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Brexit and Multilingualism
in the European Union

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Abstract

The EU spends more than one billion euros per year, translating and interpreting, to preserve multilingualism. We examine how this budget should be fairly allocated, taking into account linguistic and economic realities of each member country. Our analysis helps to estimate the *value* of keeping English as a procedural language (in fact, almost a *lingua franca*) in the post-Brexit EU, where just about one percent of its population will have it as native language.

Keywords: Multilingualism, European Union; budget sharing; lexical distances; Brexit;

JEL codes: D63; Z13;

1 Introduction

Economists and social scientists alike have long been concerned with studying the impact of language on economic outcomes (Easterly and Levine, 1997 on Africa's growth), public policies (Alesina, Bakir and Easterly, 1999 on public goods) and conflicts and wars (Castañeda-Dower, Ginsburgh and Weber, 2017 and DeVotta, 2009 on the Sri-Lankan war and, more generally Laitin, 2000 on language and violence).[1] Special emphasis has been made on the case of multilingual societies, which provide extraordinary challenges with crucial economic implications.

Multilingualism is fortunately less hectic in the European Union (EU). On the contrary, it has always been one of its stronger pillars. Back in 1958, at the time in which the seed of the EU (the so-called Common Market) was planted, Dutch, French, German and Italian became official languages of this new union. 1973 was the time for English and Danish; 1981 for Greek; 1986 for Portuguese and Spanish and 1995 for Finnish and Swedish. In 2007, nine more languages joined the pool of official languages: Estonian, Czech, Hungarian, Latvian, Lithuanian, Maltese, Polish, Slovak and Slovenian. 2007 was the turn of Bulgarian, Irish and Romanian. Finally, Croatian became official in 2013. This sequence of events proves that, since the very beginning, language services (mainly interpretation and translation) were considered essential to guarantee the cultural and linguistic diversity of the EU.[2] Among other things, the EU ensures that European citizens have access to EU laws, regulations and key political documents in a language spoken in their country; that MEPs have the right to use their native language when addressing the European Parliament; that EU summits and meetings of the European Council can be interpreted into all official EU languages;[3] and last but not least, that citizens have the possibility to address the Commission and get a reply in their native language, as long as it is an official language in the EU.

Although there exists only a small number of official documents concerned with the breakdown of the value of each language, or even simpler accounting details, the EU admits to devote

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[1]For a recent survey, see Ginsburgh and Weber (2020).

[2]One of the first articles (no 158/1) of its constitution was devoted to the rule that governs the functioning of languages in the union.

[3]Note that in most cases, only English, French and German are used and translated, but attendants have the possibility to request interpretations from and into their native language(s).

more than one billion euros per year to achieve the goals listed above.[4] How much should each EU member contribute (implicitly or explicitly) to cover the cost of these services? Answering this question could lead to address a crucial, but largely ignored issue: the status (and role) of English after Brexit, once the UK will obviously stop contributing to the EU budget.

There are efficiency conditions to keep English as an official language and, though there is no legislation on the issue, it could even become a *lingua franca*.[5] But one can wonder whether it would be fair to let the British passively benefit from this bonanza. Even long before Brexit, it could safely be argued that the UK massively gained from the status of English worldwide. From now on, EU countries, with the exception of the UK, will have to pay for it, while the UK will benefit from it.[6] It is thus important to evaluate the *value* of using English, as well as to determine who, within the EU, will (at least, implicitly) have to pay for it.

In order to address this question, we take into account a variety of relevant characteristics of each EU member, obviously including their official languages. These characteristics range from some (admittedly, scarce and incomplete) documentation on the use of languages in interpretations and translations within the EU administration, to other linguistic aspects (such as disenfranchisement and lexical distances between languages) and economic conditions (GDPs).

More precisely, we first consider an intuitive model to share the costs of the 2.2 million documents written in, or translated into, any official language within the EU. Ideally, we would like to have, for each pair of languages $i, j \in L$, the number of pages a_{ij} translated from language i into language j. Unfortunately, only the marginal totals $\sum_{l \in L} a_{il}$ and $\sum_{l \in L} a_{li}$ are available, for each language $i \in L$. Bergantiños and Moreno-Ternero (2019a) recently introduced a method to analyze the revenue sharing from collective rights, which can be applied in our situation. The idea is to consider each translated document as a *joint venture* of the two languages in question. Several sharing rules can be used in this context. Each of these is supported by strong normative grounds. In our setting, they all suggest (to various degrees) a strong burden on

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[4]Somewhat surprisingly, there is even uncertainty about this precise amount. See, for instance, https://ec.europa.eu/info/strategy/eu-budget/how-it-works/fact-check.

[5]See, for instance, Ginsburgh, Moreno-Ternero and Weber (2017) or Ginsburgh and Moreno-Ternero (2018, 2019).

[6]At the time he was chairman of the British Council, Lord Kinnock suggested that "the English language teaching sector directly earns 1.3 billions pounds for the UK as invisible exports and our education related exports earn up to 10 billion pounds a year more." See Graddol (2006). Note that Grin (2005) estimates the amount at some 17 to 18 billion euros.

the three procedural languages (English, German and French; EGF in the rest of the paper), essentially spoken in the UK and Ireland, Germany and Austria, and France and Belgium, respectively.

We also consider a second approach that happens to be polar, and, thus, favorable to the above countries. This approach aims at reflecting the lack of effort of each other country to promote multilingualism and learn at least one of the EGF languages; it will lead us to construct, for each country, two types of *disenfranchisements* with respect to EGF.[7] On the one hand, we consider *observed disenfranchisement*, i.e., the fraction of people (in each country) who do not speak *any* of the EGF languages. On the other hand, we consider *theoretical disenfranchisement*, which is based on the illuminating concept of *lexical distances* (Dyen, Kruskal and Black, 1992) described next.

Lexical distances are constructed by exploring the similarities or dissimilarities between the vocabularies (lexicon) in pairs of languages.[8] Larger distances make comprehension in pairs more difficult. For instance, French is closer to Italian than to Danish, while German is closer to Danish than to Italian. To wit, 200 carefully chosen words in a certain number of languages, say all Indo-European languages, are used to compute such distances.[9] Each word in a given language, say English, is compared to the same word in all the other languages. If the word in both languages has a common ancestral origin, for example *five* in English and *fünf* in German, the word is said to be a *cognate* in both languages. All cognate words between English and German are then counted, and the total is divided by 200 (if the list of words contains 200 items) to obtain a certain ratio r_{EG}. The distance between the two languages is then equal to 1-r_{EG}.[10] The difficulty is of course deciding whether words are cognate or not. The example between *five* and *fünf* is obvious. Let's take another case with the words *much* in English, and *mucho* in Spanish. They have the same meaning and are phonetically very close, but are not cognate: *much* comes from the Old English word *micel* which means big, while *mucho* is derived

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[7] The use of the notion of linguistic disenfranchisement in economics was pioneered by Ginsburgh, Ortuño-Ortin and Weber (2005). See also Ginsburgh and Weber (2005, 2011) and Amodio and Chiovell (2018).

[8] These distances are unfortunately symmetric: the distance between Portuguese and Spanish is identical to the distance between Spanish and Portuguese, while it is well-known that it is easier for a Portuguese to understand a Spanish speaker than the reverse.

[9] See Swadesh (1952) for the list of words. In addition to Dyen, Kruskal and Black (1992), see McMahon and McMahon (2005) or Kessler (2001) for extensive discussions on constructing distances.

[10] This number takes values between 0 (same languages) and 1 (if the two languages have nothing in common).

from the Latin word *multum*. It is obvious that to establish these comparisons, one needs to know a great deal on languages and their origins.

In both cases, 'failures' – that is, either not speaking, or even not understanding a language, or being far from a language in terms of the vocabulary – may have, as we pointed out in the introduction, far-reaching consequences on economic growth, the distribution of public goods or political instability leading to wars and should, thus, be addressed carefully. Here, we focus on EGF and compute the number (or the percentage) of citizens in a given country with respect to EGF. If a country has all its citizens speaking at least one of the EGF languages, there is no need to provide translation into the official language of the given country. *Accountability*, which is one of the two pillars of modern theories of equality of opportunity (Roemer, 1998), would require that the corresponding budget should not be borne by such a country, as it made the effort to have its population speak one of the three important European languages. With the exception of accountability, as today's citizens have no responsibility whatsoever on 'being close' to an EGF language, a similar reasoning holds for close languages. However, even if two countries speak the same language (or their languages are sufficiently close), identity aspects might still play an important role, which should of course not be ignored, though we do not consider this aspect in our paper.

Finally, combining linguistic aspects and economic dimensions (here, GDPs) which is standard in the EU to deal with budget sharing,[11] will lead to a final multidimensional index that will give us the basis to share the burden of multilingualism.

Constructing multidimensional indices is a fairly common practice. Most of them use linear transformations of the indicators and aggregate them using an (un)weighted average across the indicators (Decancq and Lugo, 2013). This makes it easy to discuss and to understand. John Rawls (1971) famously suggested an index based on primary goods. Amartya Sen (1980) was more in favor of an index of 'functionings' as a possible measure of a person's welfare. The UNDP's human development indicator (e.g., Anand and Sen, 1994) is an index composed of GDP, literacy rate, and infant mortality rate. Somewhat closer to what we do, there is the paper by Kollias (2008) who designed a burden sharing index for the EU common defence policy averaging each member's share in the EU area, population and GDP. Olson and Zeckhauser (1966) and Weber and Wiesmeth (1991) followed a similar approach for the related problem of sharing

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[11]A very obvious regression shows that GDPs are strongly correlated with contributions to the EU budget.

the burden of NATO. Moreno-Ternero and Roemer (2006) provide normative foundations for some of these indices.[12]

The paper is organized as follows. Section 2 uses Bergantiños and Moreno-Ternero's (2019a) method to deal with the matrix of bilateral translations. Section 3 shifts to two measures of disenfranchisement to estimate the accountability of countries with respect to multilingualism. Section 4 accommodates these dimensions with the economic dimension, into an index meant to drive the sharing process. Section 5 is devoted to the consequences of Brexit regarding multilingualism in the EU, and Section 6 concludes.

2 Translation (and Interpretation) in the EU Administration

2.1 Facts and Data

Translations. On 1 January 2019, the translation service of the European Commission involved $2,241$ staff members (68 percent of whom are translators language technology experts, quality experts, terminologists and revisers, the others being support staff).[13] With the exception for 30 people located in EU member countries, most of them work in Brussels (45 percent) or Luxembourg (54 percent). Half of their work consists in translating EU law-making. The other half is devoted to the following tasks: external communication, web content (21 percent), other official documents (10 percent), incoming correspondence (9 percent), and communication with EU institutions, and national parliaments (8 percent). The administration reports that they translate approximately 2.2 million pages a year (70 percent are treated in-house and 30 percent are outsourced) for a total cost of 325 million euros (including staff, outsourcing, IT, training, events, 24/7 availability).

The breakdown of these 2.2 million pages is reported in columns (2) and (3) of Table 1. As can be seen, the overwhelming majority of documents (some 86 percent) are written in English. French and German follow with a skinnies 3.3 and 1.7 percent only.

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[12]See also Moreno-Ternero and Roemer (2012) or Zambrano (2014), among others.

[13]Most of the data we report in this section are described in a document entitled *Translation in figures 2019* available at https://op.europa.eu/en/publication-detail/-/publication/62f8069c-67d4-11e9-9f05-01aa75ed71a1/language-en. Accessed on February 28, 2020.

Interpretation. The European Parliament uses approximately 275 staff interpreters working in 24 interpreting booths, one for each official language. In the vocabulary of graph theory, this implies a tripartite graph configuration with one of the EGF languages acting as bridge node, between an official language (in which the speaker is giving his speech, or making his remarks) as source node, and the remaining official languages as destination nodes. Again, English is the leading language used in the plenary sessions of the Parliament in year 2018 (129.2 hours). German (76.3), French (38.1), Italian (36.5), Spanish (22.1) and Polish (21) follow.[14] There is no information concerning other official languages. Interpretation is also needed in many (small or large) in meetings, and these are probably difficult to count.

Unfortunately, to the best of our knowledge, no complete breakdown of interpretation costs exists and that is why our empirical analysis in this section is based on translation only.

[Insert Table 1 about here.]

2.2   An Intuitive Model

Let L describe a finite set of languages. Its cardinality is denoted by ℓ. For each pair of languages $i, j \in L$, we denote by a_{ij} the number of pages translated from language i into language j. We use the notational convention that $a_{ii} = 0$, for each $i \in L$. Let $A \in \mathcal{A}_{\ell \times \ell}$ denote the resulting matrix of translations generated within the whole set of languages L. We assume that each translated page costs the same. Without loss of generality, let that cost be 1.[15]

A translation *problem* can then be formalized as a matrix $A \in \mathcal{A}_{\ell \times \ell}$ the terms of which are a_{ij}, the number of pages translated from language i to language j, $i \neq j$.[16] The family of all the problems is denoted by $\mathcal{P}$.[17]

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[14]Partial data on hours spoken during plenary sessions in the European Parliament can be found in Aamna Mohdin, Even after Brexit, English will remain the language that holds the EU together, *The Guardian*, May 5, 2018.

[15]This is probably not the case, but for the sake of the model, and as we have no detailed data, we follow this assumption.

[16]The same method can be used for interpretation. The number of hours would replace the number of pages.

[17]Formally speaking, the model is identical to the one introduced by Bergantiños and Moreno-Ternero (2019a) to share the revenues from broadcasting sport leagues. In that case, a_{ij} refers to the number of viewers watching the game teams i and j playing at i's stadium, and the concern is with the sharing of revenues. In our case, the concern is with the sharing of costs.

For each $i \in L$, let f_i and t_i respectively denote the total number of pages translated from i, and the number of pages translated to i, while α_i the aggregation of both numbers. That is,

$$\alpha_i = \sum_{j \in L}(a_{ij} + a_{ji}) = \sum_{j \in L} a_{ij} + \sum_{j \in L} a_{ji} = f_i + t_i.$$

For each $A \in \mathcal{A}_{\ell \times \ell}$, let $||A||$ denote the total number of pages translated:

$$||A|| = \sum_{i,j \in L} a_{ij} = \sum_{i \in L} f_i = \sum_{i \in L} t_i = \frac{1}{2} \sum_{i \in L} \alpha_i.$$

A *sharing rule* R is a mapping that associates with each problem, an allocation indicating the amount each language covers from the total burden generated by translating. That is, $R : \mathcal{P} \to \mathbb{R}^\ell$ is such that, for each $A \in \mathcal{P}$,

$$\sum_{i \in L} R_i(A) = ||A||.$$

We consider two focal rules. The first so-called *equal-split* rule, splits equally the burden of each document between both languages involved in the translation (either from or into):

Equal-split rule, ES. For each $A \in \mathcal{P}$, and each $i \in L$,

$$ES_i(A) = \frac{\alpha_i}{2}.$$

The other focal rule, *concede-and-divide*, takes into account the relative importance of each language.[18] More precisely, the rule subtracts from each α_i a constant amount for each of the other $\ell - 1$ languages (the average of pages translated not involving language i). Formally, this rule can be expressed as:

Concede-and-divide, CD. For each $A \in \mathcal{P}$, and each $i \in L$,

$$CD_i(A) = \alpha_i - (\ell - 1)\frac{\sum\limits_{j,k \in L \setminus \{i\}}(a_{jk} + a_{kj})}{(\ell - 2)(\ell - 1)} = \frac{(\ell - 1)\alpha_i - ||A||}{\ell - 2}.$$

Bergantiños and Moreno-Ternero (2019a) provide normative foundations for both rules. They also show that a game-theoretical approach supports the first rule, whereas a statistical approach supports the second. They can indeed be considered as focal rules to solve the

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[18]The term was coined by Thomson (2003), who used it to describe the intuitive solution to the so-called (and related) contested garment problem that is originally described in the *Talmud*.

problem. But they are somewhat polar and the following compromise between both could also relevant:[19]

Compromise rules, $\left\{EC^\lambda\right\}_{\lambda \in [0,1]}$. For each $\lambda \in [0,1]$, each $A \in \mathcal{P}$, and each $i \in \ell$,

$$EC_i^\lambda(A) = \lambda ES_i(A) + (1-\lambda)CD_i(A).$$

At the risk of stressing the obvious, note that when $\lambda = 0$ then EC^λ coincides with *concede-and-divide*, whereas when $\lambda = 1$ then EC^λ coincides with the *equal-split* rule. That is, $EC^0 \equiv CD$ and $EC^1 \equiv ES$.

Straightforward algebraic computations allow us to show that, for each $A \in \mathcal{P}$, each $i \in \ell$, and each $\lambda \in [0,1]$,

$$EC_i^\lambda(A) = \frac{\alpha_i}{2} + \frac{\ell(1-\lambda)}{2(n-2)}(\alpha_i - \overline{\alpha}), \tag{1}$$

where

$$\overline{\alpha} = \frac{\sum_{i \in L} \alpha_i}{\ell}.$$

Finally, it is worth mentioning that all the rules discussed above are minimalistic from an informational viewpoint. That is, even though the rules are defined over problems, they only require to know the vector $(\alpha_i)_{i \in L}$ rather than the whole matrix A.

2.3 Results

Data and results of the computations are displayed in Table 1. Column (1) indicates that the official language of some countries, or parts of countries, is the same as the native language in a larger country. For instance 'See Germany' means that Austria's language (German) is included in Germany.[20] Columns (2) and (3) contain the basic data (total translations from, and total translations to). Columns (4) to (6) provide the solutions of the three rules defined above, in absolute value, while in columns (7) to (9), the values are displayed in relative values. Note that these columns contain an amount for each language, not country. To recover the country allocation, we suggest to split the amount for the language in proportion of the populations. For instance, about 90 percent of the amount associated to German would be covered by Germany and about 10 percent by Austria (and a tiny percentage for Luxembourg, that we will ignore in what follows).

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[19]Bergantiños and Moreno-Ternero (2019b) provide normative foundations for this compromise as well.

[20]The reason for which we have to do that will become clearer in the ensuing sections of the paper.

As expected, the *equal-split* rule is more favorable to dominating languages, while *concede-and-divide* is the most unequal, as it would make English covering almost 95 percent of the burden, whereas the *equal-split* rule roughly halves this number. Still, English 'counts' for half of the budget, while some languages (and countries) would get subsidized as seen in columns (8) and (9) (negative signs in *concede-and-divide* and the *compromise* rule). Notice though that these subsidies are rather small, with the exception of Irish and Maltese to some extent, two languages that became official quite recently.[21] This might look controversial, as English is largely dominant in both countries (Ireland and Malta).

The even compromise between the *equal-split* solution and the *concede-and-divide* solution (i.e., the compromise rule obtained for $\lambda = 1/2$) seems to be the most reasonable, and will now be compared with other methods of sharing, based on the number of speakers (observed and theoretical disenfranchisement, depending on whether we take into account lexical distances or not) of EGF in each EU country.

3   Taking Disenfranchisement into Account

Although the analysis in the previous section allows for a variety of solutions (exemplified in the whole family of compromise rules presented), they may be too severe for widely used languages, especially, for English). We take a somewhat dual approach in this section, referring to the concept of *linguistic disenfranchisement*, that can be considered in two ways. *Observed disenfranchisement* is the fraction of people in each country who do not speak *any* of the EGF languages. The data are derived from surveys such as Special Eurobarometer (2006). *Theoretical disenfranchisement* amends the previous concept and takes into account the similarities or dissimilarities between the vocabularies (lexicon) in every pair of languages.

3.1   Observed Disenfranchisement

Consider Table 2, which shows populations in column (1), and observed disenfranchisement rates of English, German and French in columns (2) to (4). A couple of examples may be in

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[21]Irish in 2007 and Maltese in 2004, but both countries had to wait for some time before getting documents translated into their language.

order. Austria has a disenfranchisement rate of 0, as all its citizens speak German,[22] and so does obviously the UK (and a large fraction of Irish people) as well as France (and French-speaking Belgians). In other cases, say Luxembourg, the large majority of people speak either French or German, and some speak both; this also drives their observed disenfranchisement rate to 0. Finally, 84 percent of Bulgarians do not speak English, but may speak one or both other languages (6 percent speak German, and 4 percent French). These numbers are cumulated in column (5), after having eliminated double and triple counts (a Bulgarian who speaks both German and French will not be counted twice; this is also so for a Bulgarian who speaks all three languages).[23] The population that is disenfranchised appears in column (6), while column (7) shows the percentage of the total number of people who are disenfranchised in the EU (186.4 millions citizens).

[Insert Table 2 about here]

Let us illustrate the sometimes large differences between disenfranchisement rates (in column 5) and disenfranchised population in percentage terms (in column 7), for a specific pair of countries, say Portugal and Romania. Both have the same disenfranchisement rate (81 percent in column 5), and seem to have the same 'weight.' Turning to column (7), one notices a drastic change, which shows that Romania would have to cover roughly twice as much as Portugal. The reason is that the population of Romania is roughly twice as large as the Portuguese.

Obviously, the UK, Germany and France would have to contribute nothing. Note that, for the UK, this is very different from the results discussed in Section 2 where English would have, in the best case, to contribute some 50 percent to the total budget.

3.2   Theoretical Disenfranchisement

It is often argued that not all languages are equally easy to translate. Translating a document from French into, say, Bulgarian, is more difficult (and therefore more expensive) than

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[22]Note that in each country, there are some foreigners who speak none of the EGF languages, say Syrians during their first or second year after immigration. We drop these numbers which are in no case more than one percent of the population.

[23]Note that these rates are computed for the year 2007 in Fidrmuc, Ginsburgh and Weber (2007). They may look outdated. We, nevertheless, assume that the relative values of the rates did not change (or hardly did so) between 2007 and 2018, and apply them on 2018 populations.

translating it into Spanish.[24] To account for this, we consider a second way to compute disenfranchisement, using lexical distances, briefly discussed in Section 1. The underlying assumption is that languages that are closer (according to such distance) will generate less expensive translations/interpretations, but are also easier for two individuals whose language are close.

[Insert Table 3 about here]

We now reproduce what we did in Subsection 3.1, but instead of observed disenfranchisement, we use linguistic distances between English, or German or French and all the other EU official languages. Our results are summarized in Table 3, which is almost a replica of Table 2. Columns (2) to (4) contain the necessary distances, and column (5) contains the minimal distance between EGF and other languages.[25] For instance, the minimal distance between the language spoken in Austria and any of the EGF languages is 0, as the distance between the German used in Germany and Austria is 0.[26] Likewise, the smallest distance between Bulgarian and one of the EGF language obtains with German (0.769). Column (6) contains the disenfranchised population obtained by multiplying population in column (1) and the closest EGF language. Finally, column (7) expresses disenfranchisement of each country into ratios of total disenfranchisement (126.1 million).

Again, the UK (and English-speaking people in Ireland), Germany (and Austria) and France (and French-speaking Belgians) would not have to contribute. But Poland, Spain and Italy would have to pay, respectively, 22.7, 9.0 and 9.5 percent, that is almost half of the budget. See column (7) in Table 3.

Note that in some cases, such as Italy, and Spain, the minimal distance is small, but as their populations are large, they would have to contribute relatively more. This is in contrast with Estonia, Irish-speakers, Greece, and Hungary. Finland is again different. Finnish is very far from EGF, but its population is small, and so is its relative weight.

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[24]Though this may vary with the degree of expertise of the translator or the interpreter.

[25]Contrary to all other languages, Estonian, Finnish, Hungarian and Maltese are not Indo-European languages and their distance to EGF is therefore set to 1,000.

[26]We consider that all Austrians, and Germans, whatever their local dialect is, also speak German. This will also be so for French and French-speaking Belgians, English and Irish speakers of English, Greeks and Greek-speaking Cypriots and, finally, French and German-speaking Luxemburgers.

4 Compromising

In Sections 2 and 3, alternative budget sharing processes are suggested. Each of these favored some (and, sometimes, different) countries. As each one can be criticized for targeting a specific dimension, and thus dismissing important aspects, we now 'compromise' among them, moving from a single indicator, to a multidimensional index.

As mentioned in the introduction, constructing multidimensional indices is a fairly simple and easy common practice. Here, we follow the standard approach considering a simple average of the indicators. The *caveat* is that we consider percentages in each case, rather than total amounts. The consequence is that the index will also yield percentages, which can directly be used to share the total burden of translation and interpretation. This is particularly useful given the uncertainty about the exact amount in the budget mentioned above (one billion Euros). Whatever the exact amount of the budget is, our index will indicate the portion each country should be 'charged.'

Before going to the final calculations, and as Table 1 is constructed on the basis of languages, while Tables 2 and 3 are based on countries, we have to reconstruct slightly the table that shows the shares each country should be 'charged.' The results are shown in Table 4, where we 'transfer' some countries to others to be able to have the same dimensions in Tables 1, 2 and 3.[27] This makes each language associated to a unique country. Going back to countries is easy though, as we can share the burden of each language spoken in several countries proportionally to populations (See Section 2) or GDPs.

Our first index in Table 4 (Index I) includes the two linguistic dimensions considered in Sections 2 and 3: (i) EU administration's translations, according to the *compromise* rule which is itself an average between the polar *equal-split* and *concede-and-divide* solutions (Table 4, column (2)); (ii) disenfranchisement, according to the average of observed and theoretical disenfranchisement allocations (Table 4, column (3)). Index I, which appears in Table 4, column (4)), is finally the average of these two (linguistic) dimensions.

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[27]As already mentioned earlier, Austria is added to Germany, Flemish-speaking Belgium to The Netherlands, French-speaking Belgians to France, Greek-speaking Cypriots to Greece, English-speaking Irish to the UK, half of Luxembourg to France, the other half to Germany, and finally English-speaking Maltese to the UK. Note that some five percent (300.000 citizens) of Finns speak Swedish, but seventy percent of them speak or understand Finnish. We, therefore, ignored this distinction and left Swedish-speaking Finns in Finland.

Index I thus shows that the largest contribution falls on the UK (in fact, English), with some 35 percent (to be shared with Ireland and Malta), Polish (10.4 percent), Italian (8.8 percent) and Spanish (8.6 percent). It is interesting, but not surprising, that the two other procedural languages, German (1.6 percent) and French (2.6 percent) would have to pay very little. They are indeed far from having the power of English in the EU administration, which uses a very large number of translations from English (1.9 million pages out of a total of 2.2 million), and the disenfranchisement rates of both procedural languages are of course equal to 0. This is also the case for the UK, but the UK weighs for over 70 percent in the translations dimension. Italians, Poles and Spaniards have, unfortunately, not made much effort to learn any EGF language, and their disenfranchisement rates with respect to EGF are therefore rather large.

This looks nevertheless quite unfair, and in Index II (Table 4, column (7)) we also include GDPs as a new dimension, with equal weights to the other two. More precisely, Index II is obtained taking the averages of columns (2), (3) and (6) in Table 4. This makes English a little 'cheaper,' decreases slightly the burdens of Poland and Spain, but increases those of France, Germany and Italy.

If we assume that the budget is actually one billion (and, we reiterate, there is some uncertainty about that), we can easily calculate the *cost*, the *price*, or the *value* of each of the 24 official EU languages.

5   And along came Brexit...

On 23 June 2016, the so-called *United Kingdom European Union membership referendum* took place. The result, that very few observers had predicted, was legally non-binding, but, at the time, the government promised to implement it, initiating the official withdrawal process of the UK from the EU (although, as of today, it has not been materialized in monetary amounts). In the aftermath of this shocking result, reactions came from the whole political spectrum. In one of them, Danuta Hubner, the head of the European Parliament's Constitutional Affairs Committee, warned that English would lose its status of official language in the EU. Here is an excerpt from what she said: "We have a regulation [...] where every EU country has the right to notify one official language. The Irish have notified Gaelic, and the Maltese have notified Maltese, so you have only the UK notifying English [...] If we don't have the UK, we don't

have English."[28]

The very next day, the Commission's representation in Ireland released an official statement claiming that it is up to the Council of Ministers to vote *unanimously* on changes of EU's language regime. In other words, any change to the EU's language regime is subject to a unanimous vote of the Council, including Ireland. This implies that Ireland would obviously vote against deleting English from the list of official languages and Malta, which is in a similar situation but much smaller than Ireland, would probably cast a similar (negative) vote.

It is a matter of speculation that this special treatment of English would be the same if, say, Hungary or Estonia, or even Sweden decided to secede. Sweden is also such a special case as, if it decided to leave the EU, Finland (which has Swedish as an official language) could also claim Swedish to remain an official language. One could probably find other weird situations.

It is also questionable whether such a special treatment could or should be given to a language, because a small country such as Ireland (and perhaps Malta, which is even smaller) sets the result of a vote. Catalan, for instance, is an official language in Spain, but not in the EU, and the population of Catalonia is larger than the population of Ireland.[29]

One can also question the fact that when a new country (with a non-EU language) enters the EU, its language is automatically accepted. In fact, there is a formal vote, but it has always been unanimous. Why should it be that when a country leaves the EU, its language does not automatically follow, and exit with its owner?

There are, of course, strong arguments in favor of English, which deserves special treatment. English is, by far, the language that disenfranchises the smallest number of EU citizens, and it probably is the most spoken language in the world, with the exception of Chinese and Arabic if one puts all their local dialects in the same basket (See Ginsburgh, Melitz and Toubal, 2017). The EU (and all of us) obviously need a common language, whichever it is, official or not, but spoken by as many Europeans as possible. Ginsburgh and Moreno-Ternero (2018) suggest that this could be a further step, and argue that, for efficiency reasons, English could become the *lingua franca* in the EU, without any necessity to vote. This fact, which had already been predicted in 1873 by the Swiss scientist (in fact a botanist), De Candolle (1987), in *Avantage*

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[28]See for example https://www.politico.eu/article/english-will-not-be-an-official-eu-language-after-brexit-senior-mep/

[29]To be fair, not all Spanish citizens living in Catalonia speak Catalan, but Catalan is certainly spoken by more citizens than Maltese in Malta, or the share of the Swedish-speaking population in Finland.

pour les sciences d'une langue dominante et laquelle des langues modernes sera nécessairement dominante au XXe siècle, and is even more obvious today. This is what De Candolle wrote, after having described the role of Latin, followed by French, and to some extent by German as a scientific language, in the 19th and first part of the 20th centuries:

> A language can become dominant if and only if it satisfies the following characteristics: (i) to have enough words or germanic and latin forms to be accessible both to the speakers of both Germanic and Romance languages, and (ii) to be spoken by a considerable majority of civilized people.[30] It would also be important that this language should grammatically be simple enough as well sharing some conciseness and clarity. English is the only language that, could, in 100 or 150 years offer such conditions. The future preponderance of the Anglo-American language is so obvious that it will be imposed by the populations of both hemispheres.

But would it be fair to let the British people passively benefit from this (and reap as Lord Kinnock mentioned billions of pounds[31]) without compensating its very close citizens living in Continental Europe? The more so that one could safely argue that the previous amounts would increase considerably. We believe that it looks reasonable for the UK to contribute to the budget in the amounts described above. This should be part of the EU divorce bill, for which negotiations are currently taking place.

6 Conclusions

In this paper, we explore how to share the burden of multilingualism in the EU, even if this is only a 'theoretical exercise.' We consider three alternative approaches:

The first one uses a stylized model of allocating revenues from collective rights to share the costs from translation and interpretation (unfortunately, data for the latter are not available and, thus, we concentrate on the former for the empirical application). This approach is worrisome for procedural languages, especially English, which would have to support at least half of the effort.

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[30]In the time he wrote this, Arabic and Chinese were not at the point at which they are nowadays.

[31]See the Introduction for some details.

The second approach uses two notions of linguistic disenfranchisement (with or without taking into account lexical distances) to implement the principle of accountability. Contrary to the first approach, procedural languages would now be treated in a better way.

The third approach compromises between the previous two, by introducing an economic dimension, which leads us to a multidimensional index. In that sense, our approach is reminiscent of an old paper by Greenberg (1956) and a more recent one by Desmet, Ortuño-Ortin and Weber (2009), who also consider linguistic distances to 'augment' existing indices (in their case, of diversity or polarization).

We believe that the allocation derived from this index is the most natural proposal to solve our problem as it balances linguistic and economic aspects of EU's member states, as well as capturing the principle of accountability, which is a cornerstone for the modern theory of fair allocation. Modifying the index to give a higher weight to the economic dimension (for instance, imposing an equal weight to the average of linguistic dimensions) would have, as main effect, a reduction of the burden of English, while increasing the one of French and, especially, German. Anyhow, English would still face a higher share of the burden than the other two languages together.

Some *caveats* on the grounds of fairness should be mentioned though, with respect to the allocation derived from our indices. On the one hand, six languages (the three procedural languages, plus Italian, Polish and Spanish) out of 24, would have to support some 63 percent of the burden. This is not unreasonable, as they are the largest countries, with the largest populations in the EU. This group happens to be the same as the one that results from the analysis in Fidrmuc, Ginsburgh and Weber (2007), who try to determine the optimal number of official languages in the EU. On the other hand, Irish and Maltese are spoken by small numbers of citizens. If they benefit from the same conditions than all other languages (and there is no reason why they should not), Irish will collect a small subsidy (-0.1 percent) and so would Maltese (-0.2 percent).[32]

To conclude, we believe that our analysis is particularly relevant, given the crucial juncture the EU is facing in the aftermath of Brexit. Although the 2020 coronavirus pandemic is shaking almost all pillars of civilization worldwide, with a special strength in some continental European countries, as well as the UK itself, thus postponing many crucial issues (such as the

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[32]We ignore Luxembourgish, as it is not yet an official language. But, clearly, its cost would also be negligible.

implementation of Brexit), we hope that attention will gradually shift back to them. When this happens, we will have to address, among other things, the UE-UK divorce bill. In this paper, we argue that an item in such a bill should correspond to the status of English as an official language in post-Brexit UE. There are certainly efficiency arguments that suggest that the EU will not only keep English as an official language in the future, but also as a de facto *lingua franca*. But that would exacerbate benefits for the UK, which should compensate the EU by chipping in, to face the burden of multilingualism in post-Brexit EU.

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Appendix. Countries with more than one official language

Belgium

• Date of accession to the EU (Common Market at the time): 1958. Official languages in the country: Flemish (assimilated to Dutch), French and German. Official language in the EU: As The Netherlands, France and Germany were also among the founding member states, the three Belgian official languages were *ipso facto* Common Market official languages and the entry of Belgium added no new language.

• Belgium is separated into two parts: the Flemish-speaking provinces of Antwerpen, Limburg, Oost-Vlaanderen, Vlaams Brabant and West Vlaanderen plus 50 percent of Brussels for GDP, but only 10 percent of its inhabitants speak Dutch (Flanders in what follows) and the French-speaking (Walloons usually speak French) provinces of Brabant Wallon, Hainaut, Liège Luxembourg and Namur plus 50 percent of Brussels for GDP but 90 percent for its language (Wallonia). The German-speaking population of Eastern Belgium is included in Wallonia (note there are only 77,000 German speakers and most of them also speak French).

• Total population: 11.4 million. Total GDP: 458.28 billion.

• Sharing languages of populations: The population of 11.4 million is separated as follows: Flanders: 6.7 million that is 6.6 million living in the Flemish provinces (see above) plus 10 percent of the 1.2 million living in Brussels; Wallonia: 4.7 million of which 3.6 live in the French-speaking provinces (see above), plus 90 percent of the 1.2 million living in Brussels. Belgian censuses do not include questions on languages. The 90 percent is borrowed from a recent paper issued by a serious local newspaper (Pauline Deglume, Bruxelles à 91.8 pour cent francophone selon les déclarations fiscales, *L'Echo*, January 29, 2020) which reports on the languages (Flemish or French) used by inhabitants of Brussels in their income tax returns. Source: *www.statistica.com/statistics/517196/population − of − belgium − by − region.*

• Sharing GDPs by language: Belgian total GDP of 458.3 billion is shared as follows: Flanders: Euros 311.6 billion, that is the GDP of the provinces cited earlier plus 50 percent of the GDP of the Brussels region; Wallonia: 146.7 billion that is the provinces cited earlier and 50 percent of the Brussels region. Source: *https : //ec.europa.eu/eurostat/news/themes − in − the − spotlight/regional − gdp.*

• EGF Empirical disenfranchisement: Flemish-speaking population: 17 percent. Source: Ginsburgh, Victor and Shlomo Weber (2007), La connaissance des langues en Belgique, Reflets

et Perspectives de la Vie Economique 47, 33-43; French and German-speaking populations: 0 percent. For disenfranchisement data, see Fidrmuc, Ginsburgh and Weber (2007).

- Linguistic disenfranchisement: The distances are equal to 0 for French and German, and to 0.163, the minimum distance between Dutch and English (0.392), Dutch and French (0.756) and Dutch and German (0.163). Source: Dyen, Kruskal and Black (1992).

Ireland (Republic of)

- Date of accession to the EU: 1973. Official languages in the country: English and Irish (also often called Gaelic). Official language in the EU: Irish.
- Total population: 4.8 million. Total GDP: 320.16 billion.
- Ireland is separated into two parts: English speakers: 99 percent of the population; Irish: 36 percent also speak Irish. Source: $https://en.wikipedia.org/wiki/Irish-language$.
- Sharing languages of populations: 99 percent of Irish citizens speak English and 36 percent speak Irish, thus we assume that 1 percent of the population speaks Irish only. See previous paragraph.
- Sharing GDPs by language: We make the assumption that 36 percent, that is 115.3 = billion is produced by Irish speaking citizens, and 64 percent, that is 204.9 billion by English-speaking citizens.
- EGF Empirical disenfranchisement: One percent only of the population does not speak English.
- Linguistic disenfranchisement: 0 for those who speak English; 1 percent speak only Irish. The distances from English, German and French to Irish are 0.817, 0.806 and 0.812. The minimum is 0.806. Source: Dyen, Kruskal and Black (1992).

Luxembourg

- Date of accession to the EU: 1958. Official languages in the country: Luxembourgish, French and German. Official language in the EU: In 1958, Luxembourg waved its rights to add Luxembourgish to the list of languages as French and German were already official languages in the Common Market. However, recently Luxembourg asked the EU to accept Luxembourgish as an official language as well (Source: $https://www.euractiv.com/section/languages-culture/news/luxembourgish-makes-comeback-bid-for-eu-approval/$)
- Total population: 0.6 million.

- Total GDP: 59.2 billion.

- Sharing languages of populations: The whole population knows either E, or G, or F, and many speak at least two of those three languages.

- Sharing GDPs by language: The whole GDP is produced by EGF.

- EGF Empirical disenfranchisement: 0 percent.

- Linguistic disenfrachisement: 0 with respect to EGF.

Malta

- Date of accession to the EU: 2004. Official languages in the country: English and Maltese. Official language in the EU: Maltese. However, at the time Malta became a member of the EU, and given that a large majority of Maltese citizens know English, the country temporarily waved its rights to have Maltese translated and interpreted. The Council set a transitional period of three years starting May 1, 2004, during which the institutions were not constrained to draft or translate acts in Maltese. It was agreed that the Council could extend this transitional period by an additional year, but decided not to. All new acts of the institutions were required to be adopted and published in Maltese starting with documents issued as early as April, 30 2007. Source: $https : //en.wikipedia.org/wiki/Languages_of_the_European_Union$. The EU recently issued guidelines for contractors translating into Maltese. Source: $https : //ec.europa.eu/info/resources-partners/translation-and-drafting-resources/guidelines- translation - contractors/guidelines - contractors - translating - maltese$.

- Total population: 0.5 million.

- Total GDP: 12.7 billion.

- Sharing languages of populations: 98 percent speak Maltese, 88 percent can speak English. Source: Eurobarometer 386, 2012.

- Sharing GDPs by language. We make the assumption that GDPs are proportional to languages spoken (see below). Thus 11.2 (= 0.88 percent out of 12.75 billion) is produced by English speakers and 1.53 (= 0.12 percent of 12.75 billion) is produced by those who also speak English.

- EGF Empirical disenfranchisement: 12 percent at most.

- Theoretical disenfranchisement: 0 with respect to EGF for 88 percent of the population; 1000 for those 12 percent who speak only Maltese which is not an Indo-European (and perhaps also Italian, or French).

Table 1 Translations. Results of Sharing Rules

Countries	See country for language (1)	Translations (1,000 pages) from (2)	to (3)	Absolute values Equal split (4)	Concede & divide (5)	Compr-omise (6)	Relative values (%) Equal split (7)	Concede & divide (8)	Compr-omise (9)
Austria	Germany								
Belgium Dutch	Netherlands								
Belgium French	France								
Bulgaria		14.0	87.3	50671	3567	27119	2.3	0.2	1.2
Croatia		7.4	87.5	47466	-3136	22165	2.1	-0.1	1.0
Cyprus	Greece								
Czechia		7.9	88.1	47973	-2076	22948	2.1	-0.1	1.0
Denmark		5.7	87.5	46599	-4949	20825	2.1	-0.2	0.9
Estonia		2.9	86.1	44492	-9354	17569	2.0	-0.4	0.8
Finland		4.3	86.7	45511	-7222	19144	2.0	-0.3	0.9
France (F)		74.7	144.5	109620	126823	118221	4.9	5.6	5.3
Germany (G)		38.5	118.5	78518	61791	70154	3.5	2.7	3.1
Greece		21.0	90.1	55544	13755	34649	2.5	0.6	1.5
Hungary		11.3	88.1	49697	1530	25614	2.2	0.1	1.1
Ireland English	UK								
Ireland Irish		0.0	19.2	9584	-82342	-36379	0.4	-3.7	-1.6
Italy		20.1	96.0	58065	19027	38546	2.6	0.8	1.7
Latvia		3.6	86.3	44963	-8368	18297	2.0	-0.4	0.8
Lithuania		6.2	85.8	45976	-6251	19862	2.0	-0.3	0.9
Luxembourg GF	F. And G.								
Malta English	UK								
Malta Maltese		0.2	85.0	42641	-13224	14708	1.9	-0.6	0.7
Netherlands		9.3	92.3	50809	3855	27332	2.3	0.2	1.2
Poland		22.5	90.5	56492	15738	36115	2.5	0.7	1.6
Portugal		6.1	92.1	49133	350	24741	2.2	0.0	1.1
Romania		12.9	89.0	50944	4138	27541	2.3	0.2	1.2
Slovakia		6.5	85.5	45993	-6216	19888	2.0	-0.3	0.9
Slovenia		6.0	85.8	45915	-6378	19769	2.0	-0.3	0.9
Spain		29.1	98.3	63702	30813	47258	2.8	1.4	2.1
Sweden		5.4	88.0	46698	-4742	20978	2.1	-0.2	0.9
UK		1937.0	193.8	1065398	2125269	1595333	47.3	94.4	70.8
Total		2252.6	2252	2252398	2252398	2252398	100.0	100.0	100.0

Column (1) refers to the language of another country which similar the mother tongue. Sources: Translations in Figures, 20
https://op.europa.eu/en/publication-detail/-/publication/62f8069c-67d4-11e9-9f05-01aa75ed71a1

Other columns result from our calculations. See text.

Table 2. Observed disenfranchisement

Countries	Population (in millions) (1)	Obserevd rates of disenfranchisement (%)				Disenfr. pop. (millions) (6)	Disenfr. pop. (% of total) (7)
		English (2)	German (3)	French (4)	E, G & F (5)		
Austria	8.8	55	0	94	0	0.0	0.0
Belgium Dutch	6.7	na	na	na	16*	1.1	0.6
Belgium French	4.6	80	95	0	0	0.0	0.0
Bulgaria	7.1	84	94	96	79	5.6	3.0
Croatia	4.1	71	85	99	62	2.5	1.4
Cyprus	0.9	49	98	95	49	0.4	0.2
Czechia	10.6	84	81	98	69	7.3	3.9
Denmark	5.8	34	73	97	31	1.8	1.0
Estonia	1.3	75	92	100	70	0.9	0.5
Finland	5.5	69	95	99	67	3.7	2.0
France	67.0	80	95	0	0	0.0	0.0
Germany	82.8	62	0	92	0	0.0	0.0
Greece	10.7	68	94	95	63	6.7	3.6
Hungary	9.8	92	91	100	85	8.3	4.5
Ireland English	3.1	0	98	91	0	0.0	0.0
Ireland Irish	1.7					0.0	0.0
Italy	60.5	75	96	90	69	41.7	22.4
Latvia	1.9	85	97	100	83	1.6	0.8
Lithuania	2.8	86	96	99	82	2.3	1.2
Luxembourg	0.6	61	12	11	0	0.0	0.0
Malta English	0.4	0	98	91	0	0.0	0.0
Malta Maltese	0.1					0.0	0.0
Netherlands	17.1	23	43	81	18	3.1	1.7
Poland	38.0	82	90	99	76	28.9	15.5
Portugal	10.3	85	98	91	81	8.3	4.5
Romania	19.5	86	97	90	81	15.8	8.5
Slovakia	5.4	83	82	99	72	3.9	2.1
Slovenia	2.1	59	79	98	50	1.1	0.6
Spain	46.9	84	98	94	81	38.0	20.4
Sweden	10.1	33	88	97	33	3.3	1.8
UK	66.2	0	98	91	0	0.0	0.0
Total	512.4					186.4	100.0

Sources: Populations 2018:

https://ec.europa.eu/eurostat/documents/2995521/9063738/3-10072018-BP-EN.pdf/ccdfc838-d909-4fd8-b3f9-db0d65ea457f

Rates of disenfranchisement: Fidrmuc, Ginsburgh and Weber (2007). Other columns result from our calculations.

Table 3. Theoretical Disenfranchisement

Countries	Population (millions) (1)	Linguistic distances (x 1,000) English (2)	German (3)	French (4)	Minimum (5)	Disenfr. pop. (millions) (6)	Disenf. pop. (% of total) (7)
Austria	8.8	422	0	756	0	0.0	0.0
Belgium Flemish	6.7	411	163	754	163	1.1	0.9
Belgium French	4.6	764	756	0	0	0.0	0.0
Bulgaria	7.1	772	769	791	769	5.5	4.3
Croatia	4.1	766	764	772	764	3.1	2.5
Cyprus	0.9	838	812	843	812	0.7	0.6
Czechia	10.6	759	741	769	741	7.9	6.2
Denmark	5.8	407	293	759	293	1.7	1.3
Estonia	1.3	1000	1000	1000	1000	1.3	1.0
Finland	5.5	1000	1000	1000	1000	5.5	4.4
France	67.0	764	756	0	0	0.0	0.0
Germany	82.8	422	0	756	0	0.0	0.0
Greece	10.7	838	812	843	812	8.7	6.9
Hungary	9.8	1000	1000	1000	1000	9.8	7.8
Ireland English	3.1	0	422	764	0	0.0	0.0
Ireland Irish	1.7	817	806	812	806	1.4	1.1
Italy	60.5	753	735	197	197	11.9	9.5
Latvia	1.9	803	800	793	793	1.5	1.2
Lithuania	2.8	784	776	779	776	2.2	1.7
Luxembourg GF	0.6	na	na	na	0*	0.0	0.0
Malta English	0.4	0	1000	1000	0	0.0	0.0
Malta Maltese	0.1	1000	1000	1000	1000	0.1	0.1
Netherlands	17.1	392	162	756	162	2.8	2.2
Poland	38.0	761	754	781	754	28.7	22.7
Portugal	10.3	760	753	291	291	3.0	2.4
Romania	19.5	773	751	421	421	8.2	6.5
Slovakia	5.4	750	742	765	742	4.0	3.2
Slovenia	2.1	751	733	782	733	1.5	1.2
Spain	46.9	760	747	266	266	12.5	9.9
Sweden	10.1	411	305	756	305	3.1	2.4
UK	66.2	0	422	764	0	0.0	0.0
Total	512.4					126.1	100.0

Sources: Populations 2018: See Table 2

Linguisic distances: Dyen, Kruskal and Black (1992).

Other columns result from our calculations. See text.

Table 4 Results of Sharing Rules (%)

Countries	Language	See country for language (1)	Compromise rule (2)	Disenfranchisement (3)	Index 1 ((2)+(3))/2 (4)	GDP (%) (5)	GDP (%) reordered (6)	Index 2 ((2)+(3)+(6))/3 (7)
Austria	German	Germany				2.4		
Belgium Dutch	*Dutch*	Netherlands				2.0		
Belgium French	*French*	France				0.9		
Bulgaria	Bulgarian		1.2	3.7	2.4	0.4	0.4	1.7
Croatia	Croatian		1.0	1.9	1.5	0.3	0.3	1.1
Cyprus	Greek	Greece				0.1		
Czechia	Czech		1.0	5.1	3.0	1.3	1.3	2.5
Denmark	Danish		0.9	1.2	1.0	1.9	1.9	1.3
Estonia	Estonian		0.8	0.8	0.8	0.2	0.2	0.6
Finland	Finnish		0.9	3.2	2.0	1.5	1.5	1.8
France (F)	French		5.3	0.0	2.6	14.8	15.9	7.1
Germany (G)	German		3.1	0.0	1.6	21.0	23.4	8.8
Greece	Greek		1.5	5.7	3.6	1.2	1.5	2.9
Hungary	Hungarian		1.1	6.1	3.6	0.8	0.9	2.7
Ireland English	*English*	UK				1.3		
Ireland Irish	*Gaelic*		-1.6	0.5	-0.5	0.7	0.7	-0.1
Italy	Italian		1.7	15.9	8.8	11.1	11.1	9.6
Latvia	Latvian		0.8	1.0	0.9	0.2	0.2	0.7
Lithuania	Lithuanian		0.9	1.5	1.2	0.3	0.3	0.9
Luxembourg GF	*F and G*.	F. And G.				0.4		
Malta English	*English*	UK				0.1		
Malta Maltese	*Maltese*		0.7	0.0	0.3	0.0	0.0	0.2
Netherlands	Dutch		1.2	2.7	2.0	4.8	6.8	3.6
Poland	Polish		1.6	19.1	10.4	3.1	3.1	7.9
Portugal	Portuguese		1.1	3.4	2.3	1.3	1.3	1.9
Romania	Romanian		1.2	7.5	4.4	1.3	1.3	3.3
Slovakia	Slovak		0.9	2.6	1.8	0.6	0.6	1.4
Slovenia	Slovene		0.9	0.9	0.9	0.3	0.3	0.7
Spain	Spanish		2.1	15.1	8.6	7.6	7.6	8.3
Sweden	Swedish		0.9	2.1	1.5	2.9	2.9	2.0
UK	English		70.8	0.0	35.4	15.2	16.6	29.1
Total			100.0	100.0	100.0	100.0	100.0	100.0

Column (1) refers to the language of another country for the mother tongue.

Sources: Column 2, see Table 1; column (3) is an average of the two disenfrachisement rates in Tables 2 and 3.

Column 5: GDPs, see: https://en.wikipedia.org/wiki/List_of_sovereign_states_in_Europe_by_GDP_(nominal)

Other columns result from our calculations. See text.