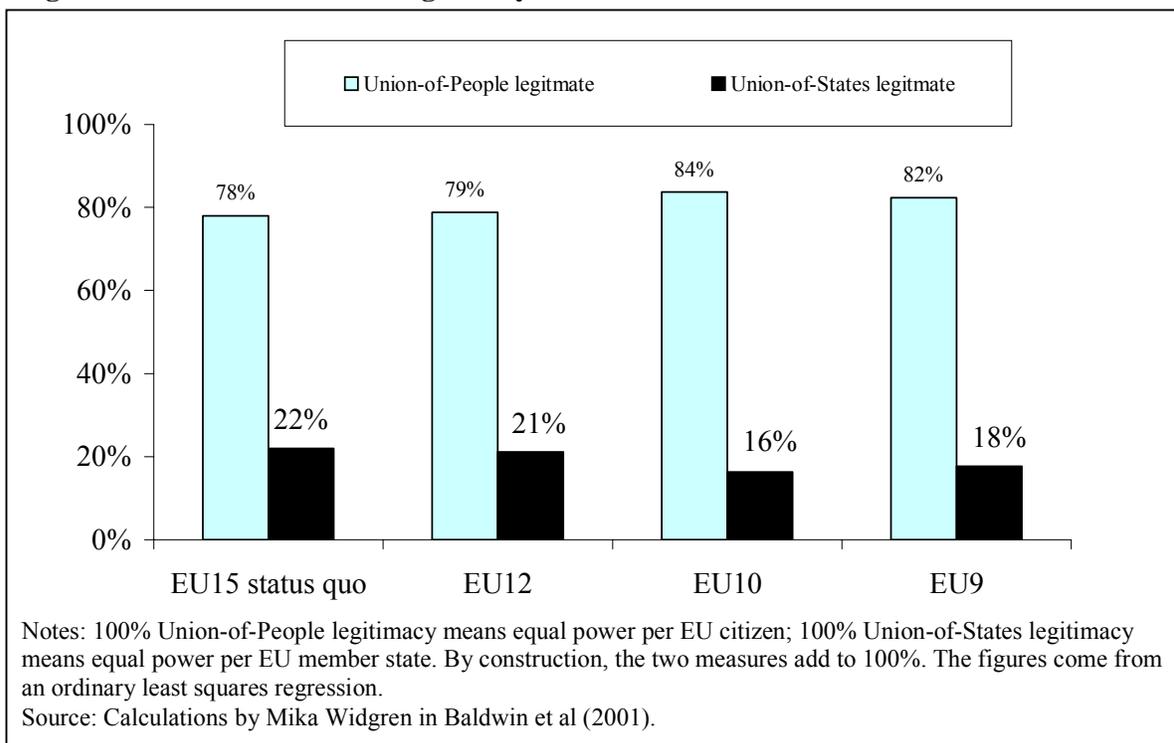
⁷ Try a simple example. With a 50% majority rule and one-vote per citizen, there are 4 winning coalitions when there are 3 citizens (A&B, A&C, B&C, A&B&C). With 5 voters there are 11 winning coalitions (A&B&C, A&B&D, A&B&E, A&C&D, A&C&E, A&D&E, B&C&D, B&C&E, A&B&C&D, A&B&C&E, A&B&C&D&E).

Two-Union legitimacy: historical outcomes

The correct blend of the two Unions is not possible to determine objectively, but we can easily compare the outcome of historical blends, as Laruelle and Widgren (1998) showed. Here is the idea.

Actual power distributions can be thought of as a blend of two extreme power distributions; equipotent people and equipotent states. A simple statistical technique (least squares) shows the blend that best fits the actual power distribution. The results of this are displayed in Figure 1 for historical EUs. For the EU12, the actual distribution of power among members was 79%-21% blend of an equal-power-per-member scheme and an equal-power-per-person scheme.

Figure 1: Historical 2-Unions legitimacy blend



We note that the historical blend has traditionally been about 80-20, with the first figure showing the weight of the union-of-peoples notion (i.e. equal power per person) and the second number showing the weight of union-of-nations (i.e. equal power per nation).

Why we do not present these figures for the duals

In this essay we do not calculate these figures for all the possible dual-rules. Such an analysis would greatly increase the length of this essay. Moreover, experience of five years of contributions on this issue reveal that policy makers seem to have a much better feel for the balance than they do for efficiency and power issues. Consequently, the value-added to the policy discussion of this sort of quantification does not merit inclusion. It is simple, however, to present the Penrose power distribution for EU25, EU27 and EU28. Interested readers can compare the power distributions of all the dual rules to these.

Even power per person of EU25, EU27 and EU28

The Penrose rule says that the power per person is even when nation's power is proportional to the square root of its population. The numbers are presented in Table 1.

Table 1: Penrose power share distributions, EU25, EU27 and EU28

	EU28	EU27	EU25
Germany	8.8%	9.5%	10.4%
Turkey	7.8%		
UK	7.5%	8.1%	8.8%
France	7.4%	8.1%	8.8%
Italy	7.4%	8.0%	8.7%
Spain	6.1%	6.7%	7.2%
Poland	6.0%	6.5%	7.1%
Romania	4.6%	5.0%	
Netherlands	3.9%	4.2%	4.6%
Greece	3.1%	3.4%	3.7%
Czech Rep.	3.1%	3.4%	3.7%
Belgium	3.1%	3.4%	3.7%
Portugal	3.1%	3.4%	3.7%
Hungary	3.1%	3.4%	3.6%
Sweden	2.9%	3.1%	3.4%
Bulgaria	2.8%	3.0%	
Austria	2.8%	3.0%	3.3%
Slovak Rep.	2.3%	2.4%	2.7%
Denmark	2.2%	2.4%	2.6%
Finland	2.2%	2.4%	2.6%
Ireland	1.9%	2.1%	2.2%
Lithuania	1.9%	2.0%	2.2%
Latvia	1.5%	1.6%	1.8%
Slovenia	1.4%	1.5%	1.6%
Estonia	1.1%	1.2%	1.3%
Cyprus	0.8%	0.9%	1.0%
Luxembourg	0.6%	0.7%	0.8%
Malta	0.6%	0.7%	0.7%

Source: Authors calculations: $(\text{pop})^{1/2} / \text{sum of } (\text{pop})^{1/2}$ over all members.

2.4. Even versus uneven dual majority rules

It now appears that the parity of the "two legs" of the double majority formula is an important condition for a considerable number of member states, so we comment briefly on the issue of what we call even-dual and uneven-duals.

There are symbolic and aesthetic reasons for thinking that even duals are superior to uneven duals. But are the convincing economic or mathematical reasons?

There is a fundamental difference between even and uneven dual rules that has a close connection to the definition of the EU as a union of states and peoples. As discussed above, the former is implemented by the membership criterion and the latter by population criterion. Using the same majority threshold in both gives an equal weight for both criteria. If the goal is to implement union of states and peoples without favouring either of them even duals are logical. Which threshold to choose is then primarily a matter of desired ability to act, i.e. the passage probability. If the goal is emphasize either criterion more than the other then a logical choice is an asymmetric dual majority rule.

Another approach is to set the following goal: each citizen should have the same indirect influence in the Council regardless of his/her home state (the so-called one-person-one-vote principle). This is fulfilled when member states' power in the Council is proportional to their square-rooted populations. This weighting scheme was proposed by the Swedish delegation in IGC-2000 and it became later known as the square-root rule or Penrose rule according to its inventor Lionel Penrose (1946).

Widgrén (2004) demonstrates that there is a wide range of vote thresholds (practically from 55% to 70%) where the power distribution using the Penrose rule remains very stable and implements one-person-one-vote principle perfectly. Symmetric dual majorities are like proxies to Penrose rule, which gives them extra justification but the above-mentioned huge variance in EU states' populations affects negatively on the accuracy of the approximations.⁸

With this intuition in hand, we turn now to our evaluation of dual majority systems.

3. Intuition: factors affect decision-making efficiency and power distribution

Before turning to the exact numbers on various dual majority systems under consideration, we present an intuitive way of thinking about such systems in the EU. We start with decision-making efficiency as measured by the passage probability.

3.1. Factors affecting the passage probability

A good way to think of a dual majority system is to view each member's vote as having two weights – one reflecting its population share and one reflecting its membership share. This perspective helps provide intuition for how two key factors affect a voting system's efficiency – the two majority thresholds, and the EU's population distribution.

When it comes to the first factor – the thresholds' impact – there is an easy part and a hard part.

- The easy part is that simultaneously raising both thresholds will always lower the passage probability since this reduces the number of winning coalitions, i.e. makes it more difficult to find a winning coalition.
- The hard part concerns the impact of raising the membership threshold independently, or raising the population threshold independently.

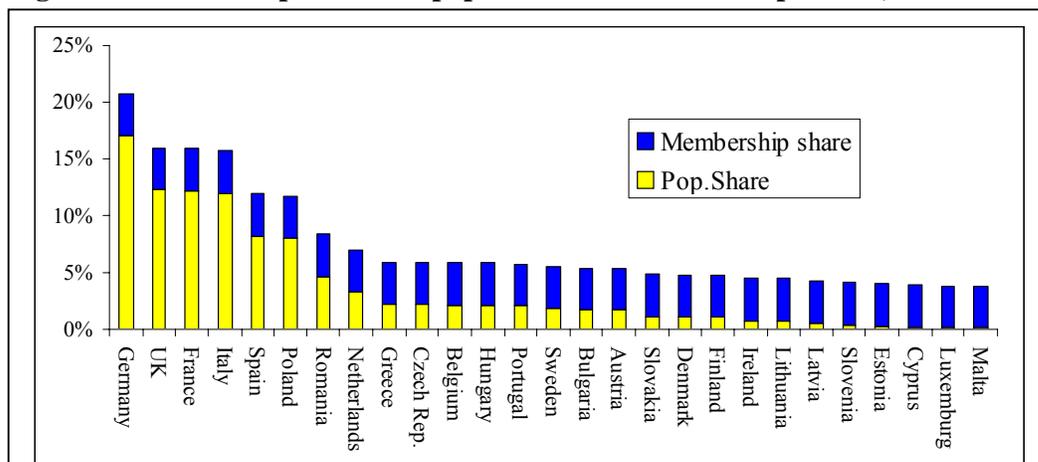
⁸ Baldwin et al. (2000) investigates the voting rules that were proposed during the IGC-2000.

To understand the hard part, one needs to take on board 2 background points.

EU population distribution is very uneven

The first is that the EU's population distribution is extremely skewed in the sense that most EU27 members have nowhere near 1/27th of the EU27 population; most either have much more than 1/27th or much less. This means that the two weights – membership share and population share – are extremely different for different members; Figure 2 shows this graphically for all members, but two examples make the basic point. Germany's population-share weight is huge in the EU27, about 18%, while its member-share weight is 1/27th. The opposite is true for small members like Estonia. Its population share is about 1/500th (2 tenths of 1%) but its membership share is 1/27, or 3.7%.

Figure 2: Relative importance of population and membership shares, EU27

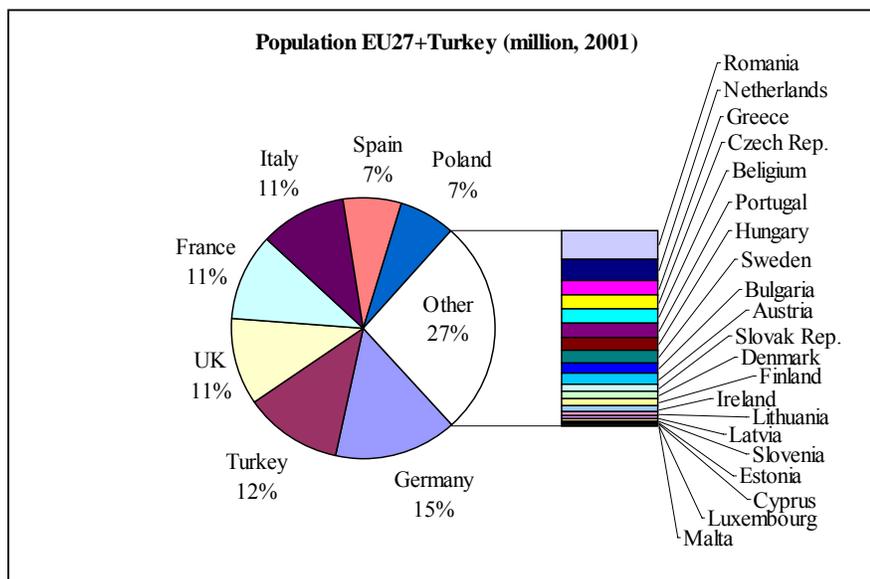


Source: Authors' calculations based on 2001 population data.

Box 4: The EU27's skewed population distribution

The EU population distribution by member state is very, very uneven. Taking the EU27 plus Turkey, for instance, a quarter of the total population resides in the 2 largest nations, half resides in the 4 largest nations, and three-quarters live in the largest 7 countries. On the other extreme, the 14 smallest nations together only account for a tenth of the population.

More specifically, it is useful to group the EU27 + Turkey into three broad categories: big, small and very small. The "big" nations are more populous than any city in the world, having 35 million people or more, and there are six of these in the EU27 – the five big EU15 members (Germany, the UK, France, Italy and Spain) and Poland; Turkey also falls in this category, with its 65 million citizens.

Figure 3: EU28 population, 2001

The populations of the “small” nations are on the scale of a big city, say London or Paris; to be concrete, we draw the lines between 8 and 11 million. By this definition, there are eight small nations, five of which are in the EU15 (Greece, Belgium, Portugal, Sweden and Austria) and three more in the EU27, the Czech Republic, Bulgaria and Hungary.

The “very small” nations are those whose population would make up a medium to small city in, say, Germany or the UK. There are 11 of these, but altogether they account for less than 5% of the 27-nation population. The very small nations are the Slovak Republic, Denmark, Finland, Ireland, Lithuania, Latvia, Slovenia, Estonia, Cyprus, Luxembourg and Malta. The only nations that fall between these categories are the Netherlands with its 16 million people and Romania with its 22 million.

Number of nations needed to win

The second background point concerns the way in which a higher threshold changes the number of nations that make up the average winning coalition. To fix ideas, consider a simple membership-threshold-only voting system where each member has $1/27^{\text{th}}$ of the votes and the threshold was, say, 50%. Under this rule, every winning coalition would require 14 members. If the threshold were raised to 60%, every winning coalition would need 17 members. Plainly, it is typically hard to put together a coalition of 17 members as opposed to 14 and this is the intuitive reason why the passage probability would fall as the majority threshold rose.

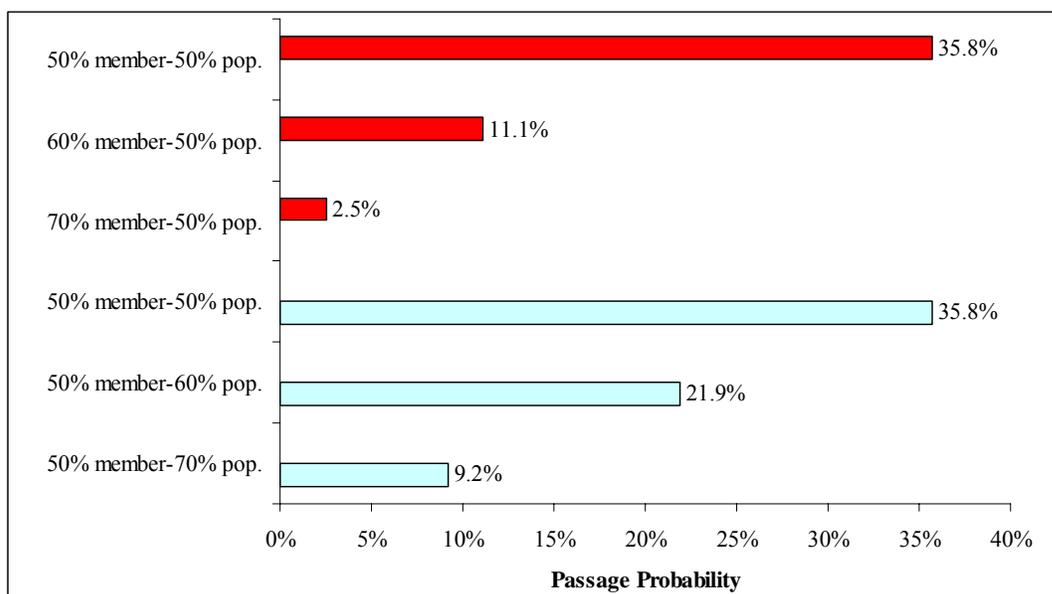
Again to fix ideas, consider another simple voting system – a population-threshold-only system where members had vote shares in line with their population shares. And again, start with a majority threshold of 50%. There are many ways of combining EU nations to make up at least 50% of the population. One thing to note is that the number of members in these winning coalitions would vary enormously, ranging from a low of just 4 nations, to a maximum of all 27. What happens when we raise the threshold in the membership-threshold-only system?

If winning requires, say, 60% of the population instead of just 50%, the passage probability would fall since it would be harder to put together a winning coalition. However, and this is the key point, the increase in difficulty would be less under the population-only system than it would be under the membership-only system. The intuitive reason is that many of the winning coalitions in the population-system would involve only a handful of big nations and these are easier to assemble. Or, more specifically, raising the threshold on the population-

only system would eliminate proportionally fewer winning coalitions than in the membership-only system since many of the winning coalitions in the former rest on the large vote blocks of big nations.

To illustrate this intuition in practice, Figure 4 shows the passage probability for various dual majority systems. The top three bars show what happens as the membership threshold rises while the population threshold remains at 50%. The bottom 3 bars show how the passage probability falls as the membership threshold remains at 50% and the population threshold rises. As per our intuition, raising the membership threshold lowers efficiency faster than raising the population threshold.

Figure 4: Passage probability – raising membership vs population thresholds, EU27



3.2. Factors affecting the power distribution

This section presents the basic intuition for how changes in the two dual majority thresholds can shift power. Fortunately, having gone through the reasoning in section 3.1, the intuition is easy. All we have to do is combine the facts from Figure 2 with the analysis of the two thresholds' impact on efficiency.

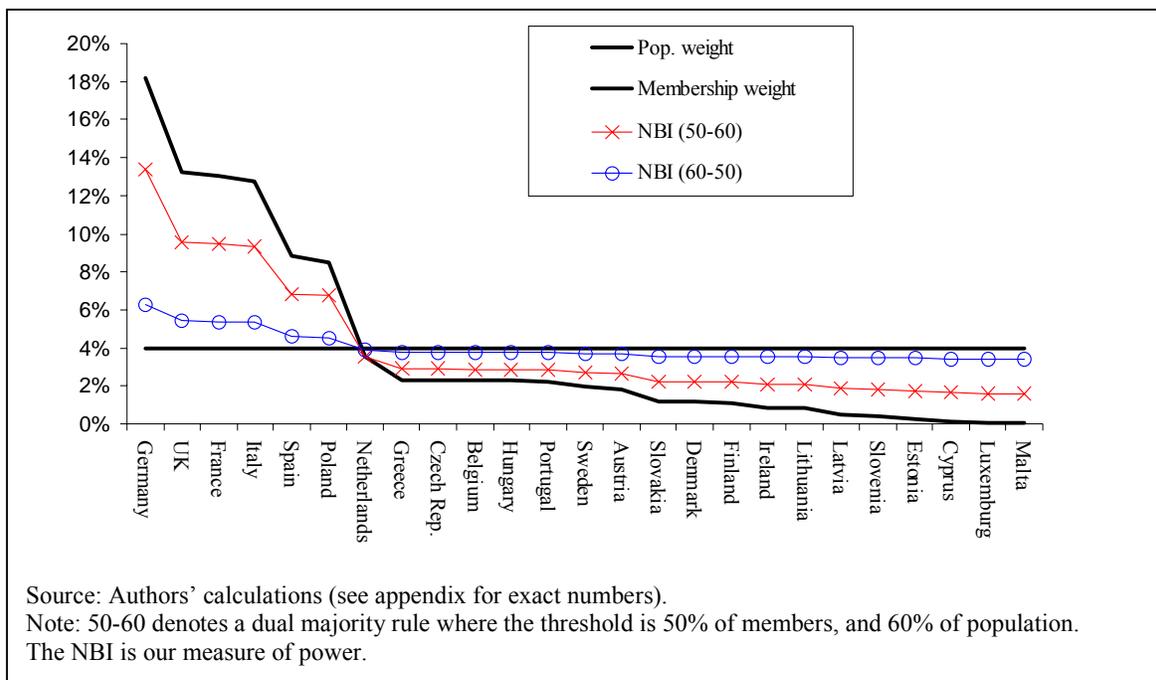
The power of a big nation, like Germany, depends mostly on its population share since its weight in the EU population is much larger than its weight in the number of members. By contrast, the power of small nations, like Estonia, depends mainly on its membership share. As we saw above, raising the majority threshold for population makes the population criteria harder to meet relative to the membership criteria. For example, with a 50% membership threshold and a 70% population threshold, the member threshold becomes the 'easy' one and population becomes the 'hard' one. Given this, nations whose power depend relatively more on their population share will find their votes are more valuable. Nations whose power rests mainly on their membership share will find their vote relatively less valuable. In other words, tightening the population threshold shifts power to big nations because the EU's population distribution is so skewed.

To make this point graphically, we plot the membership shares and the population shares for the EU25 in Figure 5. The figure also shows our power measure, the NBI, for two dual

majority schemes, Giscard's 50-60 and the converse, 60-50. Now comparing the 50-60 to the 60-50, it is plain to see that a relatively tight population threshold shifts power to nations whose population shares exceed their membership share. A relatively tighter membership share does the opposite.

This intuition is not airtight as could be expected when thinking about the outcome of a calculation that involves literally billions of individual comparisons. It need not work for all examples, and it is especially liable to break down for the nations with very big or very small populations since their unusual size may allow them to play unusual roles in breaking coalitions.

Figure 5: Power rotation: power shifts and majority thresholds, EU25



4. Ability to act: evaluation of various duals

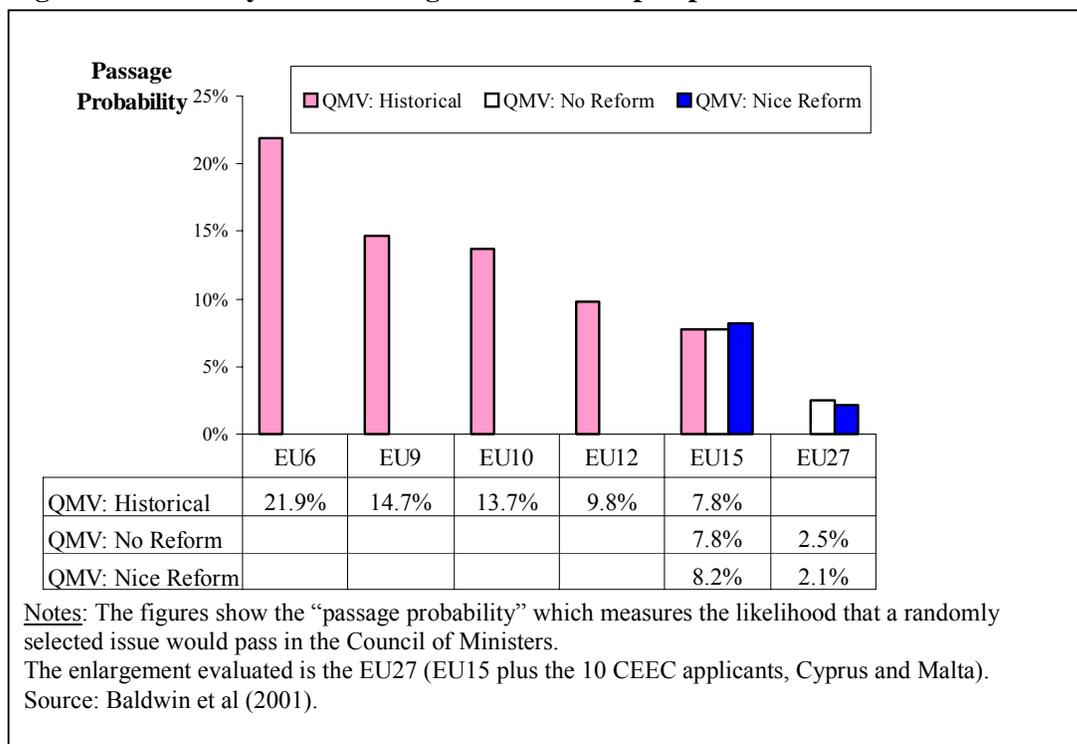
This section presents our calculations on the efficiency of various dual rules for the EU25, EU27 and EU27 plus Turkey. Note that we summarise in this essay many of the results from our earlier papers, but we have switched our notation to match the standard practice of listing the membership threshold first and the population threshold second.

As a background to this discussion, it is important to note just how broken the EU decision-making system will be when the Nice rules take effect.

Figure 6 makes this point by showing the historical passage probabilities for the EU. These indicate that although past enlargements lowered the EU's decision-making efficiency, the declines have been moderate. The last enlargement lowered the probability only slightly, from 10% to 8%, and the Iberian expansion lowered it from 14% to 10%. The figures also hide the fact that the Single European Act, which took effect in 1987, greatly boosted efficiency by implementing majority voting for Single Market issues. The figure also shows what would have happened to efficiency if enlargement occurred without any reform of qualified majority voting rules. The results – illustrated by the middle bars for the EU27 –

show that letting in 12 newcomers without reform would dramatically reduce efficiency, cutting the current passage probability by something like a third, from 7.8% to 2.5%. The intuition for this explanation is simple. Expanding membership increases the number of ways to form a 30% blocking coalition much more rapidly than it increases the number of ways to form a 71% winning coalition. Moreover, the gap between these numbers increases with the initial membership. This is a clear-cut implication of the mathematics of combinatorics and it means that any future enlargements will have a much larger effect on the Council's ability to act than did past enlargements.

Figure 6: Efficiency of reforms agreed at Nice in perspective



The final point to take away from the figure is that the Nice reforms will actually made matters worse (Baldwin et al 2001). Admitting 12 new members without any reform would have cut the passage probability to a third of its already low level, namely to 2.5%. With the Nice reforms, the figure drops even further to 2.1%. Of course, there is no practical difference between 2.5 and 2.1, but both numbers are far below the level in the EU15. In short, the Nice reforms failed to meet the goal of maintaining the efficiency of EU decision making when the membership nearly doubles.

4.1. Efficiency in the EU27

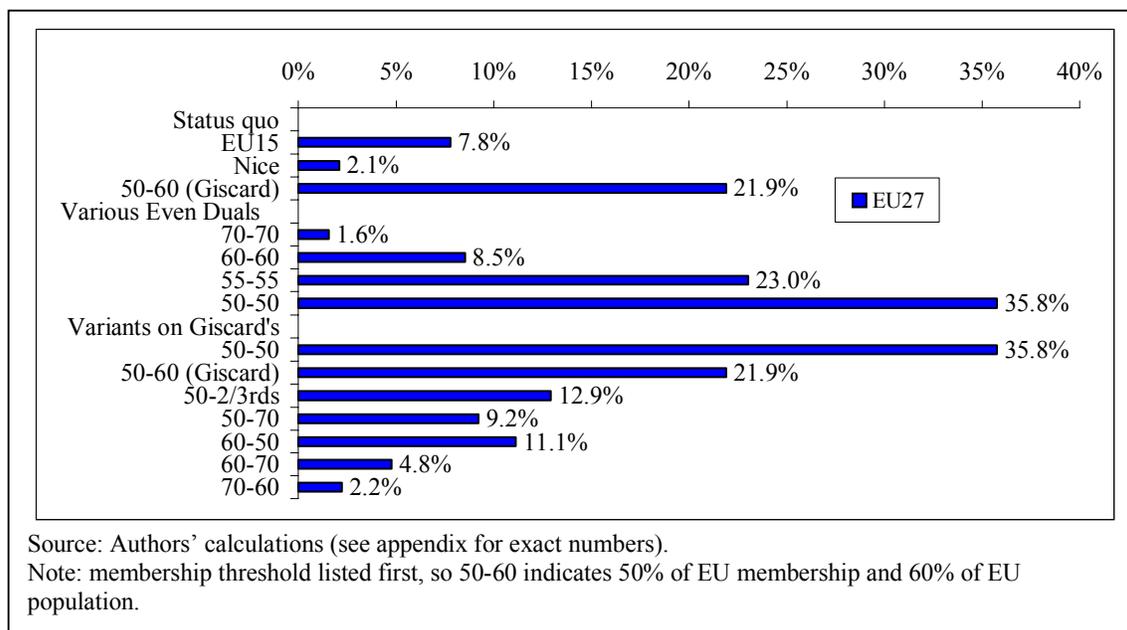
EU leaders know that two more nations will join their organisation, so it would seem natural to take the EU27 as the main benchmark. After all, they do not want to have to negotiate yet another voting reform after Romania and Bulgaria join.

Figure 7 shows the passage probability of various dual majority schemes including Giscard d’Estaing’s 50% of membership and 60% of population. For comparison, we show the remarkably low passage probability implied by the Nice Treaty’s triple-majority voting scheme and the passage probability for the EU15 under current, pre-Nice rules.

The main points are easily summarised.

- All the duals with thresholds of 60% or less would maintain the EU27's ability to act at or above the EU15 level.
- For the 'even' dual rules (same threshold on membership and population), efficiency declines as the threshold rises. Importantly, the decline accelerates as the threshold rises. Shifting from 50-50 to 55-55 drops the passage probability by about 1/3rds, from 55-55 to 60-60 drops it by about 2/3rds, and from 60-60 to 70-70 by about 80%.⁹
- For variants of Giscard's 50-60, raising either threshold will lower efficiency rapidly, but the efficiency-loss curve is steeper when raising the membership threshold.
- Raising the membership threshold and lowering the population threshold simultaneously tends to cancel out efficiency reductions. In particular, the meet-me-half-way solution, 55-55, has about the same level of efficiency as Giscard's 50-60.

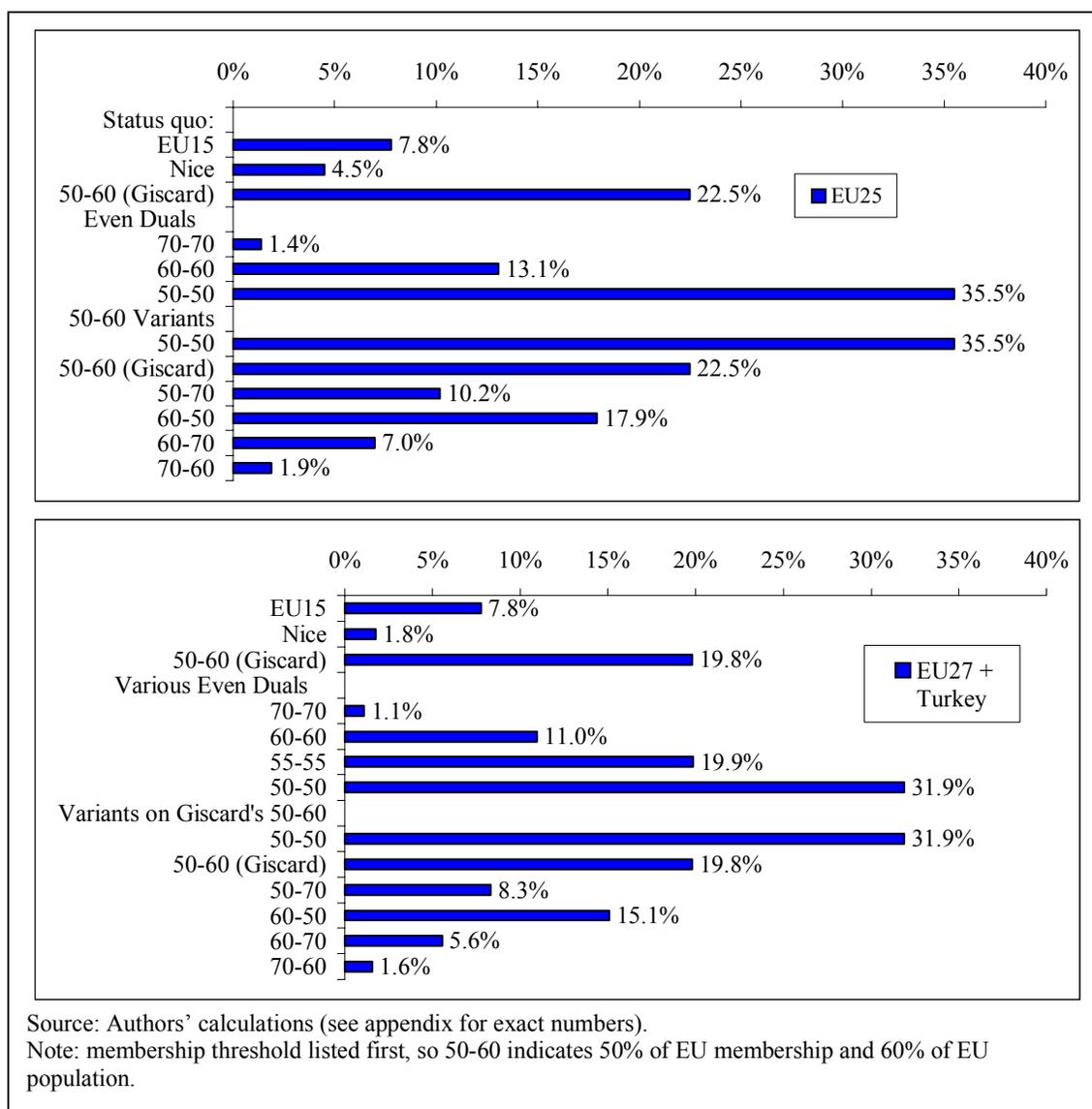
Figure 7: Passage probabilities, various dual majority rules, EU27



As it looks increasingly likely that Turkey may start EU accession talks, it is worth considering the efficiency of the various systems in an EU consisting of the EU27 and Turkey. We do this in the next section, but before turning to those results (which do little more than confirm the Figure 7 results) we address a subtle misunderstanding that concerns the apparent similarity of the Nice rules and the 50-70 dual rule.

⁹ The acceleration reflects the highly non-linear distribution of coalitions. Indeed the likelihood of a given coalition of yes votes is given (approximately) by a normal (i.e. bell-shaped) distribution. The distribution's shape is such that the number of winning coalition drops slowly at first (when thresholds are near 50%), but it picks up speed for thresholds up to about 85% at which point it becomes flatter.

Figure 8: Passage probabilities, various dual rules, EU25 & EU27+Turkey



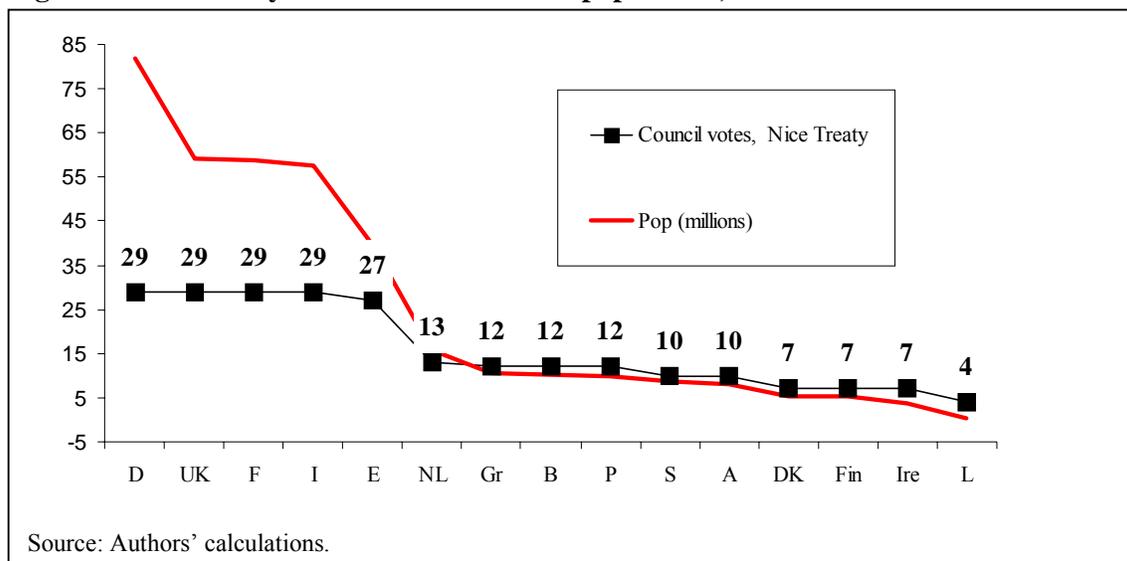
Why are the Nice rules so inefficient compared to 50-70?

The 50-70 dual majority rule is four times more efficiency than Nice rule's triple majority which has a membership threshold of 50%, a population threshold of 62% and a Council vote threshold of 72%. But, 50-70 is not far from 50-62, so why is Nice so much less efficient?

The first point, and perhaps the point that solves most of the mystery, is that Nice's triple majority is, *de facto*, a single threshold system since the membership and population thresholds almost never matter. Why? Because most coalitions that can muster 72% of Council votes also meets the population and membership thresholds; for these coalitions, the population and membership criteria are redundant. More specifically, in the EU27 there are 134,217,728 coalitions all together and about 2.7 million of them are winning using the Council vote majority criterion in the Nice Treaty (246 of 345 votes). Among the 2.7 million coalitions that meet the vote criterion, only 23 fail on either the population or member threshold; 16 fail to satisfy the majority of member states criterion and 7 more fail on the

population criterion. What this means is that the population and member thresholds almost never matter; after all 2.7 million minus 23 is basically 2.7 million.

Figure 9: Nice Treaty's Council votes versus population, EU15



The second point is that compared to a 50-70 majority, Nice rules contain two steps backward in terms efficiency. These are:

- Reweighting in favour of small nations. The Nice Council vote allocation was less favourable to big members than the population-weighting scheme implicit in the dual rules; as Figure 9 shows.
 - Such reweighting tends to worsen efficiency. To see this, compare two extreme vote allocations, one where votes are very dispersed (evenly distributed, to be specific) and one where they are very concentrated (one nation has all votes, to be specific). Although the votes-concentrated allocation would be illegitimate, it would plainly be more efficient in the sense that such a Council would have an easy time taking decision. Since the Nice Council votes are less concentrated than population, the population weighting of the dual rule tends to be more efficient.
- Since the 70% threshold is so high, even the small increase from 70% to 72% has a big effect on efficiency (See footnote 9 and note that the 71% threshold falls at one of the steepest parts of the normal distribution).

To summarise, the Nice Treaty voting reform is dominated by the allocation of Council votes and the Council vote threshold. Minimum requirements in terms of number of countries and population have negligible impact.

4.2. Efficiency in the EU27 and EU27 + Turkey

The numbers for the EU25 and EU28, shown in Figure 9: Nice Treaty's Council votes versus population, EU15

, do little to alter the conclusions from our calculations for the EU27. In most cases, the accession of Turkey makes decision-making harder, but not always. The reason is that Turkey is very unusual in terms of its size; indeed, only Germany would have a large population. Another reason is that, at least for a 50% membership rule, the switch from an odd number of nations to an even number has an impact. Or, to put it differently, at least 50%

of 27 is 14, i.e. 51.85%, while at least 50% of the 28 is also 14. Note that since there are already so many members in the EU27, neither of these factors has a big impact on efficiency.

The key point of this analysis is that all dual majority rules with thresholds no higher than 60% would meet the goal of maintaining the Union's ability to act, even after Turkey joins.

Box 5: The "Nice Treaty" voting rules from the Accession Treaty

The political agreement on voting reforms was contained in protocols to the Treaty of Nice that are not legally binding. The 'Nice' rules that will take effect are actually set in the Accession Treaty. If a proposal is to be adopted by the Council of Ministers, it must attract votes that meet or exceed a triple majority rule, namely the winning coalition must have at least 72% of the Council votes (232 votes of the 321 Council votes in the EU25), at least 50% of the 25 members and at least 62% of the EU population.

These thresholds were not the ones agreed in the Nice Treaty but the changes were done with little or no public comment. It is not hard to see why. The Nice Treaty rules were botched in the sense that they failed to meet their goal of ensuring "the efficiency of the institutions of the Union while preserving its legitimacy as a Union of States and peoples (June 2000 Presidency's report on IGC). But even more embarrassing for EU leaders, the Nice Treaty protocols contain several numerical inconsistencies.

The Nice Treaty deal announced in mid December 2000 contained inconsistencies that – despite weeks of post-Nice negotiations – were never straightened out. Declaration 20 of the Final Act of the Nice Treaty says the Council vote threshold for the 27 listed nations is 258, but Declaration 21 says that once all the listed nations are in and we have a EU27, the blocking minority is 91, which implies a winning threshold of $345-90=255$, not 258. The percentages also throw up an oddity. Declaration 21 says that while the enlargement has not yet been completed (i.e. not all 12 have joined), the Council vote threshold will move, "according to the pace of accessions, from a percentage below the current one to a maximum of 73.4%. When all the candidate countries mentioned above have acceded, the blocking minority, in a Union of 27, will be raised to 91 votes, and the qualified majority threshold resulting from the table given in the Declaration on enlargement of the European Union will be automatically adjusted accordingly." The inconsistency is that 91 votes to block in the EU27 implies a threshold of 73.91%, so where does the 73.4% come from? Moreover, the Accession Treaty's 72% is not "a percentage below the current one"; the actual threshold is 71.26%.

5. Power shifts

As we predicted in our June and November 2003 essays, the power changes implied by Giscard's 50-60 rule proved politically unacceptable to the IGC 2003.¹⁰ EU negotiators are now trying to find something workable to avoid having to rely on the Nice Treaty's botched voting system for the foreseeable future.

This section describes our evaluation of the power-distribution implications of various dual majority rules. As with the efficiency calculations, this summarises much of our earlier work but adds the 55-55 rule that seems to be emerging as a possible compromise. Note that we adopt the standard convention of listing the threshold for membership first and the population threshold second (this was reversed in our earlier essays).

5.1. EU25, EU27 and EU28 results are similar

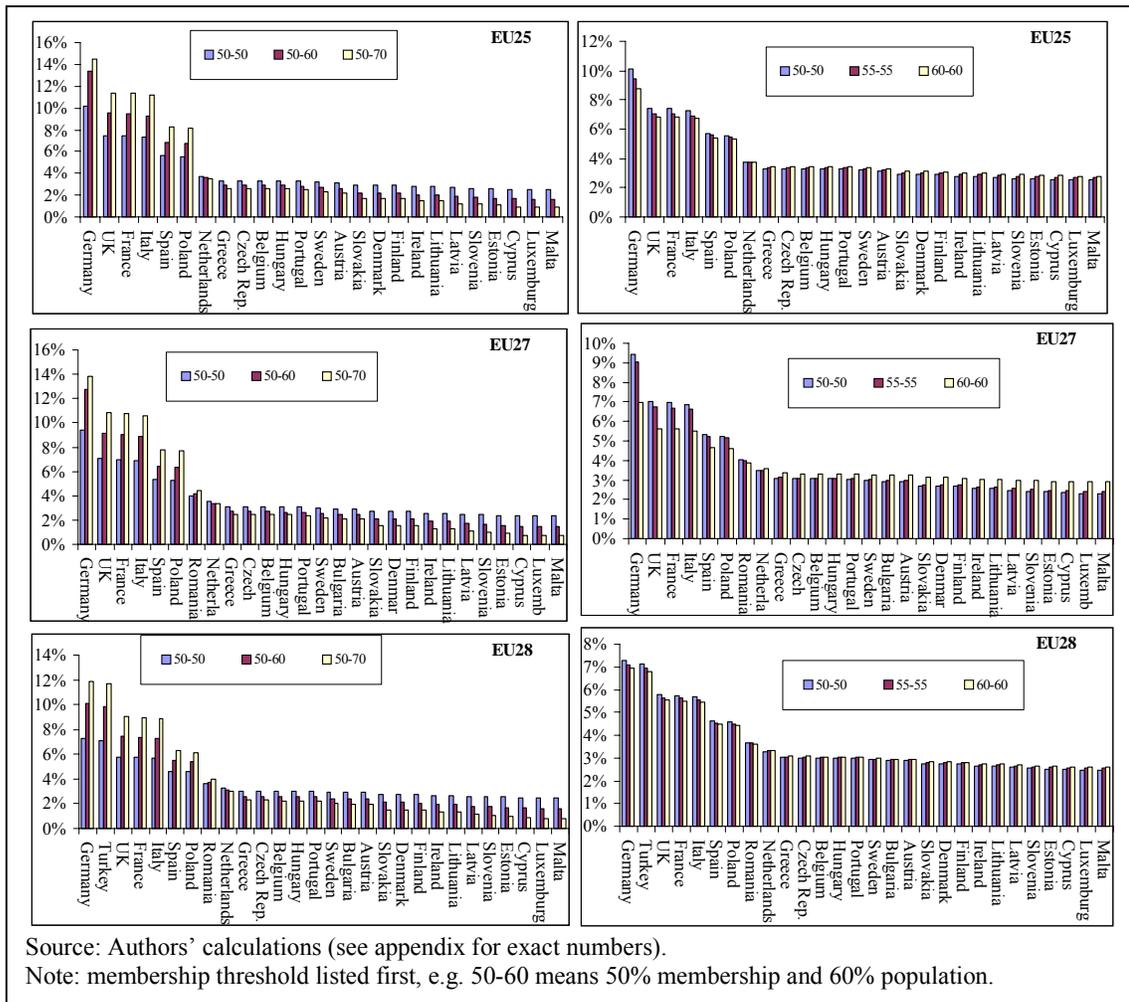
The distribution of power in any organisation depends upon its exact membership. Any new member will alter the voting weights for all members, both the membership and population weights, so which EU should we use to evaluate the options?

¹⁰ As we wrote on the first page of our November 2003 essay, "Giscard's system is so impolitic that any Constitutional Treaty that contains it will almost certainly fail to garner the necessary unanimous support." (Baldwin and Widgren 2003b).

The EU will enlarge to 25 members and it has a concrete plan to grow that number to 27 within a few years. Turkey's member is much less certain and remote, but because it is a very large nation, its accession could potentially have a big influence on the power distribution. As is often the case, then, there is no clear cut answer. In principle, we should look at all the various dual rules for the EU25, EU27 and EU28. Such a multiplication of cases, however, would greatly increase the density of our analysis. As it turns out, we do not need to do this.

The union is now big enough so that the qualitative power implications of the various rules are quite similar in the EU25, EU27 and EU28. This point, which is made graphically in Figure 10, allows us to focus on the EU27 case. There are a few instances when the addition of Turkey matters (mainly for German power) and we will mention these explicitly. (All the power figures for all rules and all EU's can be found in tabular form in the appendix.)

Figure 10: EU25, EU27 and EU28 power shifts results are similar



5.2. Variations on Giscard's 50-60 rule

We start the analysis by looking at is how changes in Giscard's 50-60 rule would alter the power distribution. The main messages from the calculations shown in Figure 11 are:

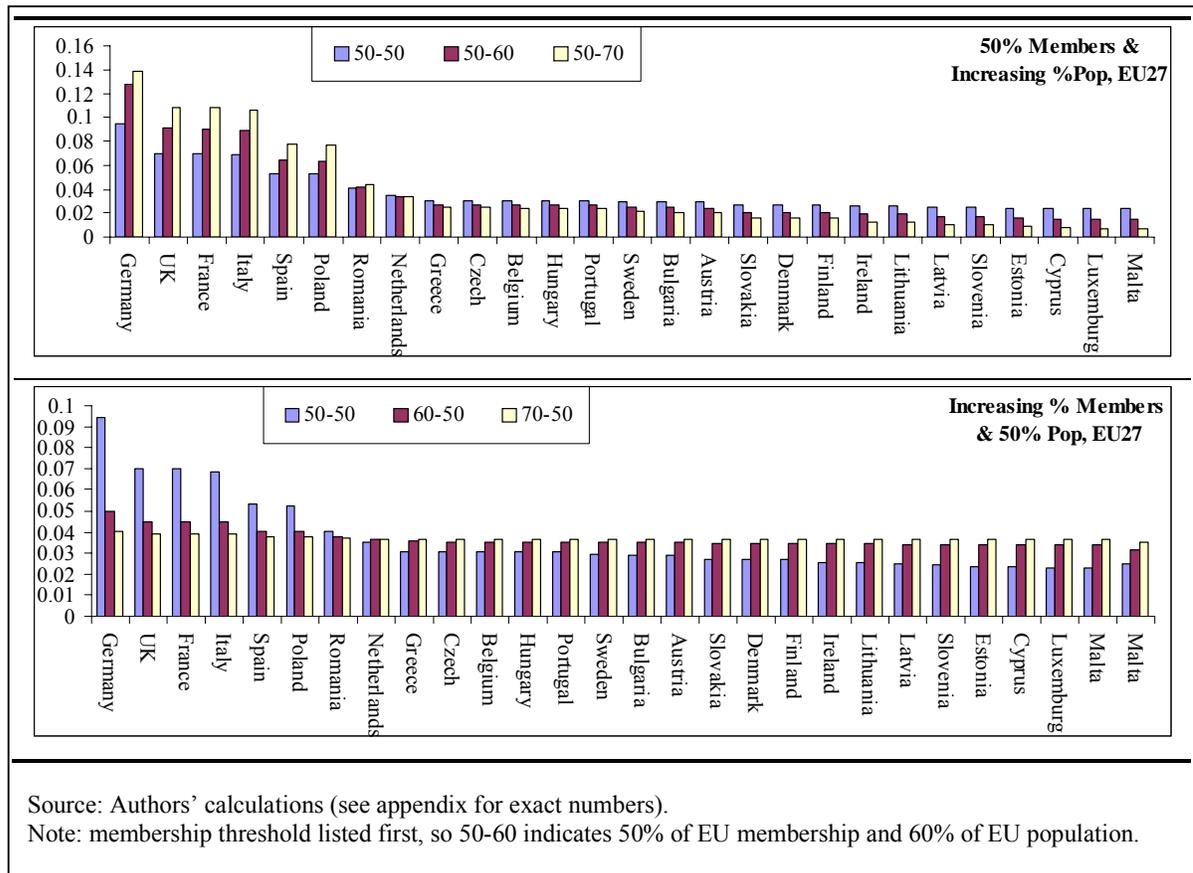
- Tightening the population criteria tends to favour populous members at the expense of small nations.

- Tightening the membership criteria tends to even-out the power curve, i.e. result in a nearly equal distribution of power per member state. (See section 0 for the intuition.)

More specifically, the top panel of the figure shows the impact of maintaining Giscard's 50% of membership rule but raising the required population share. What the results clearly show is that tightening the population share favours populous members at the expense of small members, with the Netherlands being the 'fulcrum' for the rotation in power; nations with fewer citizens than the Dutch lose from tighter population thresholds and those with more gain. (Note that Netherlands's population share and membership share are quite similar in the EU27.)

The bottom panel shows that tightening the membership criteria shifts power the other way. When the membership threshold becomes the difficult criteria – for example, when 70% of the membership must vote yes – all the EU members end up with approximately the same power. Loosening the membership criteria makes the population criteria relatively more difficult and thus rewards members with big population shares. This effect can be quite strong. For example when the dual rule is 70-50, Germany has power share equal to 4%, while that smallest nation, Malta, has a power share of 3.6%.

Figure 11: Power levels for variants on Giscard's 50-60 rule, EU27



Variants of Giscard compared to Nice

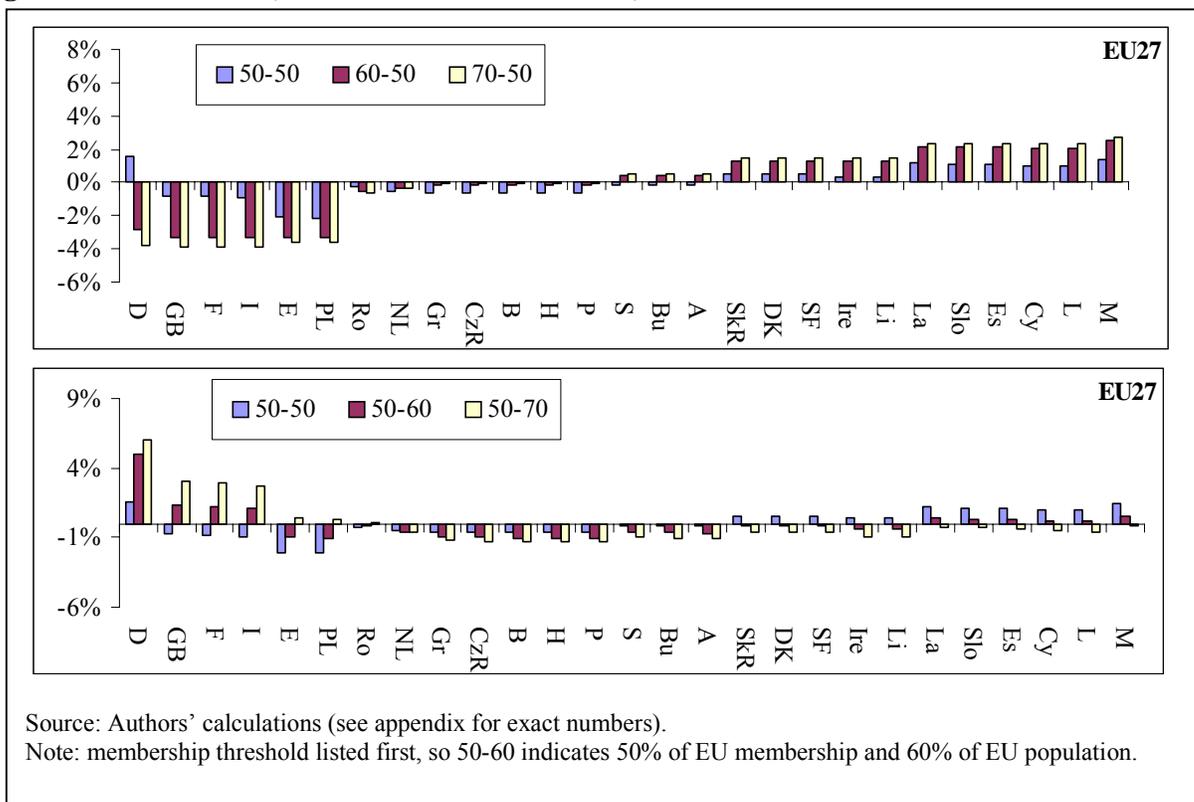
The form of Figure 11 hides the changes on which EU political leaders are likely to be focusing, namely the impact on their power compared to the status quo. But what is the status quo? If nothing comes of the draft Constitutional Treaty, the Nice Treaty's rules will come

into effect. In this sense, the Nice system, not the draft Constitution's 50-60 rule, is the proper benchmark. Figure 12 presents the power shifts implied by variants on the 50-60 dual majority system compared to the power distribution implied by the Nice Treaty rules. We show the results for the EU27, since the results for the EU25 and EU28 are similar to those for EU27 (numbers for the EU25 and EU28 can be found in the appendix).

50% members with tighter population limit

Figure 12 shows the power shift for various Giscard variants. The top panel shows variants of Giscard's rule where the population threshold remains at 50% and the membership threshold is progressively tightened from 50 to 70. As we saw above, a tighter membership rule tends to even out the power distribution, and, given the Nice Treaty's generous allocation of power to large nations, this ends up as a 'power rotation', i.e. a shift of power from small to big, with the smallest gaining the most and the biggest losing the most. The fulcrum for this rotation is the small nations (defined as those with populations of a large city, like Rome) in the sense that the small nations experience very little change in their power. Very small nations (defined as nations whose populations are like those of medium to small cities, like Greater Manchester, Lyons or Lausanne) gain quite a lot from the tighter membership criteria. The reason, as mentioned above, is that tightening the membership threshold tends to make the membership criteria the one that is hard to meet, and this in turn, places more importance on the weighting implied by nations' share of EU membership. That share is of course the same for all, so tightening the membership criteria tends to even out the power distribution.

Figure 12: Power shifts, variants of Giscard vs Nice, EU27



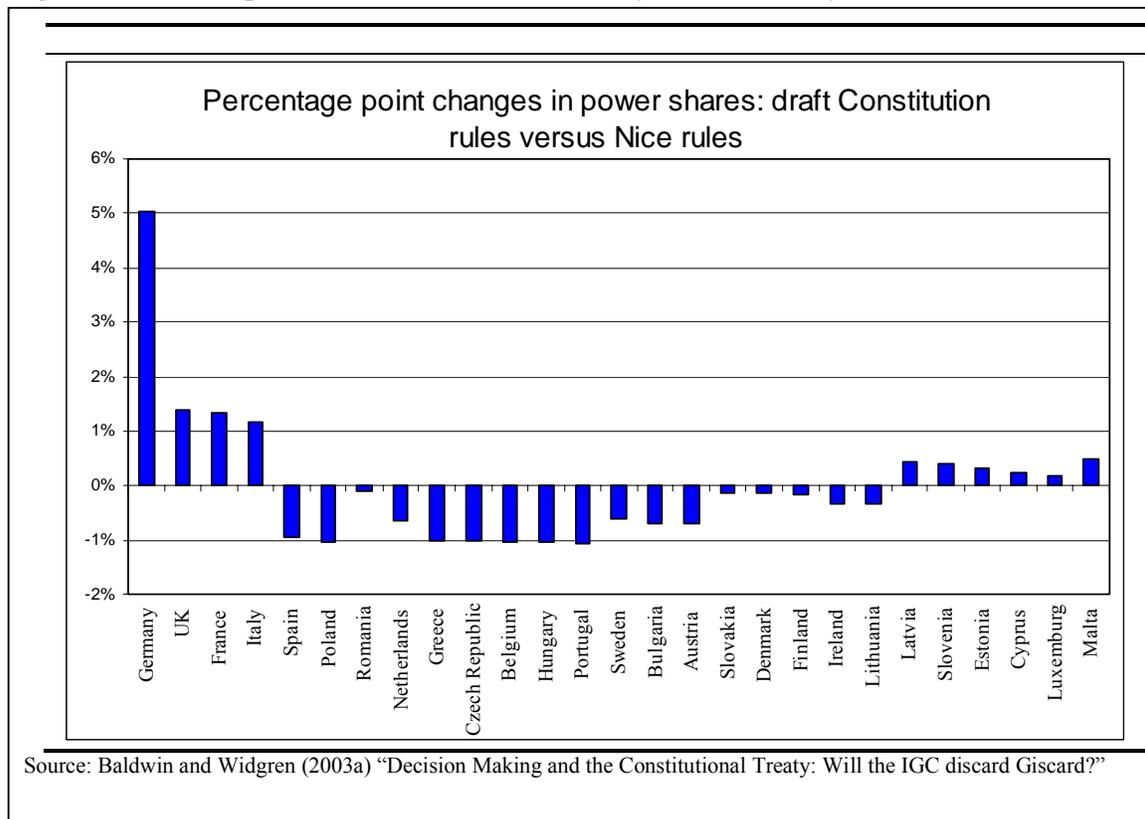
50% population with tighter membership limit

The second panel shows the impact of keeping the membership threshold at 50% but varying the population threshold from 50 to 70. The tighter population test places more emphasis on nation's population share and so favours relatively large nations. The power shift, however, is not nearly so neat as the one in the top panel. The reason for this has to do with the Nice rules, not the dual majority rules.

As discussed above, the Nice rules impose a triple criteria, but only one of them really matters – the Council vote threshold of 72%. And the Council vote allocation is where the Nice Treaty rules are most idiosyncratic. France's overriding goal in the negotiations was to maintain the appearance of power parity with Germany. The combination of carrots and sticks that allowed the summit's chairman, Jacques Chirac, to achieve his anachronistic goal introduced many oddities into the distribution of Council votes. One of the big winners in the horse-trading was Spain – it won 27 votes to France's 29. One of the big losers was Germany, who got only 29 votes even though it has 25% more citizens than France, and twice as many as Spain. Poland, who was not at the negotiating table, won a free ride from the deals done by the Spanish.

These oddities of the Nice rules can be seen clearly in the power shift implied by a more systematic voting system. Under Giscard's 50-60 rule, all the big members gain substantial power compared to the Nice rules, except Spain and Poland. (See Box 6 for a close up this Giscard-versus-Nice power shift.) Members with populations between 20 and 5 million lose about as much as Spain and Poland. Nations with 5 million or less experience very little change. Raising the population threshold to 70% exaggerates this odd shift.

Figure 13: Close-up of draft Constitutional Treaty vs Nice Treaty Power Shift, EU27



We note that the analysis is not very different for the EU27+Turkey. One difference that is likely to be important politically is the impact on Spain and Poland. When Turkey is in, tightening Giscard's population criteria from 60% to 70% would imply a further loss for Spain and Poland while the bigger nations gain more. The intuition is that the entry of Turkey tends to make Poland's and Spain's population shares look more like their membership shares and this, given the logic of section 0, means that their power shares reacts to a population-threshold tightening in a way that resemble that of a small nation.

To sum up, because the small nations lost substantial amounts of power under the Nice rules and even more under Giscard's proposal in the draft Constitutional Treaty, unanimous support for a tighter membership threshold (which would further concentrate power) is unlikely, to say the least.

Box 6: Power changes between the draft Constitutional's 50-60 and the Nice rules

The Figure 13 shows a close up of the power shift implied by the the 50-60 rules compared to Nice rules. The big winner is Germany with an impressive 5% gain in its power share. Giscard's native France also does well, gaining over 1%, as do the UK and Italy. By contrast, Spain and Portugal are among the big losers as they see their power fall by about 1%. Since Spain's government was especially proud to win 'near-big' country power in the Nice Treaty, this power loss must be doubly galling. The other losers are the small nations, those with populations resembling that of a big city, like London or Paris. Interestingly, the very small nations – whose populations resemble that of a medium-big city in Britain or Germany – actually gain from the 50-60 dual rules. The reason is that the membership criterion would be occasionally important under the 50-60; under the Nice rules, it will almost never matter since the Council vote threshold is so strict.

5.3. Various 'even' duals vs Nice

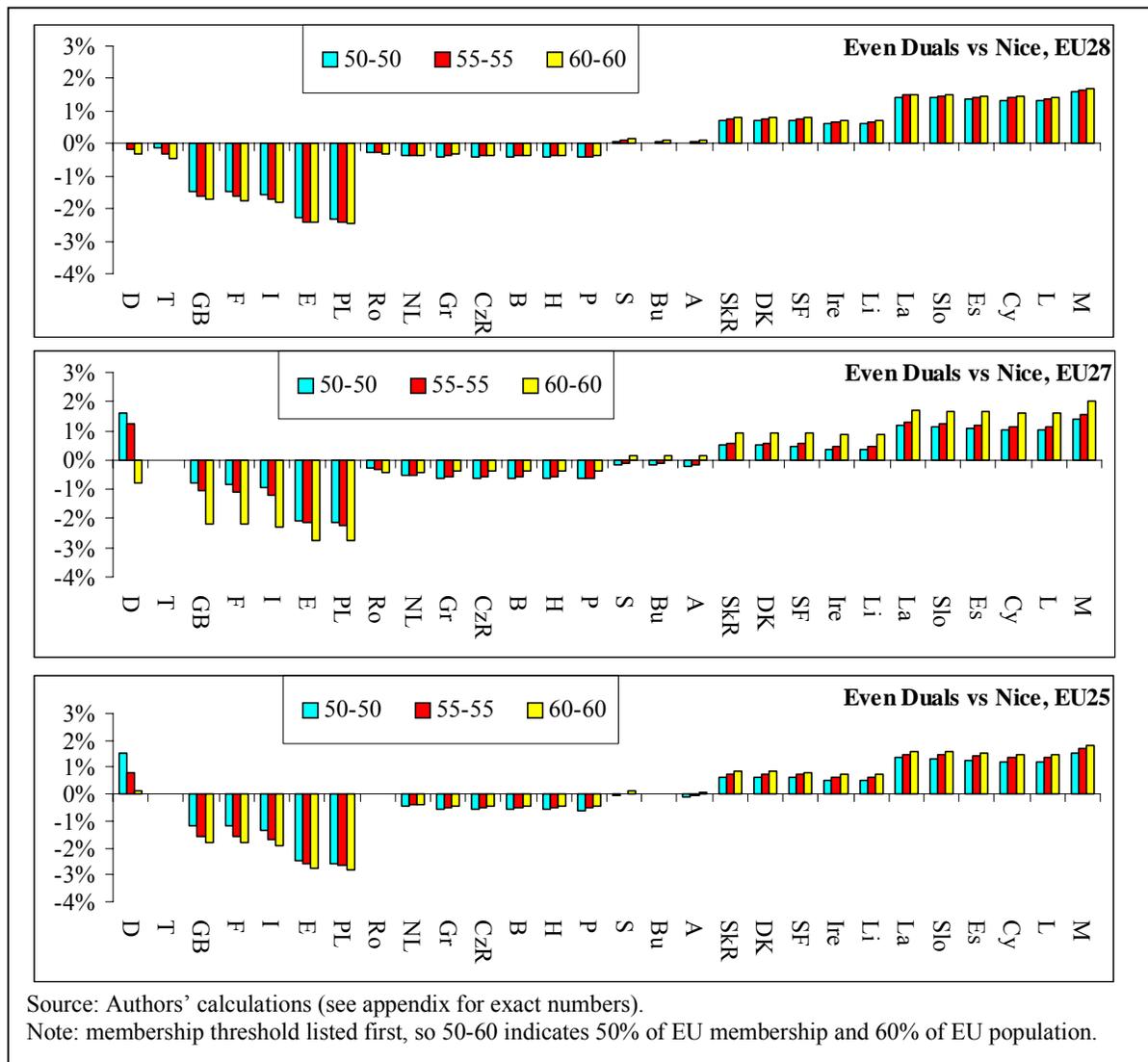
We turn next to the power implications of various 'even' duals against the two benchmarks. Figure 14 presents our calculations for the EU25, EU27 and EU28.

The top panel shows that all the even duals go some way to redressing the extra shift in power to large nations that is implied by Giscard's rule. In fact, the higher is the overall threshold, the greater is the reduction in large nations' power and the larger is the increase in small nations' power. This time, Bulgaria is the fulcrum for the power twist. A few points are especially noteworthy:

- All the even duals trim the power of big nations as a whole compared to the Nice rules, but do little to cut the power of the two most powerful members, Germany and Turkey.
- All the even duals raise the power of very small members.
- All the even duals reduce the power of middle sized nations slightly
- All the even duals reduce Spanish and Polish power substantially more than they reduce French, Italian and British power; this effect is strongest in the EU25 and EU27.

In short, the even dual majority rules 'rotate' the power distribution in favour of nations whose membership shares are larger than their population shares. The magnitude of the rotation increases as the two thresholds are raised.

Figure 14: Power shifts for various 'even' duals vs Nice, EU25, EU27, EU28



6. Spain versus France

If media reports are to be believed, Spain and Poland were the main holdouts against adoption of Giscard's 50-60 dual majority scheme (although our NBI analysis suggests that many small nations might have been quietly supportive of their position). On one level, this may seem to be related to the fact that Spain and Poland would be the biggest losers from a switch from the Nice rules to the Giscard rules. At another level, however, it may reflect the desire of Spain and Poland to be treated like big nations. One can imagine, for example, that French President Jacques Chirac won Spanish backing for the loopy Nice voting scheme exactly because it treated Spain as a near-equal to France. (Poland, who was not at the table when the power-bounty was divvied up in Nice, got a free ride since it has the same population as Spain.) If this version of reality has any merit, then the change in the French-versus-Spain power gap will be an important feature of any voting system when it comes to the system's political acceptability.

Following this line of reasoning, Table 2 shows how the various duals affect the power gap. The top set of rows shows French and Spain NBI's and the difference for the EU27. The bottom set shows the same for the EU27 plus Turkey.

Table 2: French-Spanish power gap, various dual majority systems

<i>EU27</i>							
	Nice	50-60 (Giscard)	50-50	55-55	60-60	70-70	60-50
France	7.8%	9.1%	7.0%	6.7%	5.6%	5.4%	4.5%
Spain	7.4%	6.4%	5.3%	5.2%	4.7%	4.5%	4.1%
Difference	0.4%	2.6%	1.7%	1.5%	0.9%	0.9%	0.4%
<i>EU27 + Turkey</i>							
France	7.3%	7.4%	5.8%	5.6%	5.5%	4.8%	4.4%
Spain	6.9%	5.5%	4.6%	4.5%	4.5%	4.0%	4.0%
Difference	0.4%	1.9%	1.1%	1.1%	1.0%	0.7%	0.4%

Source: Authors' calculations (see appendix for exact numbers).

The benchmark here is the Nice Treaty gap, which is less than one-half of one percentage point, despite the fact that France has almost 50% more citizens. Giscard's system widens the gap substantially, especially in the EU27. As might be expected from the intuition in Figure 5, the gap narrows as the membership threshold rises. Indeed, a dual majority consisting of 60-50 restores the power gap to its Nice level.

7. Repairing the Nice system

Dual majority systems are intuitively appealing, easy to explain and widely used in EU member states (for example, Germany's upper and lower houses of parliament constitute a dual majority system). However, the only dual majority system that maintains the near-great power status granted to Spain and Poland by the Nice Treaty is 60-50 and this implies a very substantial power shift from big members to very small members. Given this, it may be the case that no dual majority system will attract the necessary unanimous support.

If this turns out to be the case, EU leaders might consider the alternative of 'repairing' the Nice rules. As it turns out, the most noxious aspects of the Nice system can be fixed by altering the three majority thresholds, as we pointed out in Baldwin, Berglof, Giavazzi and Widgren (2001). Specifically, the damage the Nice rules do to the EU's capacity to act could be repaired without substantially altering its power implications. Only two changes are needed.

1. Lower the 74% threshold of Council votes to two-thirds, and
2. Lower the population threshold to one-half.

This repaired scheme would have a respectably high passage probability (14.6% which is about twice that of the EU15 under pre-Nice rules) and would lead to very little alteration in the Nice power distribution. No country would gain or lose more than a tenth of a percentage point of power compared to the Nice rules, including Spain (see Baldwin, Berglof, Giavazzi and Widgren 2001 for details).

It is important to note that a dual majority system of two-thirds population and 50% membership would have very different effects compared to a repaired triple majority system.

The reason is that the Council vote distribution under Nice is very different from the population distribution (see Figure 9 on this point).

8. Concluding remarks

This paper provides quantitative estimates of the efficiency and power distributions of various EU voting schemes. Our main conclusions were summarised in the introduction so we limit ourselves to a few concluding points.

- Beware of last-minute, unstudied 'compromises'

The two big mistakes the EU has made with respect to voting reform were both due to last-minute 'surprise' schemes. Jacques Chirac pulled out his triple majority plan at the last minute, discarding months of careful preparation. Because the plan was so complex and unusual, EU leaders were able to convince themselves that it would solve their problems. As everyone now recognises, this was wrong. The second mistake arose for similar reasons but in a very different context. Giscard d'Estaing felt that open discussion and careful study was unnecessary. He felt he could develop, with nothing more than a smattering of 'consultation', a system that would solve Europe's decision-making problems. He was wrong; his proposed system failed to pass the political acceptability test, but it is easy to see where he went astray.

The EU that Giscard d'Estaing dealt with as President of France was a radically simpler body. In the EU9, there are only 512 possible coalitions.¹¹ Clever politicians can think through that many possibilities in their sleep. Indeed, given that these 1970s era politicians were also highly familiar with the domestic politics of all 10 members, it was possible to focus on a handful of coalitions that were thought to be really relevant. For example, one could say that the key was to ensure that a blocking coalition would have to consist of 2 big nations and a couple of small nation. In the EU27, there are over 130 million possible coalitions – more than even a chess grand master could handle. And, 12 of the 27 are fairly young democracies whose voting behaviour may be hard to predict. Working out the power and efficiency implications of a dual majority system with 130 million possible coalitions is difficult; mental arithmetic is most definitely not good enough.

The morale should be clear. This time around, EU leaders should limit themselves to choosing among voting systems that have been thoroughly studied and discussed. If one of the dual majority schemes proves unacceptable, leaders should consider some of the schemes that were discussed openly and thoroughly during IGC 2000. If none of these proves acceptable, leaders should postpone this reform. Adopting yet another un-heard-of 'surprise' solution is likely to prove to be EU leaders' third mistake on this issue.

- The merits of quantification

The quantitative numbers we present in this essay are inevitably rather crude – one cannot hope to capture the full richness of a voting system with a handful of numbers. Yet despite this, such numbers provide important intellectual landmarks for political debates. At the very least, references to the passage probability and power distribution serves to rule out the most egregious mistakes. For example, our passage probability calculations, done days after the draft Nice Treaty was released, convinced us that those reforms were unworkable in the EU27 – a view that subsequently became the received wisdom. Likewise, our power

¹¹ The formula is 2 raise to the power of 'n' where n is the number of members.

distribution calculations done days after the draft Constitutional Treaty was released convinced us that Giscard's system would be discarded – a prediction that came true 6 months later when EU leaders refused the draft Constitutional Treaty due to its impact on the distribution of decision-making power.

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Table 3: Normalised Banzhaf Index and Passage Probability for EU27+Turkey

(mem-pop)	50-50	50-60	50-2/3	50-70	60-50	70-50	55-55	60-60	70-70	70-60	60-70	Nice	Pop.'01
Germany	7.3%	10.1%	10.5%	11.9%	5.0%	3.8%	7.1%	6.9%	5.7%	4.4%	9.1%	7.3%	82.3
Turkey	7.1%	9.8%	10.3%	11.7%	4.9%	3.8%	7.0%	6.8%	5.6%	4.4%	8.9%	7.3%	65.0
UK	5.8%	7.4%	7.8%	9.0%	4.4%	3.7%	5.6%	5.5%	4.8%	4.0%	7.0%	7.3%	59.9
France	5.8%	7.4%	7.7%	9.0%	4.4%	3.7%	5.6%	5.5%	4.8%	4.0%	7.0%	7.3%	59.0
Italy	5.7%	7.3%	7.6%	8.8%	4.4%	3.7%	5.6%	5.4%	4.7%	4.0%	6.9%	7.3%	57.8
Spain	4.6%	5.5%	5.7%	6.3%	4.0%	3.6%	4.5%	4.5%	4.0%	3.7%	5.2%	6.9%	40.1
Poland	4.6%	5.4%	5.6%	6.1%	3.9%	3.6%	4.5%	4.4%	4.0%	3.7%	5.1%	6.9%	38.6
Romania	3.6%	3.7%	3.8%	4.0%	3.6%	3.6%	3.7%	3.6%	3.6%	3.6%	3.8%	3.9%	22.4
Netherlands	3.3%	3.1%	3.1%	3.0%	3.5%	3.6%	3.3%	3.3%	3.4%	3.5%	3.2%	3.7%	16.0
Greece	3.0%	2.6%	2.5%	2.3%	3.4%	3.5%	3.0%	3.1%	3.3%	3.4%	2.7%	3.4%	10.6
Czech Rep.	3.0%	2.6%	2.5%	2.3%	3.4%	3.5%	3.0%	3.1%	3.3%	3.4%	2.7%	3.4%	10.3
Belgium	3.0%	2.6%	2.5%	2.3%	3.3%	3.5%	3.0%	3.1%	3.3%	3.4%	2.7%	3.4%	10.3
Hungary	3.0%	2.6%	2.5%	2.2%	3.3%	3.5%	3.0%	3.1%	3.3%	3.4%	2.7%	3.4%	10.3
Portugal	3.0%	2.5%	2.5%	2.2%	3.3%	3.5%	3.0%	3.0%	3.3%	3.4%	2.7%	3.4%	10.3
Sweden	2.9%	2.4%	2.3%	2.1%	3.3%	3.5%	3.0%	3.0%	3.2%	3.4%	2.6%	2.9%	8.9
Bulgaria	2.9%	2.4%	2.3%	2.0%	3.3%	3.5%	2.9%	3.0%	3.2%	3.4%	2.5%	2.9%	8.1
Austria	2.9%	2.4%	2.3%	2.0%	3.3%	3.5%	2.9%	3.0%	3.2%	3.4%	2.5%	2.9%	8.1
Slovakia	2.7%	2.1%	2.0%	1.5%	3.3%	3.5%	2.8%	2.8%	3.1%	3.4%	2.3%	2.0%	5.4
Denmark	2.7%	2.1%	2.0%	1.5%	3.3%	3.5%	2.8%	2.8%	3.1%	3.4%	2.3%	2.0%	5.3
Finland	2.7%	2.1%	1.9%	1.5%	3.2%	3.5%	2.8%	2.8%	3.1%	3.4%	2.3%	2.0%	5.2
Ireland	2.6%	1.9%	1.8%	1.3%	3.2%	3.5%	2.7%	2.7%	3.1%	3.4%	2.1%	2.0%	3.8
Lithuania	2.6%	1.9%	1.8%	1.3%	3.2%	3.5%	2.7%	2.7%	3.1%	3.4%	2.1%	2.0%	3.7
Latvia	2.6%	1.8%	1.7%	1.1%	3.2%	3.5%	2.6%	2.7%	3.0%	3.4%	2.0%	1.2%	2.4
Slovenia	2.6%	1.8%	1.6%	1.1%	3.2%	3.5%	2.6%	2.7%	3.0%	3.4%	2.0%	1.2%	2.0
Estonia	2.5%	1.7%	1.6%	1.0%	3.2%	3.5%	2.6%	2.6%	3.0%	3.4%	1.9%	1.2%	1.4
Cyprus	2.5%	1.6%	1.5%	0.9%	3.2%	3.5%	2.6%	2.6%	3.0%	3.4%	1.9%	1.2%	0.8
Luxemburg	2.5%	1.6%	1.4%	0.8%	3.2%	3.5%	2.5%	2.6%	3.0%	3.3%	1.8%	1.2%	0.4
Malta	2.5%	1.6%	1.4%	0.8%	3.2%	3.5%	2.5%	2.6%	3.0%	3.3%	1.8%	0.9%	0.4
Passage prob.	31.9%	19.8%	11.7%	8.3%	15.1%	1.7%	19.9%	11.0%	1.1%	1.6%	5.6%	1.8%	

Table 4: Normalised Banzhaf Index and Passage Probability for EU27

(Mem-Pop.)	50-50	50-60	50-2/3	50-70	60-50	70-50	55-55	60-60	70-70	70-60	60-70	Nice
Germany	9.4%	12.8%	13.8%	13.8%	5.0%	4.0%	9.0%	7.0%	6.6%	5.0%	9.1%	7.8%
UK	7.0%	9.1%	10.4%	10.8%	4.5%	3.9%	6.7%	5.6%	5.4%	4.4%	7.2%	7.8%
France	7.0%	9.1%	10.3%	10.8%	4.5%	3.9%	6.7%	5.6%	5.4%	4.4%	7.2%	7.8%
Italy	6.9%	8.9%	10.1%	10.6%	4.5%	3.9%	6.6%	5.5%	5.4%	4.4%	7.1%	7.8%
Spain	5.3%	6.4%	7.1%	7.8%	4.1%	3.8%	5.2%	4.7%	4.5%	4.1%	5.5%	7.4%
Poland	5.3%	6.3%	6.9%	7.7%	4.0%	3.8%	5.2%	4.6%	4.4%	4.1%	5.5%	7.4%
Romania	4.0%	4.2%	4.6%	4.4%	3.8%	3.7%	4.0%	3.9%	3.9%	3.8%	4.1%	4.3%
Netherlands	3.5%	3.3%	3.4%	3.4%	3.7%	3.7%	3.5%	3.6%	3.6%	3.6%	3.5%	4.0%
Greece	3.1%	2.7%	2.6%	2.5%	3.6%	3.7%	3.1%	3.3%	3.4%	3.6%	3.1%	3.7%
Czech Republic	3.1%	2.7%	2.5%	2.4%	3.6%	3.7%	3.1%	3.3%	3.4%	3.6%	3.1%	3.7%
Belgium	3.1%	2.7%	2.5%	2.4%	3.6%	3.7%	3.1%	3.3%	3.4%	3.5%	3.1%	3.7%
Hungary	3.1%	2.7%	2.5%	2.4%	3.6%	3.7%	3.1%	3.3%	3.4%	3.5%	3.1%	3.7%
Portugal	3.1%	2.6%	2.5%	2.4%	3.5%	3.7%	3.1%	3.3%	3.4%	3.5%	3.0%	3.7%
Sweden	3.0%	2.5%	2.3%	2.2%	3.5%	3.7%	3.0%	3.3%	3.3%	3.5%	2.9%	3.1%
Bulgaria	2.9%	2.4%	2.2%	2.1%	3.5%	3.7%	3.0%	3.2%	3.3%	3.5%	2.9%	3.1%
Austria	2.9%	2.4%	2.2%	2.1%	3.5%	3.7%	3.0%	3.2%	3.3%	3.5%	2.9%	3.1%
Slovakia	2.7%	2.1%	1.7%	1.6%	3.5%	3.6%	2.8%	3.1%	3.2%	3.5%	2.6%	2.2%
Denmark	2.7%	2.1%	1.7%	1.6%	3.5%	3.6%	2.8%	3.1%	3.2%	3.5%	2.6%	2.2%
Finland	2.7%	2.0%	1.7%	1.5%	3.5%	3.6%	2.8%	3.1%	3.2%	3.5%	2.6%	2.2%
Ireland	2.6%	1.9%	1.4%	1.3%	3.4%	3.6%	2.7%	3.0%	3.1%	3.5%	2.5%	2.2%
Lithuania	2.6%	1.9%	1.4%	1.3%	3.4%	3.6%	2.7%	3.0%	3.1%	3.5%	2.5%	2.2%
Latvia	2.5%	1.7%	1.2%	1.1%	3.4%	3.6%	2.6%	3.0%	3.1%	3.4%	2.4%	1.3%
Slovenia	2.4%	1.6%	1.2%	1.0%	3.4%	3.6%	2.5%	3.0%	3.1%	3.4%	2.4%	1.3%
Estonia	2.4%	1.6%	1.1%	0.9%	3.4%	3.6%	2.5%	2.9%	3.0%	3.4%	2.3%	1.3%
Cyprus	2.3%	1.5%	1.0%	0.8%	3.4%	3.6%	2.5%	2.9%	3.0%	3.4%	2.2%	1.3%
Luxemburg	2.3%	1.4%	0.9%	0.7%	3.4%	3.6%	2.4%	2.9%	3.0%	3.4%	2.2%	1.3%
Malta	2.3%	1.4%	0.9%	0.7%	3.4%	3.6%	2.4%	2.9%	3.0%	3.4%	2.2%	0.9%
Passage probability	35.8%	21.9%	12.9%	9.2%	11.1%	2.5%	23.0%	8.5%	1.6%	2.2%	4.8%	2.1%

Table 5: Normalised Banzhaf Index and Passage Probability for EU25

Mem-Pop	50-50	50-60	50-70	60-50	70-50	55-55	60-60	70-70	70-60	60-70	Nice
Germany	10.2%	13.4%	14.5%	6.3%	4.3%	9.4%	8.8%	6.7%	5.1%	10.8%	8.6%
UK	7.5%	9.5%	11.4%	5.4%	4.2%	7.1%	6.8%	5.6%	4.6%	8.7%	8.6%
France	7.4%	9.5%	11.3%	5.4%	4.2%	7.0%	6.8%	5.6%	4.6%	8.7%	8.6%
Italy	7.3%	9.3%	11.1%	5.3%	4.2%	6.9%	6.7%	5.5%	4.6%	8.5%	8.6%
Spain	5.7%	6.9%	8.3%	4.6%	4.1%	5.6%	5.4%	4.6%	4.3%	6.5%	8.2%
Poland	5.6%	6.8%	8.1%	4.6%	4.1%	5.5%	5.4%	4.6%	4.3%	6.3%	8.2%
Netherlands	3.7%	3.6%	3.5%	3.9%	4.0%	3.8%	3.8%	3.9%	4.0%	3.8%	4.2%
Greece	3.3%	2.9%	2.6%	3.7%	4.0%	3.4%	3.5%	3.7%	3.9%	3.2%	3.9%
Czech Rep.	3.3%	2.9%	2.6%	3.7%	4.0%	3.4%	3.4%	3.7%	3.9%	3.2%	3.9%
Belgium	3.3%	2.9%	2.6%	3.7%	4.0%	3.4%	3.4%	3.7%	3.9%	3.2%	3.9%
Hungary	3.3%	2.9%	2.6%	3.7%	4.0%	3.4%	3.4%	3.7%	3.9%	3.2%	3.9%
Portugal	3.3%	2.9%	2.6%	3.7%	4.0%	3.4%	3.4%	3.7%	3.9%	3.1%	3.9%
Sweden	3.2%	2.7%	2.3%	3.7%	4.0%	3.3%	3.3%	3.6%	3.8%	3.0%	3.2%
Austria	3.1%	2.6%	2.2%	3.7%	4.0%	3.2%	3.3%	3.6%	3.8%	2.9%	3.2%
Slovakia	2.9%	2.3%	1.7%	3.6%	3.9%	3.0%	3.1%	3.5%	3.8%	2.6%	2.3%
Denmark	2.9%	2.3%	1.7%	3.6%	3.9%	3.0%	3.1%	3.5%	3.8%	2.6%	2.3%
Finland	2.9%	2.2%	1.7%	3.6%	3.9%	3.0%	3.1%	3.5%	3.8%	2.5%	2.3%
Ireland	2.8%	2.1%	1.5%	3.5%	3.9%	2.9%	3.0%	3.5%	3.8%	2.4%	2.3%
Lithuania	2.8%	2.1%	1.5%	3.5%	3.9%	2.9%	3.0%	3.5%	3.8%	2.4%	2.3%
Latvia	2.7%	1.9%	1.2%	3.5%	3.9%	2.8%	2.9%	3.4%	3.8%	2.2%	1.3%
Slovenia	2.6%	1.8%	1.2%	3.5%	3.9%	2.8%	2.9%	3.4%	3.8%	2.2%	1.3%
Estonia	2.6%	1.8%	1.1%	3.5%	3.9%	2.7%	2.9%	3.4%	3.8%	2.1%	1.3%
Cyprus	2.5%	1.7%	0.9%	3.4%	3.9%	2.7%	2.8%	3.4%	3.7%	2.0%	1.3%
Luxemburg	2.5%	1.6%	0.9%	3.4%	3.9%	2.7%	2.8%	3.4%	3.7%	2.0%	1.3%
Malta	2.5%	1.6%	0.9%	3.4%	3.9%	2.7%	2.8%	3.4%	3.7%	2.0%	1.0%
Passage probability	35.5%	22.5%	10.2%	17.9%	2.1%	22.9%	13.1%	1.4%	1.9%	7.0%	4.5%