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Abstract

Language conflicts are primarily motivated by social, economic, and political factors, which emerge through the medium of language. While a situation of absolute equality between all the languages present in a country is difficult to achieve (if only for practical reasons), a well-designed and fair language policy can reduce practical and symbolic inequalities to politically acceptable levels with an affordable use of resources. This article develops an indicator to measure the trade-off between efficiency and fairness of language policies involving traditional minorities.

Starting from the benchmark that all individuals have equal rights with respect to using their preferred language in all situations, we discuss the denial of such rights due to efficiency reasons. In the trade-off between egalitarianism and efficiency we define the relative weight given to egalitarianism as recognition of minorities. For each denial of a minority-language right, we find an ordinal quantification of the degree of lacking recognition reflected in this denial. We interpret this quantification as an indicator of linguistic recognition of society.

The indicator is based on ideas from constitutional economics, and a specific form is found that lends itself to empirical work. The indicator depends on the critical size of the minority for which the values of costs and benefits of the language policy are equal, on the elasticity of the cost of providing the language-related good with respect to the number of beneficiaries of the policy, as well as on the size of the minority and the size of the total population in the jurisdiction.

The indicator is illustrated with some examples from the minority policy in Slovakia and Romania.

Keywords: Linguistic justice, constitutional economics, linguistic minorities, official language, language policy

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1 INTRODUCTION

Most societies are multilingual, even in countries with only one official language. This is due to the presence of indigenous/traditional linguistic minorities and recently immigrated people not speaking the official language of the host country. States manage linguistic diversity through language policy, that is, a form of public policy aimed at addressing political, social, cultural, economic and organizational issues that have a linguistic dimension (GAZZOLA, GRIN, CARDINAL, & HEUGH, 2024). What makes language policy distinct from other types of public policies is that it cannot be entirely avoided. While the government can practice neutrality concerning religion, this is impossible with languages (KYMLICKA, 1997). Language policies are inevitable because the government must choose at least one language to deliver publicly provided language-related goods such as official documents and administrative forms, names of places, the administration of justice (tribunals and courts), and public services such as basic education and primary health care.

The choice of which languages to use in a certain territory, however, is not a neutral act insofar as the population speaks different native languages (MAY, 2005). It is well known that languages fulfill two central functions in individuals' lives (KRAUS, 2024 and EDWARDS, 2009): (i) language has an undisputed practical and communicative function in society, and (ii) language has a symbolic function because it is a central tool in individuals' socialization and the creation of a sense of collective belonging (or identity). The interaction between languages – and consequently between different groups of speakers – can be harmonious, characterized by mutual respect, understanding, and collaboration. However, the coexistence of languages within a territory can sometimes be challenging, leading to tensions and, in extreme cases, conflict (NELDE, 1987, HADÎRCĂ, ROMANS, & ULASIUK, 2018).[1] Conflicts among groups may arise from both practical language-related issues and discrimination in political, economic, and social contexts, as well as from real or perceived disparities in the symbolic recognition of one group compared to others. As HASLINGER, 2022, page 134 observes, "In the political process, the statuses assigned to different language communities are projected onto their languages. Therefore, language conflicts are primarily motivated by social, economic, and political factors, manifesting through the secondary attribute of language".

Language policy can affect both dimensions of language. At the practical level, it influences the degree to which people can access and benefit from publicly provided language-related goods and services. At the symbolic level, it affects the degree of symbolic recognition of a language in society and its speakers' sense of dignity. Language policy, therefore, can play an important rôle in ethnic conflicts (LAITIN, 1999, DAVIES & DUBINSKY, 2018, and MEDDA-WINDISCHER & CARLÀ, 2022). At one extreme, a government may choose to restrict rights for minority groups by mandating the use of the majority language, which can generate resentment and disputes, ultimately leading to political disenfranchisement and conflict (HASLINGER, 2022). At the other extreme, a government might grant such extensive rights to minorities, that members of the minority have no motivation to learn and utilize the majority language. This scenario can foster the development of parallel societies within a state, potentially undermining its cohesion and political stability (DEEN & ROMANS, 2018). Additionally, the complexity of

[1] It is important to note, however, that not all conflicts manifest as violent or lead to military confrontations. In a democratic society, for instance, there are established institutional procedures that allow for the peaceful resolution of discontent and disagreements between differing interests and needs.

language dynamics is heightened by immigration. Immigrants with lawful residency, as well as asylum seekers and refugees who have fled their home countries, may not be proficient in the official language of the host nation. Initially, they may encounter significant language barriers in critical settings such as hospitals or courtrooms. To prevent their alienation from the host society, temporary support measures like translation and interpreting may be necessary (De Schutter, 2022 and Shorten, 2022).

There are several legal instruments at the international and regional level – legally binding or not – as well as years of interpretative jurisprudence of international judicial bodies, which set out norms and principles to protect linguistic minorities (for a detailed review, see de Varennes & Kuzborska, 2019, Dunbar, 2023, and Medda-Windischer & Constantin, 2024). The soft law instruments developed by the High Commissioner on National Minorities (HCNM) of the Organisation for Security and Co-operation in Europe (OSCE) are especially interesting because they are policy-driven. The HCNM corpus of guidelines and recommendations – in particular the Ljubljana recommendations (High Commissioner on National Minorities (HCNM), 2012) and the Oslo recommendations (High Commissioner on National Minorities (HCNM), 1998) – has established a relationship between the implementation of fair language policies and the prevention or reduction of conflict (Rotta & Balan, 2022). While a situation of absolute equality between all the languages present in a country is difficult to achieve (if only for practical reasons), a well-designed and fair language policy can reduce practical and symbolic inequalities to politically acceptable levels with an affordable use of resources. The HCNM pointed out the need to evaluate official language policy to monitor the potential risks of social and political tensions. One of the difficulties in such an evaluation, however, is that a policy is effective if nothing happens (van der Stoel, 2018, page 16, quoted in Rotta & Balan, 2022).

One possible way to overcome this problem is to develop quantitative indicators that reflect the degree of fairness of official language policy and then assume that a higher degree of fairness is associated with a lower risk that linguistic diversity will lead to disputes, tensions and conflict, all other things being equal. This assumption is supported by some evidence showing that political stability of a country is positively correlated with its respecting minority rights, see Liu, Brown, & Dunn, 2015. In the literature, the theme of fairness in language policy is often referred to as "linguistic justice".[2] This article aims to contribute to research in language policy and planning, linguistic justice and (language) conflict studies from a quantitative and empirical point of view. It is organized as follows. Section 2 positions the article in the relevant literature on linguistic justice. Section 3 presents the formal model. It gives a short overview of contract theory based on the concept of social contract. The rules governing the basic structure of society (for instance its constitution) are visualized as chosen by individuals from an original position; that is, the members of society choose the rules of society without knowing which position they will occupy therein. The resulting society is defined as just. This general idea is then applied to the denial of rights in favor of a linguistic minority associating it with the degree of risk aversion of the individuals behind the veil of ignorance. This is further identified as inequality aversion in a welfare-function interpretation. The resulting "indicator of minority-language recognition" is then formally derived. In Section 4, the indicator is generalized to the case of multiple minorities. Section 5 presents an empirical application to some jurisdictions in

[2] Our use of "fairness" here represents the use in common language and is, of course, very different from the *terminus technicus* in economics. See, for instance, Varian, 1974 and Varian, 1975.

Slovakia and Transylvania (Romania). Section 6 concludes the article.

2 RELATED WORK

The theme of fairness in relationships between languages – and consequently among their speakers – as well as in language policies, has been explored in the literature on "linguistic justice". While this body of work does not explicitly address the issue of conflict, it offers valuable insights for decision-makers and researchers involved in conflict prevention. SHORTEN, 2025 claims that the term "linguistic justice" first emerged in 1925, but it was not until the late 1980s that research in normative political theory began to encompass the topic, gaining significant momentum throughout the 2000s. While the foundations of research on linguistic justice lie in normative political theory, the field has also become increasingly interdisciplinary incorporating contributions from other disciplines such as economics, law, sociolinguistics, and political science (see detailed overviews by ALCALDE, 2018, MORALES-GÁLVEZ & RIERA-GIL, 2019, and SHORTEN, 2025).

One of the main areas of research in the field of language justice concerns the equality of speakers of different languages (this specific paragraph draws on and summarizes SHORTEN, 2025, pages 4–6). The fundamental question is how public authorities in a multilingual society can treat speakers of different languages as equals. According to PATTEN'S, 2014 approach equal support *per capita* should be given to every speaker, who would then be treated as equals. This naturally results in the sum of resources for a large speech community of speakers being much greater than the sum of resources for a small community. This in turn means that the public services and goods available in the language of a large speech community are often much greater than what the members of a small community eventually manage to finance and produce (technically, this is the result of the cost functions being concave, for instance due to the presence of fixed costs in the production of goods and services). DE SCHUTTER, 2017 criticizes Patten's model on this ground. According to De Schutter, it is the language communities as a whole that should be treated as equals because this allows speakers to enjoy the same services in their own language, even if this means that the average cost *per capita* is higher for members of the minority, which in practice implies that the majority subsidizes the minority. It is in fact chance that determines whether an individual is born into a linguistic minority instead of a majority. Finally, other authors criticize PATTEN'S, 2014 and DE SCHUTTER'S, 2017 approach that language justice only concerns the languages used by public institutions and argue instead for a broadening of the perspective. According to CAREY, 2019, for example, being egalitarian means asking whether, in a given sociolinguistic environment, speakers are equally successful in satisfying their individual preferences in the language of their choice, i.e. whether they can do the things they want in the language of their choice (e.g. working, and enjoying cultural goods and public services). A similar perspective is adopted by other authors who follow the capability approach (SHORTEN, 2017, LEWIS, 2017, and BRANDO & MORALES-GÁLVEZ, 2023, to which the recent GIALDINI, 2024 should be added). In this approach, equality between speakers of different languages is assessed on the basis of how the sociolinguistic environment and language policy influence their actual ability to achieve valuable outcomes.

In more recent years, the discussion on equality and language justice has been enriched by contributions from economics and political science that have sought to operationalize the concept of language justice so that it can be studied empirically and from a comparative perspective.

This has typically been done through the design of indicators later collected into indices.[3] The first two indices emphasize the rôle of government (and therefore language policy) in promoting linguistic justice.

2.1 The Index of linguistic justice

The first index was constructed by Gazzola, Wickström, & Fettes, 2023. The "Index of linguistic justice" (ILJ) puts its focus on publicly provided goods. The ILJ concentrates on government language choices in the public provision of language-related goods and services that pertain to the exclusive or prominent sphere of government action (as opposed to private actors such as businesses). There are three such spheres: law and order, public administration, and essential public services. The main advantage of focusing on the language choices of the government rather than on features of the general linguistic environment is that it enables the authors to identify a "minimum threshold" of linguistic justice to which governments might be held accountable.

The index is composed of ten indicators, reflecting three fundamental dimensions of language rights, namely (i) toleration (at least) for the private use of each language; (ii) accommodation, *i.e.* the provision of language mediation systems in certain critical contexts (such as criminal trials) in favor of non-official language speakers; (iii) compensation, *i.e.* the public provision of certain administrative and health services in traditional minority languages even when their speakers are proficient in the official language (the public provision of these services, in fact, is a form of compensation for the costs of adaptation of minorities to the majority language).

The ILJ uses as a benchmark a theoretical situation in which all individuals have the same rights to their preferred language, regardless of their knowledge of other languages. Deviation from this situation causes a lower score. All indicators take a value between zero and one. The indicators are aggregated in a synthetic index through simple summation.

2.2 Multidimensional linguistic justice index

The second index, developed by Gialdini, 2023 and Gialdini, 2024, is known as the "Multidimensional linguistic justice index" (MLJI). Rooted in the capability approach (CA), see Nussbaum & Sen, 1993, the MLJI examines linguistic justice through the lens of well-being and individual capabilities. This index emphasizes the rôle of state language policy in removing language-related barriers to individuals' capabilities and therefore in transforming potential opportunities into tangible actions and states of being (i.e., the "functionings" in the CA). Gialdini identifies six key language-related capabilities that can be influenced by official language policy, that is, (i) expression of one's individual or group identity; (ii) access to health-care with no discrimination; (iii) access to the judicial system and court proceedings; (iv) access to education; (v) access to public administration and essential services; (vi) access to public deliberation.

The language-based capabilities are associated with eleven *functionings* that are finally operationalized into an equivalent number of indicators. When the actions taken by the state in a

[3] Research in economics and political science has produced several theoretical contributions on the topic of language-policy fairness (see Pool, 1991, Wickström, 2007, Grin & Gazzola, 2013, Vaillancourt, 2018, and Wickström, Templin, & Gazzola, 2018), but the focus on more operational and comparative aspects is more recent.

specific public policy area facilitate access to and enjoyment of linguistic capabilities, the indicator is assigned a value of 1. Conversely, if such access is not provided, the value remains 0. After all indicators have been assessed, their values are aggregated by calculating the arithmetic mean. This process produces a single numeric value for each language, which represents the value of the MLJI for a particular jurisdiction, reflecting the overall linguistic justice within that jurisdiction. The average MLJI score is quantified on a scale from zero to one, with this range being segmented into four identical tiers. The score of the MLJI for each minority group is visually represented using a four-tier box system (corresponding to the following descriptive judgments: "very low", "low", "high", and "very high"). This system illustrates the relative position of each minority in comparison to others within the same jurisdiction and across jurisdictions.

2.3 LANGUAGE FREEDOM INDEX

The third index is called the "Language freedom index" (LFI). The first version of this index was developed by DUBINSKY & STARR, 2022, and later it was expanded and tested on a sample of countries by DUBINSKY, GAVIN, REES-WHITE, SCUCCHI, & STARR, 2025. The LFI was originally developed to determine when governmental linguistic restrictions could be considered instances of cruelty, and it was aimed at evaluating the degree of linguistic accommodation and/or obstruction faced by each non-dominant ethnolinguistic group within a country, in relation to their population size (DUBINSKY & STARR, 2022). The scope of the LFI index was broadened in later publications (DUBINSKY, GAVIN, REES-WHITE, SCUCCHI, & STARR, 2025).

The LFI has been defined as an index to measure how fully any person can participate in the political, social, and cultural life of their country in their preferred language. DUBINSKY, GAVIN, REES-WHITE, SCUCCHI, & STARR, 2025 see the LFI as a tool to assess the respect of language rights (or to evaluate linguistic justice), two terms that they use somewhat interchangeably. The purpose of the LFI is to provide an instrument for the systematic comparison across language-policy and language-conflict contexts. The index measures seventeen indicators grouped into three main categories, that is (i) legal rights and representation, (ii) education and health care, and (iii) media, culture, and religion.

The LFI is not based on a specific theoretical approach; it has been designed to cover a wide range of issues and sociolinguistic domains that are generally encompassed by language rights. Each indicator can take only three values, that is -1 (the language is not present or is suppressed), 0 (the language is present sometimes / at the regional level), +1 (the language is present always/widely). Scores for each variable are then compiled into a single indicator that reflects the overall level of language freedom enjoyed by a linguistic community. Language freedom scores are calculated for each language community not smaller than 1% of the population of a country, by taking the weighted mean across the averages of each of the three categories of rights. The three categories are given an equal weight.

2.4 THE PRESENT ARTICLE

What the three indices have in common is the fact that their purpose is deliberately descriptive and oriented towards facilitating feasible empirical research. For this reason, they include relatively simple indicators that can be fed sufficiently easily with existing data.

This article aims to contribute to empirical research on linguistic justice through a more complex indicator that does not merely record the presence/implementation or non-implementation

of language rights in certain domains. It starts from the observation that the implementation of a language right usually entails costs as well as benefits, and that resources are always scarce and subject to alternative uses. Language policy is simply looked upon as public policy based on cost-benefit (or cost-effectiveness) arguments (GRIN & VAILLANCOURT, 1999, GRIN, MORING, GORTER, HÄGGMAN, Ó RIAGÁIN, & STRUBELL, 2002, WICKSTRÖM, 2024b, and WICKSTRÖM, 2025). If a language community is too small, it may be inefficient from a cost-benefit perspective to provide goods and services in the language of the speakers. From an ethical point of view, not implementing a language right in this type of situation is less of an infringement on the rights of members of a minority than choosing not to implement a language right when it is efficient. By this, we do not mean that a language right should not be implemented if it is inefficient to do so, but that the society has to take the trade-off between equal treatment of all citizens and the corresponding costs into account.

Describing and quantifying this trade-off is the purpose of the indicator developed in this article. The resulting indicator is not only intended to contribute to making existing indices cardinal and measurable. It also wants to contribute to a theoretical basis of the definition of equal treatment in language policy and to the recent study of the normative constraints that contractualism (or constitutional economics) imposes on the choice of language policy (see CAREY & SHORTEN, 2022). Such a normative analysis can justify that in certain situations giving rights to a minority language may be unreasonable if the inefficiency costs become excessive in the trade-off between efficiency and equality. Such problems are analyzed in the field of constitutional economics. The application of constitutional-economics arguments to language policy is developed in WICKSTRÖM, 2020a and WICKSTRÖM, 2024a, and form the methodological basis of the present essay in which we develop a measurable concept of recognition of linguistic minorities inherent in any language-policy measure.

3 THE MODEL

An indicator of justice resulting from language policies should, in the spirit of liberal approaches to justice, build on individuals and individual behavior, not on collective entities. The indicator should respond positively to an increase in the number of individuals with rights, and it should be a tool for consistently comparing differently sized jurisdictions.[4] However, justice cannot be seen independently of costs; giving additional rights comes at the cost of reducing other activities. Equal treatment would mean that every individual should have the same possibilities to use his or her preferred language in all social situations. This, however, is hardly feasible in modern societies and would lead to excessive direct and indirect costs.

3.1 THE FORMAL ANALYTIC BENCHMARK

Our analytic benchmark is that all individuals in society should enjoy the same rights with respect to their preferred language and any denial of a certain right for a certain linguistic minority has to be motivated. An acceptable motivation for removing a right is that the resulting decrease in costs is sufficiently high compared to the intrinsic value of the right. That is, the members of

[4] We do not discuss the issue of determining the borders between jurisdictions optimally in a given country. The manipulation of borders in order to suppress or promote a minority – gerrymandering – is, of course, also a matter of linguistic justice. See WICKSTRÖM, 2020b and the example from Slovakia in Section 5.2.

the minority suffer a loss due to the denial of the right that is seen to be so small that the gains of society due to the reduction in costs compensates for it. The bigger the reduction in costs compared to the intrinsic value of the lost right, the more acceptable it is as a justification for removing the right. The size of the trade-off between cost reduction and loss in value of a canceled right we use to define a concept of recognition of (or solidarity with) minorities characterizing the society. We operationalize this with the help of the tools of constitutional economics and relate it to individual behavior in the face of uncertainty.

3.2 QUALITATIVE ASPECTS

If the value of the benefits of a measure exceeds the costs, in a first-best world, it would in principle be possible to organize the fiscal system in such a way that everyone would approve of the measure.[5] In this case, the denial of a measure, not giving a certain right to the members of a minority that those of the majority are enjoying, could be seen as *pure discrimination* – the members of the minority would in principle be prepared to cover the costs of the measure and still be made better off, and the members of the majority would be unaffected. A society that refuses such a measure shows no solidarity at all with the minority. However, the fiscal system is not perfectly flexible, and, due to its structural rigidity, any measure will involve losers and winners, which brings distributional arguments into the analysis. In other cases, costs exceed the value of benefits; that is, if the members of the minority were paying what they are prepared to pay, there would still be a need for the members of the majority to contribute to the costs. A certain amount of solidarity of the majority with the minority is necessary, in order to finance the measure even in the case of transfer payments.

In other words, there are two aspects we have to face in the analysis: first, transfer payments are not feasible and, second, costs might exceed the value of benefits.[6] Those two aspects make the analysis interesting. The non-feasibility of transfer payments is taken care of and "neutralized" by the tools of contract theory (or constitutional economics). The problem of costs exceeding benefits and the resulting contradiction between efficiency and justice then becomes the focus of this paper. A situation with equality of costs and aggregated benefits then determines an "upper limit" of the interesting range of the analysis which can be restricted to the case of costs exceeding aggregate benefits.

One can also define a "lower limit" of the trade-off for providing minority rights as a situation when each beneficiary agrees that the *per capita* costs of the policy (equally distributed over all individuals in the jurisdiction) exceed individual benefits of each beneficiary. Of course, for all members of the majority this is true for any costly provision, since (considering direct effects) they are not benefiting from the right, only paying for it.[7] For the members of the minority, the attributed value of the policy to the average individual has to be compared to the *per capita* tax rate.

[5] Economists then talk of *equivalence* – the beneficiaries of a measure are willing to pay the costs of implementing the measure. The idea was originally developed by WICKSELL, 1896.

[6] In the case of transfer payments being feasible, the economist talks about a "first-best" analysis, and if transfers are not fully possible, the problem is a "second-best" one.

[7] They could benefit indirectly if they have preferences for a just society or a taste for diversity as such. We ignore this possibility.

3.3 THE CONSTITUTIONAL-ECONOMICS ARGUMENT

Instead of asking if certain planning measures are just, we consider the non-implemented measures (that is how far away from the equal-rights benchmark the society finds itself) and ask how low the level of recognition in the society has to be, in order not to implement these measures. Using the idea of choosing the structures of society from an "original position" behind a "veil of ignorance", the degree of recognition is related to the concept of risk (or inequality) aversion in the modeling. Different societies are then ranked according to their degrees of recognition (or "justice"). Using a consistent methodology based on welfare economics accounting for differences in population size, in numeric size of linguistic minorities, in costs and in benefits of planning measures, implies that concepts derived from the model, such as an indicator of recognition, are also consistent with respect to these variables.

3.4 NOTATION

Let the total population in a society consist of P individuals; n_i persons belong to a minority i and, correspondingly, N_i make up the population not belonging to minority i, i.e. $P = N_i + n_i$. A homogeneous majority does not necessarily exist. The minorities are each homogeneous, and for each minority the majority is the rest of the population in the jurisdiction. The situation can, for instance, be that of the European Union with no unique dominant language, or that of Switzerland or Spain with one dominant language, but, as a complement to each minority, a linguistically heterogeneous "majority", or that of Wales with only one homogeneous majority. The benefits accrue to the minority group under consideration and the costs are divided equally by everyone in the country. That is, the minority under consideration has benefits and costs and all other individuals have costs. Removing a language rights from minority i causes a saving in costs equal to $c(n_i)$ and decreases the tax rate of everyone by $t_i = c(n_i)/P$. Each individual in the minority i evaluates this denied right related to their respective language; b_i is defined as the average implicit value of the right under consideration.[8]

3.5 THE CONCEPT OF SOCIAL CONTRACT AND DENIAL OF LANGUAGE RIGHTS

Many approaches to justice in constitutional economics build on ideas of a social contract.[9] In short, in an "original position" individuals regard the world not knowing which position they will occupy in it and then choose the rules of society and distributions of resources they prefer. RAWLS, 1971 visualizes this imaginary process as choosing behind a "veil of ignorance".

The basic idea, however, goes back at least to the Greek philosophers (PLATO, 1980 /1888 [ca. – 395]), and can be found in the work by, among others, HOBBES, 1651, ROUSSEAU, 1762, and KANT, 1797. In modern times, the concept has especially come to be associated

[8] There is both a practical and emotional side to the benefits; take street signs, for instance. It is important to know where you are, but the recognition of your culture and identity might be more important. For practical orientation, the language might not matter, but would give the speakers of the chosen language a socially more prominent position and a higher intrinsic value of the policy measure, for example in the case of *Aleksanterinkatu* and *Alexandersgatan*; this, however, might not be the case for רחוב המלך דוד and شارع الملك داود with their different orthographies. The equal treatment of all individuals, however, requires a benchmark with street signs in all languages spoken.

[9] The discussion in this section of choosing just rights closely follows WICKSTRÖM, 2020a and WICKSTRÖM, 2024a.

with RAWLS, 1971, but is very much present in the foundations of constitutional economics, for instance, in BUCHANAN & TULLOCK, 1962 and BUCHANAN, 1987.

The idea can be formalized as a choice between lotteries. The lottery interpretation fits very well with the axiomatic approach developed by VICKREY, 1945 and HARSANYI, 1955. It is shown that if individual behavior is described with the help of a concave utility function of the type used to analyze individual behavior under uncertainty, see VON NEUMANN & MORGENSTERN, 1944, then, under some general axioms, the social-welfare function introduced by BERGSON, 1938 and SAMUELSON, 1947, has to be a weighted sum of individual utility functions. If the weights are set equal to $1/P$ and the individual utility functions are identical for all individuals, the social-welfare function will evaluate the value of the (implicit) income distribution as if it were a lottery and each (implicit) income in the distribution a possible win with probability $1/P$. The implicit income is here the sum of all monetary and non-monetary incomes. Each lottery is, hence, a distribution of resources in society and all individuals are treated equally. That is, the probability to end up in any position in society is *a priori* the same.

One type of society might be one where a linguistic minority has no rights and the taxes are low, since one does not have to pay for providing minority rights; another type of society is one where the minority has extensive rights and the taxes are correspondingly high. Interpreting the choice of society as a choice of "lottery of life",[10] in the first one, an individual will with probability $n/P = \alpha$ end up in the minority and have no rights but a relatively high explicit income and with probability $N/P = 1-\alpha$ become a member of the majority with rights and the same explicit income; that is, in both cases the explicit income will be the same, but in implicit income – including the value of the rights – the majority will be better off. In the second lottery, the individual with probability one receives rights and a lower explicit income.[11] The question is which lottery an individual in the original position would prefer. This depends on his/her risk attitude, on the value attributed to language rights (b), and on the costs of introducing those rights ($c(n)$).

In expected-utility analysis of situations involving risk, risk aversion is directly related to the concavity of the utility function used to evaluate the situations. In the social-contract approach to the analysis of distributional issues, this risk aversion is associated with inequality aversion, and in our analysis this inequality aversion is connected to recognition for minority rights. The derivation of an indicator of recognition is made in three steps:

1. in a constructive analysis, we relate the reduction in language rights for a given linguistic minority in a society to a measure of concavity of an associated utility function;

2. we find a von Neuman-Morgenstern utility function characterized by this measure of concavity;

3. we apply this utility function to the general problem of finding the degree of concavity (level of recognition) necessary for denying certain language rights for any minority in any given society.

[10] Compare: "... [Y]ou might have been a Chinaman, or a Hottentot, ... But you are not, you are an Englishman, and have subsequently drawn the *greatest* prize in the lottery of life." Cecil John Rhodes to Lord Gray 1896, Quoted in MICHELL, 1910, page 178, emphasis in the original.

[11] The lottery is as a matter of fact degenerated into a situation of full certainty.

3.5.1 Associating rights denial with a measure of concavity of some utility function behind the "veil of ignorance"

Table 3.1 illustrates the situation with a minority of size n, indicated by foot script n; a majority of size N with foot script N. For simplicity, we have dropped the i specifying the minority considered. In society/lottery zero, the benchmark S^0, everyone has the same rights and the same explicit general income net of language rights for the minority, e^g. In addition, there is an implicit income due to the language right, b, less the equally divided costs of implementing the right, $c(n)/P$.[12] The sum of the implicit and explicit incomes is denoted by e^0. In society/lottery one, S^1, the minority is without the right, and the individuals have implicit incomes e_n^1 and e_N^1, respectively. A typical member of the minority will have only the general income e^g. A majority member has the same net income, but enjoys language rights in his/her language with an implicit value b. The general income in the absence of rights, e^g, is the same for everyone. The third line gives the average income in each society and the difference in average income in the two societies.[13]

TABLE 3.1 Choice between societies behind a veil of ignorance.

	Probability	S^0	S^1	$S^0 - S^1$
Minority	$\frac{n}{P} = \alpha$	$e^0 = e^g + b - \frac{c}{P}$	$e_n^1 = e^g$	$\Delta e_n = b - \frac{c}{P}$
Majority	$\frac{N}{P} = 1 - \alpha$	$e^0 = e^g + b - \frac{c}{P}$	$e_N^1 = e^g + b$	$\Delta e_N = -\frac{c}{P} < 0$
Expected total income		$\bar{e}^0 = e^g + b - \frac{c}{P}$	$\bar{e}^1 = e^g + b\frac{N}{P}$	$\Delta\bar{e} = b\frac{n}{P} - \frac{c}{P}$

Two obvious conditions can be characterized at once. Since Δe_N is negative, S^1 is the best society for the individuals belonging to the majority. If also Δe_n is negative, S^1 will be the best society for individuals in the minority as well.That is, S^1 is the society chosen behind the veil of ignorance[14] if:

$$P \leq \frac{c(n)}{b} \tag{3.1}$$

The society chosen behind the veil is our definition of a just society. If $P \leq c(n)/b$, providing no rights for the minority then characterizes a just society, no matter what risk preferences the individuals posses behind the veil of ignorance.

Given that the individuals behind the veil of ignorance are risk averse, they value S^0 because of its lack of uncertainty. Possible preferences for S^1 can be explained if the expected income in S^1 is sufficiently higher than in S^0. This implies that for an average implicit income in S^0 that is higher than or equal to that in S^1, society S^0 must be the just society independently of

[12] It is assumed that rights for the minority language carries no (positive or negative) explicit or implicit value for members of the majority.

[13] In the lottery interpretation, "average" of course becomes "expected".

[14] This is in accordance with Rawls' difference principle. Inequalities are acceptable if they improve the situation of the lowest ranked individual.

the risk preferences behind the veil of ignorance, since it is both less uncertain (in fact perfectly certain) and has a higher (or equal) expected income. Hence, S^0 is just for:[15]

$$n \geq \frac{c(n)}{b} \tag{3.2}$$

The interesting case, with which we are left, is then:

$$P > \frac{c(n)}{b} > n \tag{3.3}$$

Here, we have to weigh the efficiency (the size of the "cake"), of society S^1, against the equity of society S^0. A general method of doing this is to appeal to expected-utility analysis.[16] We define a strictly concave utility function, u, of implicit income e. The concavity of this function defines the degree of trade-off between efficiency and equity. The more concave the utility function, the higher weight is given to equity in this trade-off. That is, what the individual behind the veil of ignorance chooses depends on his or her risk attitude. If he/she is risk neutral, only the expected implicit income matters and S^1 will be chosen; if he/she is extremely risk averse, only the implicit income of the worst case will matter, and S^0 will be chosen as the just society.[17] This attitude towards risk then determines the degree of costly redistribution in favor of the minority and is identified with the degree of recognition for giving rights to the minority.

Behind the veil of ignorance, an individual will be indifferent between societies S^0 and S^1 if, and only if, the expected value of utility, EU^0 and EU^1 of the corresponding implicit incomes will be equal. Denoting utility as a function u of implicit income, we find:

$$EU^0 = u(e^0) = EU^1 = \alpha u(e_n^1) + (1-\alpha)u(e_N^1) \tag{3.4}$$

or

$$\alpha\left[u(e^0) - u(e_n^1)\right] = (1-\alpha)\left[u(e_N^1) - u(e^0)\right] \tag{3.5}$$

We note that:

$$\begin{aligned} e^0 - e_n^1 &= b - \frac{c(n)}{P} > 0 \\ e_N^1 - e^0 &= \frac{c(n)}{P} > 0 \end{aligned} \tag{3.6}$$

Letting β^n be the average slope of u on the interval $\left[e_n^1, e^0\right]$:

$$\beta^n := \frac{u(e^0) - u(e_n^1)}{e^0 - e_n^1} \tag{3.7}$$

and β^N on the interval $\left[e^0, e_N^1\right]$:

$$\beta^N := \frac{u(e_N^1) - u(e^0)}{e_N^1 - e^0} \tag{3.8}$$

[15] This corresponds to efficiency, since $nb \geq c(n)$.

[16] The original axiomatic characterization of the expected-utility hypothesis can be found in VON NEUMANN & MORGENSTERN, 1944.

[17] The latter corresponds to Rawls' maximin principle.

as well as substituting the value of α into 3.5, we can rewrite 3.5 as:

$$\frac{n}{P}\beta^n\left[b-\frac{c(n)}{P}\right]=\frac{N}{P}\beta^N\frac{c(n)}{P} \tag{3.9}$$

or:

$$\frac{n}{c(n)}\frac{Pb-c(n)}{N}=\frac{\beta^N}{\beta^n}=:\beta \tag{3.10}$$

Writing the cost-benefit ratio of the policy as ρ:

$$\rho(n,b):=\frac{c(n)}{nb} \tag{3.11}$$

expression 3.10 becomes:

$$\beta=\frac{1}{\rho(n,b)}\frac{P-n\rho(n,b)}{P-n}\quad\frac{P}{n}>\rho(n,b)>1 \tag{3.12}$$

Expression 3.12 relates a policy measure costing $c(n)$ and bringing an average benefit b to the members of a minority of size n in a total population of size P to a level of recognition that we define as $1-\beta$ and which is required for the measure to be approved of and implemented in the given society.

3.5.2 A well-defined class of utility functions with β as a measure of concavity

We need to show that there exists a concave utility function parametrized by β and that β can be used as an indicator of concavity, which in the language of risk behavior is interpreted as a measure of risk aversion:

LEMMA 3.1 The utility function:

$$u(y)=\frac{y-e_n^1}{y-e_n^1-\beta(y-e_n^1-\zeta)} \tag{3.13}$$

of income y, parametrized by β, ζ, and e_n^1 has the properties:

1. $u(y)$ is a von Neumann-Morgenstern utility function[18] for any income y on the interval $y\in[e_n^1,\infty)$
2. For all values of y,

$$\frac{u(e_n^1+\zeta)-u(y)}{e_n^1+\zeta-y}\frac{y-e_n^1}{u(y)-u(e_n^1)}=\beta \tag{3.14}$$

3. As the concavity of u decreases towards linearity, β increases on the interval $(0,1]$, and for linearity $\beta=1$

[18] I.e. it can be used to analyze behavior under uncertainty and satisfies the expected-utility hypothesis. In other words, it is concave increasing in income y.

PROOF Trivial ■

Note that the utility function is parametrized by ζ. As a matter of fact, utility is equal to zero for $y = e_n^1$ and equal to one for $y = e_n^1 + \zeta$. i.e., ζ simply scales the values of the utility function. The parameter ζ can be chosen freely. If it is set equal to b, the utility takes on values between zero and one for the range of possible implicit incomes in our construction. In this case, expression 3.12 obtains. For a different society with a different $b = \eta\zeta$, where η is some positive parameter, the expression is slightly more complicated:[19]

3.5.3 The relationship between the concavity measure β and the denial of minority rights

We fix a benchmark value of b equal to b_0 and set $\zeta = b_0$. Letting $b = \eta b_0$ implies $\rho(n, b) = \rho(n, b_0)/\eta$. The parameter η lets us compare the indicator between societies with different values of the utility of a given policy measure.[20] It can take any positive value. Now, we can formulate:

LEMMA 3.2 For any value of $b = \eta b_0$, equation 3.12 takes the form:

$$\beta = \frac{P - n\rho(n,b)}{\frac{P}{\eta}(\rho(n,b) + \eta - 1) - n\rho(n,b)} \quad 1 \le \rho(n,b) \le \frac{P}{n} \tag{3.15}$$

A proof is given in Appendix A.

We are now ready to define the general indicator of recognition $\mathfrak{R}$ as $1 - \beta$ if the minority is deprived of its right:

$$\begin{aligned} \mathfrak{R} &= 0 && \rho(n,b) \le 1 \\ \mathfrak{R} &= \frac{\rho(n,b) - 1}{\rho(n,b) - 1 - \eta\left(\frac{n}{P}\rho(n,b) - 1\right)} && 1 \le \rho(n,b) \le \frac{P}{n} \\ \mathfrak{R} &= 1 && \rho(n,b) \ge \frac{P}{n} \end{aligned} \tag{3.16}$$

It is readily seen that at the breakpoints the indicator is continuous. The breakpoints also determine the relevant range of η: if $\eta = \frac{n}{P}\rho(n, b_0)$, $\mathfrak{R} = 1$, and if $\eta = \rho(n, b_0)$, $\mathfrak{R} = 0$. Further, letting $\eta = 1$, gives us the simple formula:

$$\mathfrak{R} = \frac{\rho(n,b) - 1}{\rho(n,b)\left(1 - \frac{n}{P}\right)} \quad 1 \le \rho(n,b) \le \frac{P}{n} \tag{3.17}$$

If the minority is granted rights, the value of the indicator is $\mathfrak{R} = 1$, of course.

[19] Any utility function parametrized by any value of ζ would serve our purpose of constructing an indicator. The indicator resulting from any ζ, being an ordinal measure, would just be an order-preserving transformation of the indicator resulting from a different ζ. The crucial point is that the same utility function be used, i.e. the same ζ for all situations analyzed. Only then the results are comparable between different jurisdictions and different policy measures.

[20] For instance, due to different *per capita* incomes.

3.6 THE COST STRUCTURE IN SOME DETAIL

Putting some restrictions on the cost function $c(n)$ lets us simplify the analysis.

ASSUMPTION 3.1 The cost function is a concave non-decreasing function of the size of the minority, $c'(n) \geq 0, c''(n) \leq 0$.

ASSUMPTION 3.2 For a sufficiently large size of the minority, n^*, it is efficient to introduce minority rights. That is, the solution $n = n^*$ of equation $bn = c(n)$ exists; that is $c'(n) < b + \varepsilon$ for sufficiently large values of n and a positive constant ε.

The assumptions say that the costs of implementing minority rights are given by a concave non-decreasing cost function, $c(n)$ the rate of increase of which is less than b for sufficiently large values of n.[21] The elasticity of the cost function on the interval $[n^1, n^2]$ is defined as:

$$\sigma(n^1, n^2) := \frac{c(n^1) - c(n^2)}{c(n^2)} \frac{n^2}{n^1 - n^2} \tag{3.18}$$

If σ is zero on the relevant interval, the costs are constant for this range of values of n and the language-related good provided is perfectly non-rival on the interval. If the costs are proportional to the size of the minority, σ is one, and the good provided is a perfectly rival good.[22] If the good provided is street signs in the minority language, σ is zero, since the costs are independent of the number of beneficiaries; if it is the right to contact and receive answers from the authorities in the minority language, σ is close to one, since the costs increase almost linearly with the number of inquiries which in turn is almost proportional to the number of beneficiaries. If the cost function displays fixed costs and proportional variable costs,[23] then $\sigma(n^1, n^2)$ is a constant for different values of n^1 and increasing in n^2, ranging from zero in the case of no variable costs to one in the case of no fixed costs.

Under Assumption 3.2 we can rewrite $n\rho(n, b)$ as:

$$n\rho(n, b) = \frac{n}{\eta}\rho(n, b_0) = \frac{c(n)}{b} = n^* \frac{c(n)}{c(n^*)} =: n^0(n, n^*) \tag{3.19}$$

Using 3.18, we find:

$$n^0(n, n^*) = n\sigma(n, n^*) + n^* [1 - \sigma(n, n^\bullet)] \tag{3.20}$$

We note that $n = n^0(n, n^*) \Leftrightarrow n = n^*$. The relationship between n^0, n, and n^* describes the cost structure of the planning measure.

Substituting n^0 into 3.16, we find:

$$\mathfrak{R} = \frac{n^0(n, n^*) - n}{n^0(n, n^*) - n - \eta\left(\frac{n}{P} n^0(n, n^*) - n\right)} \quad n \leq n^0(n, n^*) \leq P \tag{3.21}$$

[21] The cost function will in general be different for different jurisdictions. It could, for instance, depend on the geographical size of the jurisdiction. See WICKSTRÖM, 2024b and WICKSTRÖM, 2025.

[22] See WICKSTRÖM, TEMPLIN, & GAZZOLA, 2018 for a discussion of the properties of language-related goods.

[23] This comes close to the situation in many countries, where official recognition implies street and other signs in the minority language and the right to communicate with the authorities in it. The signs represent fixed costs and the communication with the authorities approximately causes linear variable costs.

We see that if $n = n^0(n, n^*)(= n^*)$, then $\mathfrak{R} = 0$. Not implementing rights when it is efficient signifies that the level of recognition in society is zero. If $(n <)P = n^0(n, n^*)(< n^*)$, then $\mathfrak{R} = 1$. If denying rights to the minority is the preferred action for all individuals in society, one shows no lack of recognition doing so; the recognition indicator is one. If $n < n^0 < P$, then $0 < \mathfrak{R} < 1$. Not giving rights to the minority signifies a lack of recognition, but one that is quantified to be less than one, the level of recognition depending on the size of the minority and on the cost structure of implementing rights. Finally, if $\eta = 1$, expression 3.21 becomes very simple:

$$\mathfrak{R} = \frac{P}{n^0(n, n^*)} \frac{n^0(n, n^*) - n}{P - n} \quad n \le n^0(n, n^*) \le P \tag{3.22}$$

4 INDICATOR OF RECOGNITION WITH SEVERAL MINORITIES

For a minority language i spoken in a jurisdiction of size P, by a minority of size n_i, the average *per capita* value of giving official rights to the language is $b_i = \eta_i b_0$. We make the following definitions:

DEFINITION 4.1 **(Language-specific indicator of recognition)**

1. If a minority language i is recognized for language rights, the corresponding indicator of recognition for that measure is $\mathfrak{R}_i = 1$.

2. If a minority language i is not recognized for language rights, the corresponding indicator of recognition for that measure is:

$$\begin{aligned} \mathfrak{R}_\mathrm{i} &= 0 && (n_i^* \le) n_i^0(n_i, n_i^*) \le n_i \\ \mathfrak{R}_\mathrm{i} &= \frac{n_i^0(n_i, n_i^*) - n_i}{n_i^0(n_i, n_i^*) - n_i - \eta_i \left(\frac{n_i}{P} n_i^0(n_i, n_i^*) - n_i \right)} && n_i \le n_i^0(n_i, n_i^*) \le P \\ \mathfrak{R}_\mathrm{i} &= 1 && P \le n_i^0(n_i, n_i^*) \end{aligned} \tag{4.1}$$

Let $\gamma_i := \frac{n_i}{\sum_j n_j}$ be the weight given to each minority language considered. In other words, each individual speaking a minority language, receives the same weight. Then:

DEFINITION 4.2 **(Aggregate indicator of recognition)**

The indicator of recognition in a jurisdiction is defined as the weighted arithmetic average of the language-specific indicators of recognition for each minority i:

$$\mathfrak{R} = \sum_i \gamma_i \mathfrak{R}_i \tag{4.2}$$

where the sum is over all minority languages spoken in the jurisdiction.

The indicator $\mathfrak{R}_i$ in the case of an unrecognized minority is a function of the size of the population in the jurisdiction (P), the size of the unrecognized minority i (n_i), the average propensity to pay of the beneficiaries for the measure ($b_i = \eta_i b_0$), the size of the minority necessary for the policy measure to be efficient (n_i^*), as well as the elasticity of provision of the language related good(s) with respect to the number of beneficiaries (σ_i). If $P \leq \sigma_i n_i + (1 - \sigma_i) n_i^* = n_i^0$, the value of the indicator is one and if $n_i \geq n_i^*$ it is zero.

PROPOSITION 4.1 The indicator $\mathfrak{R}_i$ has the following properties:

1. The value of the indicator $\mathfrak{R}_i$ decreases (or stays equal to zero or one) as the value of P, σ_i, or η_i increases.
2. The value of the indicator $\mathfrak{R}_i$ decreases (or stays equal to zero or one) as the value of n_i increases if $P \geq n^*$.
3. The value of the indicator $\mathfrak{R}_i$ increases (or stays equal to zero or one) as the size of n_i^* increases.

For a proof, see appendix B.

PROPOSITION 4.2 The properties of the indicators for each single minority all carry over to the aggregate indicator.

PROOF The result is a direct consequence of the linearity of the aggregate indicator. ■

The first proposition simply states that if the size of the total population increases, the indicator of recognition decreases. The indicator is also increasing in n. That the indicator increases as n^* increases makes sense, since a given minority will fulfill the efficiency condition to a lesser degree. Since this value generally is politically determined, the policy maker can manipulate the index by choosing an unreasonably high value – or can be supportive of minorities by letting the value be small.[24] The same type of argument can be brought for η. An increase leads to a decrease in n_i^*, decreasing $\mathfrak{R}_i$. With a higher η the indicator will decrease; not introducing a right is a stronger infringement on the minority. In order to understand the reaction to changes in σ, we just have to note that the reference point of the costs is $c(n^*)$. When σ increases, costs for $n < n^*$ are lowered, and as a consequence it is "easier" to introduce rights. Not giving rights to a minority, in this case implies a higher degree of non-recognition.

5 EXAMPLES

In order to show the power of the indicator, we present a couple of stylized examples after a brief discussion of how to find the parameters in practice.

[24] See WICKSTRÖM, 2025, Section 4.

5.1 FINDING THE PARAMETERS

To calculate the index, we need to know the cost function for the policy measure considered, $c(n)$, and the propensities to pay of the members the minority. The other parameters, σ, n^0, n^*, and η can then be derived. In usage, however, it might be more convenient to start from values of σ and n^*. If we restrict the cost function to a two-parameter form, specifying fixed costs and constant variable (marginal) costs, $c(n) = \kappa + \lambda n$, there are very simple relations between the parameters. We find:[25]

$$\begin{aligned} \kappa &= n^* b\,(1-\sigma) \\ \lambda &= b\,\sigma \end{aligned} \tag{5.1}$$

and:

$$\begin{aligned} \sigma &= \frac{\lambda}{b} \\ n^* &= \frac{\kappa}{b-\lambda} \end{aligned} \tag{5.2}$$

With estimates of the fixed costs and the marginal costs of implementing a measure, the policy maker also has to estimate b. If the policy maker instead knows n^*, and σ, also an estimate of b is needed. However, if we are only interested in comparing different jurisdiction with respect to the same policy measure, we don't need the value for b, determining n^* and σ is enough. Comparing different measures, we also need to know the relationship between the b's of the different measures.

In this example, we have chosen $b = b_0$, the value of η is set equal to one, and consider two different magnitudes of the costs implying two different values for n^*. The magnitude is realistic in regard to the rules in countries like Slovakia (less than the size of the minority in the two *kraje/kerület* where Hungarian would be official) or Romania (comparable to the size of the minority in a typical *județ/megy* where the minority language is official).[26] The value of σ has been set to 0.5, since official here means that the language is used on official signs (a non-rival good) and that one has the right to communicate with the government in the language (a rival good).

[25] We know *per definitionem* that $bn^* = c(n^*)$ and that:

$$\sigma(n, n^*) = \frac{n^*}{n-n^*}\frac{c(n)-c(n^*)}{c(n^*)}$$

That is:

$$b\sigma(n, n^*) = \frac{c(n)-c(n^*)}{n-n^*}$$

Substituting the affine form for the cost function into the right-side expression, directly gives us: $\lambda = b\sigma$. The rest then follows trivially.

[26] Slovakia uses a 15% rule applied to municipalities (obcí/községek), see SLOVENSKÁ REPUBLIKA/SZLOVÁK KÖZTÁRSASÁG, 2022, §1(1). For the sake of illustration, we have extended the rule to apply to regions (*kraje/kerület*) and for a typical jurisdiction size of 600 000 people this leads to a critical value for recognition of 90 000. In Romania, the 20% rule applies to "administrative-territorial units" and, in one case of the corresponding law, regions (*județe/megyék*), see ROMÂNIA, 2001, Art. 17 and Art. 106(8), and a typical jurisdiction size of 400 000 implies a critical value of 80 000.

TABLE 5.1 Recognition indicators and recognition (marked *) of Hungarian in jurisdictions in southern Slovakia.
Source: Own calculations based on the 2011 census, ŠTATISTICKÝ ÚRAD SLOVENSKEJ REPUBLIKY, 2011.

kraj/kerület	P	n	$n^* = 30000$		$n^* = 90000$	
			n^0	$\mathfrak{R}$	n^0	$\mathfrak{R}$
Bratislavský/Pozsonyi	602 436	25 520	27 760	0.08	57 760	0.58
Trnavský/Nagyszombati*	554 741	125 972	77 986	1.00	107 986	1.00
Nitriansky/Nyitrai*	689 867	183 535	106 768	1.00	136 768	1.00
Banskobystrický/ Besztercebányai	660 563	79 830	54 915	0.00	84 915	0.07
Košický/Kassai	791 723	91 002	60 591	0.00	90 501	0.00

5.2 SOUTHERN SLOVAKIA AND THE CHOICE OF JURISDICTIONAL BORDERS

In table 5.1, we have calculated the indicator for Hungarian in the regions of Slovakia bordering on the Danube. In two *kraje/kerület*, Hungarian would have official status if the 15% rule were applied to regions, and the value of the indicator is one. In the other three, Hungarian would have no official status and the indicator ranges between zero and one in dependence of the value of n^*. The jurisdictions with the largest number of Hungarian speakers are the ones where it is given official status. In the others the indicator decreases with the size of the minority, as expected.

TABLE 5.2 Recognition indicators and recognition (marked *) of Hungarian in southern Slovakia in two actual jurisdictions and after a possible reorganization.
Source: Own calculations based on 2011 census, ŠTATISTICKÝ ÚRAD SLOVENSKEJ REPUBLIKY, 2011.

kraj/kerület	P	n	$n^* = 30000$		$n^* = 90000$	
			n^0	$\mathfrak{R}$	n^0	$\mathfrak{R}$
Nitriansky/Nyitrai*	689 867	183 535	106 768	1.00	136 768	1.00
Banskobystrický/ Besztercebányai	660 563	79 830	54 915	0.00	84 915	0.07
New south*	662 777	250 559	140 280	1	170 280	1.00
New north	687 653	12 806	21 403	0.41	51 403	0.77

The jurisdictions in southern Slovakia cover areas starting at the Danube and reaching far into the center of the country. The Hungarian speakers, however, are concentrated on the north shore of the Danube, and a reorganization of the jurisdictions can change the demographic structure of single jurisdictions considerably. WICKSTRÖM, 2020b, in a small *Gedankenexperiment*, suggests to reorganize the two jurisdictions Nitriansky kraj / Nyitrai kerület and Banskobystrický kraj / Besztercebányai kerület in a new southern and a new northern jurisdiction and claims that this would increase linguistic justice. The indicator of recognition can now be employed to objectively evaluate this suggestion. The result is displayed in table 5.2. We can with the help of

TABLE 5.3 Recognition indicators in *județ/megy* Cluj-Napoca/Kolozsvár, $P = 691\,106$. *Source*: Own calculations based on 2011 census, INSTITUTUL NATIONAL DE STATISTICĂ, 2011.

i	n_i	γ_i	$n^* = 30000$		$n^* = 90000$	
			n^0	$\Re_i$	n^0	$\Re_i$
Hungarian	102 966	0.9196	66 483	0.0000	96 483	0,0000
Romani	7 742	0.0691	18 871	0.5964	48 871	0.8511
German	569	0.0051	15 285	0.9636	45 285	0.9882
Italian	153	0.0014	15 077	0.9901	45 077	0.9968
Ukrainian	151	0.0013	15 076	0.9902	45 076	0.9969
Turkish	78	0.0007	15 039	0.9949	45 039	0.9984
Russian	77	0.0007	15 039	0.9950	45 039	0.9984
Greek	58	0.0005	15 029	0.9962	45 029	0.9988
Yiddish	46	0.0004	15 023	0.9970	45 023	0.9990
Slovak	38	0.0003	15 019	0.9975	45 019	0.9992
Polish	22	0.0002	15 011	0.9986	45 011	0.9995
Bulgarian	22	0.0002	15 011	0.9986	45 011	0.9995
Serbian	18	0.0002	15 009	0.9988	45 009	0.9996
Chinese	12	0.0001	15 006	0.9992	45 006	0.9998
Czech	7	0.0001	15 004	0.9995	45 004	0.9999
Tartar	6	0.0001	15 003	0.9996	45 003	0.9999
Armenian	4	0.0000	15 002	0.9997	45 002	0.9999
Macedonian	4	0.0000	15 002	0.9997	45 002	0.9999
Aggregate indicator of recognition				0.0523		0.0701

the indicator directly infer that such a reorganization considerably increases the level of linguistic justice without changing the rules used in Slovakia for providing official status. The indicator for the jurisdiction without rights increases from 0 to 0.41 or from 0.07 to 0.77, depending on the the value of n^* chosen by the policy maker.

5.3 TRANSYLVANIA AND INCONSISTENT RECOGNITION

In tables 5.3, 5.4, and 5.5 we have calculated the indicator for two multilingual Romanian regions (*județe/megyék*) without official minority languages and for one, where Hungarian has official recognition.

Cluj-Napoca/Kolozsvár is the region in Romania with the largest non-official Hungarian minority. Hungarian had official status until 2002. Sălaj/Szilágy is a region with a much smaller Hungarian minority, but with official recognition. In Sibiu/Nagyszeben/Hermannstadt, where the minorities are numerically weaker and the total size of the population is smaller, the indicator values are correspondingly higher.[27] If the official status of Hungarian had been kept in Cluj-Napoca/Kolozsvár, the indicator would be 0.9719 and 0.9908, respectively, in 2011 instead of 0.0523 and 0.0712. Were Hungarian to lose its status in Sălaj/Szilágy, the indicator values would

[27] However, German (for historic reasons) has a certain status here. Some public signage and institutions (theater, schools, churches) use German. Were we to consider this, the indicator values would be even higher.

TABLE 5.4 Recognition indicators (recognition marked *) for *județ* Sălaj/Szilágy, $P = 224\,384$.
Source: Own calculations based on 2011 census, INSTITUTUL NATIONAL DE STATISTICĂ, 2011.

i	n_i	γ_i	$n^* = 30000$		$n^* = 90000$	
			n^0	$\Re_i$	n^0	$\Re_i$
Hungarian*	50 928	0.8566	40 464	1.0000	70 464	1.0000
Romani	7 343	0.1235	18 672	0.6273	48 672	0.8779
Slovak	1 083	0.0182	15 542	0.9348	45 542	0.9810
Italian	36	0.0006	15 018	0.9978	45 018	0.9994
German	35	0.0006	15 018	0.9978	45 018	0.9994
Ukrainian	20	0.0003	15 010	0.9988	45 010	0.9996
Russian	9	0,0002	15 005	0.9994	45 005	0.9998
Polish	3	0.0001	15 002	0.9998	45 002	0.9999
Aggregate indicator of recognition				0.9528		0.9846

fall from 0.9528 and 0.9846 to 0.0962 and 0.1280, respectively. This would still be a higher level of justice than in Cluj-Napoca/Kolozsvár. In other words, in the interest of linguistic justice, it is more important to give official recognition to Hungarian in Cluj-Napoca/Kolozsvár than in Sălaj/ Szilágy.[28] The language policy is inconsistent, and the indicator of recognition is a suitable instrument to demonstrate this.

TABLE 5.5 Recognition indicators for *județ* Sibiu/Nagyszeben/Hermannstadt, $P = 397\,322$.
Source: Own calculations based on 2011 census, INSTITUTUL NATIONAL DE STATISTICĂ (2011).

i	n_i	γ_i	$n^* = 30000$		$n^* = 90000$	
			n^0	$\Re_i$	n^0	$\Re_i$
Hungarian	9 979	0.5712	19 990	0.5137	49 990	0.8210
German	3 825	0.2189	16 913	0.7814	46 913	0.9274
Romani	3 442	0.1970	16 721	0.8011	46 721	0.9344
Italian	67	0.0038	15 034	0.9957	45 034	0.9987
Russian	60	0.0034	15 030	0.9962	45 030	0.9988
Turkish	26	0.0015	15 013	0.9983	45 013	0.9995
Ukrainian	23	0.0013	15 012	0.9985	45 012	0.9995
Greek	16	0.0009	15 008	0.9990	45 008	0.9997
Polish	15	0.0009	15 008	0.9990	45 008	0.9997
Serbian	13	0.0007	15 007	0,9992	45 007	0.9997
Chinese	4	0.0002	15 002	0,9997	45 002	0.9999
Aggregate indicator of recognition				0.6351		0.8689

[28] This is a direct consequence of the percentage rule, which is totally inadequate for regulating language rights, see WICKSTRÖM, 2019.

TABLE 5.6 Recognition indicators for *județ* Sibiu/Nagyszeben/Hermannstadt, $P = 397\,322$. *Source*: Own calculations based on 2011 census, INSTITUTUL NATIONAL DE STATISTICĂ (2011).

i	n_i	γ_i	$n^* = 30000$		$n^* = 90000$	
			n^0	$\Re_i$	n^0	$\Re_i$
Hungarian	9 979	0.5786	19 990	0.5137	49 990	0.8210
German	3 825	0.2218	16 913	0.7814	46 913	0.9274
Romani	3 442	0.1996	16 721	0.8011	46 721	0.9344
Aggregate indicator of recognition				0.6304		0.8672

We also note, that although the smaller languages have fairly high indicator values, these make a relative low contribution to the aggregate indicator due to their low number of speakers. For practical purposes, we could concentrate on the three/four bigger minority languages (Hungarian, Romani, German, and Slovak), and nothing of interest would be lost. In table 5.6, we recalculated the indicator with only the big minority languages. The indicator value decreases from 0.6351 to 0.6304 and from 0.8689 to 0.8672, respectively.

6 DISCUSSION AND CONCLUSIONS

This article develops an analytic cardinal indicator to compare the level of linguistic justice in different situations. It is original because it is not a descriptive indicator that merely records the presence or absence of a specific language policy measure or the implementation of a specific linguistic right. Instead, it is a general indicator that does not depend on the specific characteristics of a country's legal or institutional settings. In terms of analytic rigor, the indicator is based on methods of constitutional economics, and the recognition indicator results from a formal model explicitly considering the trade-off between efficiency and equity in language policy.

This represents a significant advancement compared to indicators that only reward equity and inclusion in language policies without considering the associated costs. In terms of significance, precisely because of its general nature, the indicator can be adapted to various contexts and, therefore, can be widely used empirically by researchers and public decision-makers. It thus enables a better understanding of the degree of linguistic justice in a country and makes it possible to monitor changes over time in the equity of language policies. In this sense, it can be seen as a tool measuring the effectiveness of language policies aimed at improving the treatment of minorities and, more generally, the relations between minorities and the majority.

In other words, the indicator functions as a "thermometer" to gauge whether linguistic equality is declining, potentially leading to greater risks of conflict related to languages. The indicator is designed to study the position of traditional territorial linguistic minorities, but it can also be applied to groups of allophones resulting from recent immigration. The purpose is to enable a consistent comparative analysis. The comparison can be made over time, between different minorities within the same country, and/or between minorities in different countries.

The recognition indicator thus responds to the needs of the research community and public decision-makers interested in operational empirical tools to study and guide language policy choices. It should also be of interest to the scientific community concerned with the relationship

between languages and conflict in general, providing a useful analytic tool for monitoring variations in equity in a country's language policy and the implications of this for political tensions and conflicts between linguistically diverse groups.

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APPENDICES

A PROOF OF LEMMA 3.2

PROOF We have to solve 3.5 for β:

$$\alpha\left[u(e^0)-u(e_n^1)\right]=(1-\alpha)\left[u(e_N^1)-u(e^0)\right] \tag{A.1}$$

when the average propensity to pay $b=\eta\zeta=\eta b_0$, or $\zeta=b/\eta$. We have the values of e^0, e_n^1, and e_N^1:

$$e^0 = e^g + b - \frac{c}{P} \tag{A.2}$$

$$e_n^1 = e^g \tag{A.3}$$

$$e_N^1 = e^g + b \tag{A.4}$$

Substituting these values into the utility function 3.13:

$$u(y)=\frac{y-e_n^1}{y-e_n^1-\beta(y-e_n^1-\zeta)} \tag{A.5}$$

and the utility function into condition 3.5, we find:

$$\frac{e^0-e_n^1}{e^0-e_n^1-\beta(e^0-e_n^1-\zeta)}=(1-\alpha)\frac{e_N^1-e_n^1}{e_N^1-e_n^1-\beta(e_N^1-e_n^1-\zeta)} \tag{A.6}$$

or:

$$\frac{b-\frac{c(n)}{P}}{b-\frac{c(n)}{P}-\beta\left(b-\frac{c(n)}{P}-\zeta\right)}=(1-\alpha)\frac{b}{b-\beta(b-\zeta)} \tag{A.7}$$

Simplyfying:

$$\beta = \frac{P - n\rho(n,b)}{\frac{P}{\eta}(\rho(n,b) + \eta - 1) - n\rho(n,b)} \tag{A.8}$$

Outside of the range $1 \leq \rho(n,b) \leq P/n$ β takes the values one and zero, respectively. ■

B PROOF OF PROPOSITION 4.1

PROOF Most cases are straight forward. For simplicity, we drop the index i and take the derivatives of expression 4.1 with respect to the different variables. Of course, only the case when $n \leq n^0(n,n^*) \leq P$ is interesting. Denote the denominator by D, n/P by α, and n^*/P by γ:

The derivative with respect to P:

$$\frac{\partial \mathfrak{R}}{\partial P} = -\frac{n^0(n,n^*) - n}{D^2}\frac{\eta n n^0(n,n^*)}{P^2} \leq 0 \tag{B.1}$$

The derivative with respect to n^*:

$$\frac{\partial \mathfrak{R}}{\partial n^*} = \frac{(1-\sigma)\eta n(1-\alpha)}{D^2} \geq 0 \tag{B.2}$$

The derivative with respect to σ:

$$\frac{\partial \mathfrak{R}}{\partial \sigma} = \frac{(n-n^*)\eta n(1-\alpha)}{D^2} \leq 0 \tag{B.3}$$

The derivative with respect to n:

$$\frac{\partial \mathfrak{R}}{\partial n} = \eta(1-\sigma)P\frac{-\gamma(1-\gamma) - \sigma(\gamma-\alpha)^2}{D^2} \leq 0 \quad n^* \leq P^{29} \tag{B.4}$$

The derivative with respect to η:

$$\frac{\partial \mathfrak{R}}{\partial \eta} = (1-\sigma)\frac{\frac{\partial n^*}{\partial \eta}\eta n(1-\alpha) + (n^* - n)(\alpha n^0 - n)}{D^2} \leq 0 \tag{B.5}$$

The last result follows from the restriction $n \leq n^0(n,n^*) \leq P$ and from differentiating the definition of n^*: $c(n^*) \equiv b_0 \eta n^*$, using the concavity of the cost function. ■

[29] Note that $n^* \leq P \Rightarrow \gamma \leq 1$.