The Brexit and the distribution of power in the Council of the EU

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The Brexit when implemented will not only have effects on economy and every day's life, but also on the distribution of power in the EU institutions, most notably in the Council of the EU.

Voting in the Council is done according to the 'double majority' rule: For a proposal to pass 55% of the member states are required, which at the same time represent 65% of the population of the EU. If a country leaves the Union the share of any other country both with respect to the number of states and with respect to the number of citizens will increase. So, it seems totally obvious, that the relative influence of a member state in the Council will increase after the resigning of another country. Similarly, if a new country joins the Union, then all other members should lose power by transfering a part of their power to the new member.

Remarkably, this is not true in general and it is not the case for the Brexit in particular. As we shall see, the smaller countries will *lose* power after the UK's leaving the EU. Moreover, if Scotland should join the EU after the Brexit, the larger state will *gain* power through Scotland's accession. We regard both effects as rather against intuition.

A simple example may illustrate this somewhat counterintuitive phenomena. Suppose, a union of states has three members: A, B, and C, with 4, 3 and 3 votes respectively. Suppose furthermore that a simple majority of votes is required for an affirmative decision. Thus for a decision the consent of any two of the three states is sufficient. Consequently, the voting power of the three states is the same although A has one vote more than the other states.

Let us now assume that states C decides to leave the union. If the voting rules stay the same then under the new circumstances the 4 votes of A will always dominate the 3 votes of B. Now, it is completely irrelevant how B votes, A has complete control on the voting outcome. In this example B loses all its power after C's departure.

The voting power of a country in the Council can be measured in terms of the 'Banzhaf power index'. The Banzhaf index of a state S counts how 'frequently' the vote of S is decisive, in the sense that the vote of S can change the voting outcome, given the votes of the other states stay the same. For example, a Banzhaf power index of 100% means that the state has complete control on the voting result, a Banzhaf index of 0% means that this state's voting never ever matters at all.

A formal definition of the Banzhaf power is as follows. Look at all collections M of players (in our example: member states). We call a player P 'decisive' for M, if P belongs to M, the players in M have the majority to assure an affirmative decision according to the voting rules, but they lose this majority if P defects from M. The number of collections of players for which P is decisive is the (unnormalized) Banzhaf

power b(P). The Banzhaf index B(P) is the ratio of b(P) and the sum of b(Q) over all players Q. In formulae[1]:

$$b(P) = \#\{M; P \epsilon M, M \text{ is winning, but } M \setminus \{P\} \text{ is losing}\}$$

$$B(P) = \frac{b(P)}{\sum b(Q)}.$$

Table 1 contains the share in population and in power in the Council for the present EU, for the EU after a Brexit and for the EU with Scotland (and without the rest of the UK). Table 2 compares the Banzhaf power indices for these situations.

It is a striking result that the larger states win in power considerably, while the smaller states lose power – against intuition. In relative terms the strongest winner is Poland with almost 29% gain. All states with a population of less than 4,5 million lose in power with Ireland neither winning nor losing.

If Scotland joins the EU (of 27 members) the gain/loss balance is inverted. This time the bigger states lose power (as one would expect), but all states with less than 10 million citizens would gain power, against to a naïve guess. This time Belgium is in the 'neutral' position.

These figures illustrate that a voting system as complicated as that of the Council of the EU can show strange and unexpected effects after (relatively small) changes.

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[1] For more information on the Banzhaf index we refer to the paper: W. Kirsch: A Mathematical View on Voting and Power, available from: http://www.fernuni-hagen.de/stochastik/downloads/voting.pdf

	EU with UK		EU without UK		EU with Scotland	
	Population	Banzhaf Index	Population	Banzhaf Index	Population	Banzhaf Index
Germany	15,9%	10,2%	18,3%	11,9%	18,0%	10,8%
France	13,0%	8,4%	14,9%	9,9%	14,7%	9,0%
Italy	12,0%	7,9%	13,7%	9,2%	13,6%	8,4%
Spain	9,2%	6,2%	10,5%	7,7%	10,4%	7,1%
Poland	7,5%	5,1%	8,6%	6,6%	8,5%	6,0%
Romania	3,9%	3,8%	4,5%	4,0%	4,5%	3,9%
Netherlands	3,3%	3,5%	3,8%	3,7%	3,8%	3,6%
Belgium	2,2%	2,9%	2,5%	3,0%	2,5%	3,0%
Greece	2,2%	2,9%	2,5%	3,0%	2,4%	3,0%
Czechia	2,1%	2,8%	2,4%	2,9%	2,3%	2,9%
Portugal	2,1%	2,8%	2,4%	2,9%	2,3%	2,9%
Hungary	1,9%	2,8%	2,2%	2,9%	2,2%	2,9%
Sweden	1,9%	2,7%	2,2%	2,8%	2,2%	2,9%
Austria	1,7%	2,6%	1,9%	2,7%	1,9%	2,7%
Bulgaria	1,4%	2,5%	1,6%	2,5%	1,6%	2,6%
Denmark	1,1%	2,3%	1,3%	2,3%	1,3%	2,4%
Finland	1,1%	2,3%	1,2%	2,3%	1,2%	2,4%
Slovakia	1,1%	2,3%	1,2%	2,3%	1,2%	2,4%
Ireland	0,9%	2,2%	1,0%	2,2%	1,0%	2,3%
Croatia	0,8%	2,2%	1,0%	2,2%	0,9%	2,3%
Lithuania	0,6%	2,0%	0,7%	2,0%	0,7%	2,2%
Slovenia	0,4%	2,0%	0,5%	1,9%	0,5%	2,1%
Latvia	0,4%	2,0%	0,5%	1,9%	0,4%	2,1%
Estonia	0,3%	1,9%	0,3%	1,8%	0,3%	2,0%
Cyprus	0,2%	1,8%	0,2%	1,8%	0,2%	1,9%
Luxemburg	0,1%	1,8%	0,1%	1,7%	0,1%	1,9%
Malta	0,1%	1,8%	0,1%	1,7%	0,1%	1,9%
UK	12,7%	8,3%				
Scotland					1,2%	2,4%

Table 1: Share in population and in power in the Council for the EU member states with the United Kingdom, without the UK, and with Scotland replacing the UK

	Brexit	Scotsin	Total
Germany	16,6%	-9,6%	5,4%
France	18,0%	-9,1%	7,2%
Italy	17,1%	-8,9%	6,6%
Spain	23,3%	-7,9%	13,6%
Poland	28,8%	-8,1%	18,4%
Romania	5,7%	-3,4%	2,1%
Netherlands	5,6%	-2,4%	3,1%
Belgium	4,0%	0,0%	4,0%
Greece	3,9%	0,1%	4,0%
Czechia	3,7%	0,4%	4,1%
Portugal	3,6%	0,4%	4,1%
Hungary	3,4%	0,8%	4,2%
Sweden	3,3%	0,9%	4,2%
Austria	2,7%	1,6%	4,3%
Bulgaria	1,9%	2,6%	4,5%
Denmark	0,8%	3,9%	4,7%
Finland	0,7%	4,1%	4,8%
Slovakia	0,6%	4,1%	4,8%
Ireland	0,0%	4,9%	4,9%
Croatia	-0,3%	5,3%	5,0%
Lithuania	-1,5%	6,8%	5,2%
Slovenia	-2,4%	7,9%	5,4%
Latvia	-2,4%	8,0%	5,4%
Estonia	-3,2%	9,0%	5,5%
Cyprus	-3,8%	9,7%	5,6%
Luxemburg	-4,1%	10,2%	5,7%
Malta	-4,3%	10,4%	5,7%

Table 2: Change of relative power in the Council:
1) Brexit: change after the UK leaving the EU relative to status quo
2) Scottsin: change after Scotland joins the EU relative to status after Brexit
3) Total: change after Scotland joins the EU relative to status quo