Official recognition of minority languages and linguistic justice: An indicator based on welfare economics

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Abstract

We construct an indicator measuring the degree of linguistic (in)justice inherent in the non-recognition of official status of minority languages in given jurisdictions. 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 value of the size of the minority for which costs and benefits of the language policy are equal, on the elasticity of 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 total size of the population in the jurisdiction. The indicator is illustrated with some examples from minority policy in Slovakia and Romania.

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

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1   INTRODUCTION

Language policy is a form of public policy aimed at addressing questions of a political, social, economic or organizational nature that have a linguistic dimension. Language policy cannot be entirely avoided because government must use at least one language in the public administration in general as well as in public services that form part of modern welfare states. But the choice of which languages to use in a certain territory is not a neutral act if the population on a territory speaks different languages (MAY, 2005). The government can decide to use exclusively the language of the majority or the language of a minority (e.g. in post-colonial contexts). The government can deny rights for minorities by imposing the majority language, but this can come at the price of resentment and disputes leading to conflict (LIU, BROWN, and DUNN, 2015). At the other extreme, it can grant very extensive rights to minorities who, however, may have little incentive or interest in learning and using the majority language. This in turn can lead to parallel societies within a country, thus undermining cohesion and stability (DEEN and ROMANS, 2018). Beyond traditional territorial minorities, there are also groups of speakers who are lawful resident in a country as a result of migration. These people are not necessarily proficient in the official language, and at least initially may find it difficult to make themselves understood, e.g. in hospitals or courts.

This article starts from the observation that different language-policy measures are different in nature and have different cost structures (GAZZOLA, TEMPLIN, and WICKSTRÖM, 2018) . Providing a website in two languages entail the same production costs irrespective of the number of visitors and the size of a territory, while the costs of providing bilingual road signs depend on the size of the relevant territory. The costs of providing bilingual schools depend both on the size of the territory and the size of the population.[1] The protection and promotion of minority languages include the concrete provision by the public sector of goods and services in the minority language in addition to the majority one. These goods and services entail costs that depend on the size of the minority and the nature of the good itself. For this reason, many countries have defined thresholds below which it is not viable or too expensive to provide goods and services in the minority languages. This threshold is always context-dependent, and it is defined either as an absolute number of speakers or in percentage terms. For example, the US federal equality legislation mandates that the threshold for the use of minority languages in federal services is 10 000 people; in Finland, a variety of public services is guaranteed in municipalities where at least 3 000 persons (or 8% of the population) are members of a minority (SUOMEN TASAVALTA/ REPUBLIKEN FINLAND, 2003); in Canada, the threshold for access to federal public services in both English and French in big cities is 5 000 individuals, while other public services are provided in additional languages where there are sufficient concentrations of indigenous people or immigrants (UNITED NATIONS SPECIAL RAPPORTEUR ON MINORITY ISSUES, 2017). In Austria, public authorities are obligated to use a minority language in their relations with minority speakers in a jurisdiction if the minority population is at least 10 percent of the total population (IRYNA ULASIUK and HADÎRCĂ, 2018), while this percentage is 20 in Romania (ROMÂNIA, 2001) and 15 in Slovakia (SLOVENSKÁ REPUBLIKA/SZLOVÁK KÖZTÁRSASÁG, 2012).

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[1] It is worth noting that the study of the cost structure of language-related publicly-provided goods is relevant in the study of the cost-effectiveness of language policy. On cost-effectiveness analysis of policies aimed at supporting minority languages, see GRIN and VAILLANCOURT (1999), and GRIN, MORING, GORTER, HÄGGMAN, Ó RIAGÁIN, and STRUBELL (2002).

Thresholds based on percentages can lead to contradictory results (WICKSTRÖM, 2020b) whereas thresholds based on the absolute numbers of speakers are a consistent instrument for planning language policy in support of minorities. The problem, of course, is determining the threshold. In this article, we define justice as a compromise between equity and efficiency and develop an indicator for linguistic justice that can be used for comparative analyses. Equity, in its extreme form, requires that all languages on a territory be treated equally no matter the costs; efficiency requires that bilingual services be provided only when the provision costs are at most equal to the benefits for the beneficiaries. In this view, a society that does not provide linguistic recognition to minorities when benefits exceed costs is unduly discriminating against minorities, while a society that provides recognition to a minority when the costs of the policy exceed the perceived benefits shows solidarity with the minority. The degree of solidarity can be ranked on an ordinal scale, defining thresholds that are lower the higher is the degree of solidarity in society.

This article contributes to language policy and planning, linguistic justice, and indicator design from a quantitative and empirical point of view. The moral and legal foundation of minority rights are the object of a substantial literature in political theory and philosophy[2] and in legal studies[3]. This falls outside the scope of this essay. In recent years, the term "linguistic justice" has gained currency referring to the study of the political, economic and social inequalities associated with linguistic diversity as well as to the study of the normative and legal principles justifying (or not) policy interventions to protect minority languages or to promote a common *lingua franca*, or a mix of the two. This debate is certainly rich and stimulating, but often it remains at an abstract and theoretical level. Research has not yet addressed the question of how to measure, compare, and evaluate linguistic justice in the promotion and protection of minority languages. This article aims at responding to this need by designing a quantitative indicator based on welfare economics to measure the level of practical recognition of minority languages in society. This indicator can be used to compare language policies in different countries, whereby showing which countries better engage in the protection and promotion of minority languages.

The article is organized as follows. In Section 2, we provide definitions and introduce some formal notation. Section 3, provides a short overview of contract theory based on the concept of social contract. In Section 3.1, the ideas of constitutional economics are applied to the possible introduction of language rights, and a specific formulation is discussed, relating the introduction of language rights for a minority of size n to the degree of risk aversion of the individuals behind a veil of ignorance. This is seen as inequality aversion in a welfare-function interpretation in Appendix B, and in Section 4 an indicator of justice is suggested directly related to this inequality aversion. This is developed into an indicator of official recognition in Section 5. Some properties and related indicators are discussed in Sections 5.1 and 5.2. In Section 6 we apply the indicator to some jurisdictions in Slovakia and Transylvania (Romania). Section 7 concludes the essay.

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[2] See KYMLICKA and PATTEN (2003), VAN PARIJS (2011), PATTEN (2014). Extensive interdisciplinary overviews of the literature are provided in ALCALDE (2018) and MORALES-GÁLVEZ and RIERA-GIL (2019).

[3] See VARENNES (2007), MOWBRAY (2012), and SKUTNABB-KANGAS and PHILLIPSON (2016).

2 MEASURING LINGUISTIC JUSTICE

An indicator of justice resulting from language policies should be consistent and comparable between differently sized jurisdiction with different numbers of minorities of different sizes. In the tradition of liberal theories of justice, it should build on individual behavior, not collective entities. The indicator should respond positively to an increase in the number of individuals with rights, and it should be a tool for comparing differently sized jurisdictions.[4] However, justice cannot be seen independently of costs; giving additional rights comes at the cost of reducing other activities. Giving the same rights to speakers of every single language in a jurisdiction would lead to equity (in some well-defined sense), but could make costs excessive. A lower limit for providing minority rights is when each beneficiary agrees that the *per capita* costs of the policy – if equally distributed over all individuals in the jurisdiction – exceed individual benefits; of course, for the members of the majority this is true for any costly provision, since (considering direct effects) they are not benefiting, only paying.[5]

Given the size of the benefiting minority and the total costs of a planning measure, the *per capita* costs of implementing the language rights are lower in a big jurisdiction than in a smaller one. The provision of rights to a minority of given size in a small jurisdiction hence signifies a higher degree of solidarity than in a bigger jurisdiction. Consequently, not providing rights to a minority in a small jurisdiction is less of an infringement than not providing rights to a minority of the same size in a larger one. An indicator of linguistic justice should decrease with the size of the total population by given minorities without rights. Furthermore, it should decrease with the size of right-less minorities for given costs and given size of the majority; with increasing implementation costs due to an increase in the benefiting minority, this effect should be reduced. Finally, the indicator value should increase if the costs of providing the minority rights are shifted upwards.

This basic model was developed in WICKSTRÖM (2020a) on the basis of constitutional economics. Here, it is applied to ranking policy measures according to their degree of justice. Instead of asking if certain planning measures is just, we ask, how societies with different language policies should be ranked. Due to its basis in logically and analytically consistent theory incorporating crucial variables (population size, numeric size of linguistic minorities, costs and benefits of planning measures), concepts derived from the model, such as an indicator of justice, are also consistent with respect to these variables. To analyze the issue in detail, the concept of risk aversion (which can also be interpreted as inequality aversion) is associated with justice.

2.1 NOTATION AND DEFINITIONS

Given a number of different linguistic minorities, denoted by numbers $i = 1, 2, ...$, of size n_i, the size of the population in the jurisdiction not belonging to minority i is N_i, and the total population in the jurisdiction is $P = n_i + N_i$. Minority i as proportion of the total population is $\alpha_i := n_i/P$. The costs of planning measure m providing some language-related good(s) for

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[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).

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

a minority, are represented by a concave non-decreasing cost function, $c_m(n_i)$.[6] The elasticity of the cost function on the interval $[n^1, n^2]$ is defined as:

$$\sigma_m(n^1, n^2) := \frac{c_m(n^1) - c_m(n^2)}{c_m(n^2)} \frac{n^2}{n^1 - n^2} \tag{2.1}$$

If σ_m 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_m is one, and the good provided is a perfectly rival good.[7] 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,[8] 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. The average imputed value (in monetary terms) of the provision of a language-related good m to a member of the benefiting minority is the same for all minorities in the jurisdiction and set equal to b_m.[9] The size of a minority for which the sum of the individual propensities to pay for the measure, nb_m, equals the costs of provision, $c_m(n)$ is written n_m^* and found as the solution to equation:

$$b_m = \frac{c_m(n_m^*)}{n_m^*} \tag{2.2}$$

This is the minimal size of the minority for the measure to be efficient. From now on we will only write the foot-scripts representing a specific minority (i) and planning measure (m) when necessary.

The language policy is financed over taxes. We define two polar tax schemes:

> **DEFINITION 2.1** (**Full solidarity**): The costs of the language-related goods profiting a minority are equally divided among all individuals: $t^s = \frac{c(n)}{P}$

and

> **DEFINITION 2.2** (**Full equivalence**):[10] The costs are directly attributed to the beneficiaries: $t_n^e = \frac{c(n)}{n}, t_N^e = 0$. (The foot script N refers to a typical individual not

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[6] The cost function will in general be different for different jurisdictions. It would, for instance, depend on the geographical size of the jurisdiction.

[7] See WICKSTRÖM, TEMPLIN, and GAZZOLA (2018) for a discussion of the properties of language-related goods.

[8] 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.

[9] The value of b_m, as a rule, depends on which policy measures are implemented, since many language-related goods are complements or substitutes. Since we are concentrating on one single measure in this essay, this complication can here be safely ignored.

[10] In taxation theory, the equivalence principle means that taxes/fees collected for a certain activity at least cover the costs of the activity. Equivalence then signifies that the costs of a policy measure are covered by the additional tax revenue raised due to the measure, and that the distribution of the taxes is such that no tax payer objects to the introduction of the measure; it is a Pareto improvement. Often, as in our case, the distributional aspect is just a *Gedankenexperiment*.

belonging to the minority under consideration and n to a typical member of this minority.[11])

Under the assumption that b correctly reflects the preferences of the members of the minority, in the first case, an average member of the minority will prefer the language-related good to a situation without it and lower taxes (or be indifferent) if and only if:

$$b \geq t^s = \frac{c(n)}{P} \Rightarrow P \geq \frac{c(n)}{b} = n^* \frac{c(n)}{c(n^*)} \tag{2.3}$$

In the second case, the average minority member will prefer language rights including the tax (or be indifferent) if and only if:

$$b \geq t_n^e = \frac{c(n)}{n} \Rightarrow n \geq \frac{c(n)}{b} \Rightarrow n \geq n^* \tag{2.4}$$

Using expression 2.1 we define:

$$n^0 := \frac{c(n)}{c(n^*)} n^* = \sigma(n, n^*)n + [1 - \sigma(n, n^*)] n^* \tag{2.5}$$

and rewrite equation 2.3 as:

$$P \geq n^0 = \sigma(n, n^*)n + [1 - \sigma(n, n^*)] n^* \tag{2.6}$$

The two polar cases are characterized by two simple expressions: full solidarity implies rights for the minority language if $P \geq n^0$ and full equivalence if $n^* \leq n(< P)$. We will, from now on, write $\sigma(n, n^*)$ simply as σ. We will take these extremes to define the range of an indicator of official status: if a language with more than n^* speakers in a jurisdiction does not have official recognition, efficiency is not respected and the value of the indicator of linguistic justice is zero. If the size of the total population P in the jurisdiction falls below n^0 (which is less than n^* since $n_i < P$), the value of the indicator becomes one even if the minority language is without official recognition. If the total population is above n^0, and a minority with $n_i > 0$ is without rights, the index should be less than one. The benchmark value n^* – and, hence, also the derived value n^0 – is often in practice determined externally by the evaluator. This value is crucial to the construction of an indicator of linguistic justice and should be determined by estimating the costs of providing the language-related good and the propensities to pay of members of linguistic minorities.[12] The sizes of the resulting indicators will, of course, be influenced by the size of n^*.

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[11] A majority does not necessarily exist. The situation can be that of the European Union with no majority language, or of Switzerland or Spain with a clear majority and several minorities, or of Wales with only one important minority.

[12] The fact that in practice the value of n^* has to be determined *ad hoc* is, of course a weakness, but it is no more significant than the weakness that is found in the *ad hoc* choices of indicators or *ad hoc* manners of aggregating indicators in, say, a linear fashion. As a matter of fact, the theoretical considerations behind n^* make it a less arbitrary in principle measurable element. There is a theoretical basis for the concept and an intuitive idea of the strengths and weaknesses inherent in its determination. Behind other concepts, a good theoretical foundation is often absent, and the degree of *ad hoc*-ness is considerably higher.

TABLE 2.1 Just rights under full solidarity (fs) and full equivalence (fe) with constant elasticity σ and variable n^* as well as with constant n^* and variable elasticity σ. $P = 150$, $n = 50$, and $b = 10$; κ and λ are given by the provision technology of the measure. σ is determined by the technology and n^* by the interaction of costs and benefits. (A "$+$" indicates that introducing rights is justified and a "$-$" that the introduction cannot be justified by arguments based on justice.)

λ	κ	σ	n	n^*	n^0	fs	fe
5.0	250	0.50	50	50	50.0	+	+
5.0	500	0.50	50	100	75.0	+	−
5.0	1000	0.50	50	200	125.0	+	−
5.0	20000	0.50	50	400	225.0	−	−
0.0	2000	0.00	50	200	200.0	−	−
2.5	1500	0.25	50	200	162,5	−	−
5.0	1000	0.50	50	200	125.0	+	−
7.5	500	0.75	50	200	87.5	+	−

In general, the smaller is σ, the smaller is the critical size of the minority in the full-solidarity case for a given value of n^*. This follows since for any $n < n^*$ the costs of providing the right will positively depend on σ. In order to provide a feeling of the significance of the various parameters, table 2.1 illustrates the dependence of just policy measures according to our two polar criteria for different values of σ and n^*. The cost function is $c(n) = \kappa + \lambda n$. The elasticity then becomes $\sigma = \lambda/b$ and the critical value for efficiency $n^* = \kappa/(b - \lambda)$. Table 2.1 shows that both criteria for justice give the same result if n^* is small enough or big enough. and the criteria agree if the elasticity is small enough. However, for the interesting cases the two criteria disagree. In order to construct a continuous indicator with the end-point properties discussed, we turn to elementary constitutional-economics theory.

3 ELEMENTARY WELFARE ANALYSIS MOTIVATING THE INDICATOR

Many approaches to justice and constitutional economics build on ideas of social contract.[13] 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.

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[13] The discussion in this section of choosing just rights closely follows WICKSTRÖM (2020a).

RAWLS (1971) visualizes the imaginary process as choosing behind a "veil of ignorance".[14] 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. Apply the lottery interpretation: in the first lottery an individual will with probability $n/P = \alpha$ end up in the minority and have no rights but a high explicit income and with probability $N/P = 1 - \alpha$ become a member of the majority with rights and a high explicit income; in the second lottery, the individual with probability one receives rights and a lower explicit income.[15] The question is which lottery an individual in the original position would prefer. This depends on her risk attitude, on the value attributed to language rights, and on the costs of introducing those rights.

3.1 APPLYING THE CONCEPT TO LANGUAGE RIGHTS

Table 3.1 illustrates the situation with one minority of size n, indicated by foot script n; a majority of size N with foot script N. In society/lottery one, S^1, the minority is without rights, and the individuals have implicit incomes e_n^1 and e_N^1, respectively. A typical member of the minority will have general income e^g and pay general tax t^g. A majority member has the same net income, but enjoys language rights in her language with an implicit value b. In society/lottery zero, S^0, everyone has the same rights and implicit income e^0 (general income less general tax plus the value of language rights and less the specific tax for the rights of the minority).[16] The general income, e^g, and general tax, t^g, are independent of the allocation of minority rights.

TABLE 3.1 Choice between societies behind a veil of ignorance.

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

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[14] The basic idea goes back at least as far as to the Greek philosophers (PLATO, -395 [1888, 1980]), and can be found in, among others, HOBBES (1651), ROUSSEAU (1762), and KANT (1797). In modern times, the concept has especially come to be associated with RAWLS (1971), but is very much present in the foundations of constitutional economics, for instance, BUCHANAN and 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 HARSANYI (1955) and VICKREY (1945). 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 NEUMANN and 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 the 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.

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

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

The two conditions found in expressions 2.3 and 2.4 are easily derived. Since Δe_N is negative, S^1 is the better society for the individuals belonging to the majority. If Δe_n is also negative, S^1 will be the better society also for individuals in the minority. That is, S^1 is a just society if:[17]

$$P \le \frac{c}{b} = n^* \frac{c(n)}{c(n^*)} = n^0 (\le n^*) \tag{3.1}$$

Not introducing language rights for the minority is then just if $P \le n^0 (\le n^*)$.[18]

Given that the individuals behind the veil of ignorance are risk averse, they like S^0 because of its lack of uncertainty. Possible preferences for S^1 can only be explained if the expected income in S^1 is higher than in S^0. In other words, if the expected implicit income in S^0 is higher than or equal to that in S^1, then S^0 must be the just society independently of 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, for $n \ge c(n)/b = n^0$, S^0 is just, that is, if $n \ge \sigma n + (1 - \sigma) n^*$, which is equivalent to $n \ge n^*$.[19] We, hence, have two clear conditions: if $n \ge n^*$, it is a just policy to enact the policy measure. If $P \le n^0 (\le n^*)$, then it is a just policy not to give rights to the minority.

We are left with the intermediate cases: $P > n^0$ and $n < n^*$. There is a trade-off between higher expected implicit income in S^1 and less uncertainty in S^0. What the individual behind the veil of ignorance chooses depends on her risk attitude. If she is risk neutral, only the expected implicit income matters and S^1 will be chosen; if 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.[20] Applying expected-utility theory, we attribute a concave utility function, u depending on implicit income, e, to the individuals. Compare the expected utilities of the lotteries:[21]

$$EU^1 = \alpha u(e_n^1) + (1 - \alpha) u(e_N^1) \tag{3.2}$$
$$EU^0 = u(e^0)$$

The person behind the veil of ignorance will be indifferent between the two types of society for equal expected-utility values:

$$\alpha u(e_n^1) + (1 - \alpha) u(e_N^1) = u(e^0) \tag{3.3}$$

or:

$$\frac{n}{P} \left[u(e^0) - u(e_n^1) \right] = \frac{N}{P} \left[u(e_N^1) - u(e^0) \right] \tag{3.4}$$

We note that:

$$e^0 - e_n^1 = b - \frac{c}{P} > 0 \tag{3.5}$$
$$e_N^1 - e^0 = \frac{c}{P} > 0$$

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[17] Since *ex hypothesi* $n < P$ and c is a concave non-decreasing function of n, it follows that $n < n^*$ and, consequently, $P \le n^*$.

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

[19] This corresponds to efficiency, since $nb \ge c$.

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

[21] The original axiomatic characterization of the expected-utility hypothesis can be found in NEUMANN and MORGENSTERN (1944).

Letting β_n be the average slope of u on the interval $\left[e_n^1, e^0\right]$ and β_N on the interval $\left[e^0, e_N^1\right]$, we rewrite 3.4 as:

$$\frac{n}{P}\beta_n \left[b - \frac{c}{P}\right] = \frac{N}{P}\beta_N \frac{c}{P} \tag{3.6}$$

or:

$$\frac{n}{n^0} \frac{P - n^0}{P - n} = \frac{\beta_N}{\beta_n} =: \beta \tag{3.7}$$

Risk aversion means that u is a concave function; that is, $\beta_N < \beta_n$. The risk aversion is related to β_N/β_n. Denoted this fraction by β. 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 equal to a coefficient of risk aversion:

LEMMA 3.1   The utility function:

$$u(y) = \frac{y - e_n^1}{y - e_n^1 + \beta(b_0 + e_n^1 - y)} \tag{3.8}$$

of income y, parametrized by β, b_0, and e_n^1 has the properties:

1. $u(y)$ is a von Neumann-Morgenstern utility function[22] for any income y on the interval $y \in [e_n^1, \infty)$

2.

$$\frac{u(e_n^1 + b_0) - u(y)}{e_n^1 + b_0 - y} \frac{y - e_n^1}{u(y) - u(e_n^1)} = \beta \text{ for all values of } y \tag{3.9}$$

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

PROOF   Trivial   ■

Note that the utility function is parametrized by b_0. As a matter of fact, it has been normalized to equal zero for $y = e_n^1$ and to equal one for $y = e_n^1 + b_0$, i.e. on the endpoints of the range of possible implicit incomes without and with the measure if the propensity to pay for the measure is b_0. Due to this normalization, expression 3.7 takes its simple form. For a different policy measure with a different $b = \eta b_0$, where η is defined as $\eta := b/b_0$, the expression is slightly more complicated:[23]

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[22] 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.

[23] Any utility function parametrized by any value of b would serve our purpose of constructing an indicator. The indicator resulting from any b, being an ordinal measure, would just be an order-preserving transformation of the indicator resulting from a different b. The crucial point is that the same utility function be used, i.e. the same b_0 for all situations analyzed. Only then are the results comparable between different jurisdictions and different policy measures.

LEMMA 3.2   Let the size of the population in the alternative case be P_a, the propensity to pay for a reference measure be b_0 and the propensity to pay for an alternative measure $b_a = \eta b_0$. Equation 3.7 then takes the form:

$$\frac{n}{n_a^0} \frac{P_a - n_a^0}{P_a - n} = \frac{\beta}{\eta(1 - \beta) + \beta} \tag{3.10}$$

A proof is given in Appendix A.

The risk aversion (the concavity of the utility function) is decreasing in β. $\beta = 1$ implies risk neutrality and expressions 3.7 and 3.10 imply that in a just society rights be given to a minority if its size is at least $n = n^0$ ($n = n_a^0$) which implies that $n = n^*$ ($n = n_a^*$); that is, in the case of efficiency. As β approaches zero, the risk aversion becomes very high and in a just society rights should be given to any minority of size $n > 0$ if $P > n^0$ ($P > n_a^0$); that is the maximin criterion of Rawls. For values of β between zero and one, equations 3.7 and 3.10 can be solved for a critical value of n, giving us the lower limit for the size of the minority for which it is a just policy to provide rights, given the risk attitude corresponding to the value of β. An advantage of β as risk indicator is that it is defined on the interval $(0, 1]$ and, hence, is a good candidate for constructing indicators.

In Appendix B, the results above are derived using the concept of a welfare function.

4 DEFINING AN INDICATOR

We are interested in quantifying the injustice of not giving rights to a minority of a certain size $n < n^*$. This is accomplished by finding the β that satisfies expressions 3.7 or expression 3.10 for the size of the minority:

DEFINITION 4.1   If behind the veil of ignorance there is indifference between introducing and not introducing a measure m for a certain value of β, then β is defined to be an indicator of injustice with respect to the measure for a society where it is not introduced.

In other words, we reinterpret the risk aversion as a measure of tolerance. If the risk aversion is low, the level of tolerance is also low and *vice versa*. The level of tolerance is then associated with the term justice. From expression 3.10, we can find the level of injustice due to the non-introduction of measure m for language i. Defining $A(P, n_i, n_{im}^*)$, for short A_{im}, by:

$$A_{im} := \frac{n_i}{n_{im}^0} \frac{P - n_{im}^0}{P - n_i} \tag{4.1}$$

adding the values of β out of range, and using the definition of n_{im}^0, we find:

$$
\begin{aligned}
\beta_{im} &= 0 & P &< n_{im}^0 & n_i &< n_{im}^0 < n_{im}^* \\
\beta_{im} &= \frac{\eta_m A_{im}}{1 - A_{im} + \eta_m A_{im}} & P &\geq n_{im}^0 & n_i &< n_{im}^0 < n_{im}^* \\
\beta_{im} &= 1 & P &\geq n_{im}^0 & n_i &\geq n_{im}^0 \geq n_{im}^*
\end{aligned}
\tag{4.2}
$$

where $\eta_m = b_m/b_0$.

By associating inequality aversion with justice, we can say that $\beta = 0$, a very high inequality aversion, characterizes a planner with a very high commitment to justice, and $\beta = 1$, no inequality aversion, signifies no commitment to justice, only to efficiency. An intermediate value of β can then be associated with an intermediate commitment to justice. By finding the minimal value of β necessary to make implementation of a right for a certain minority just, we also find a quantification of the injustice of not implementing the measure.

For example, if a minority of size $n = 0.5n^*$ and $b = b_0$ is without official status and the elasticity $\sigma = 0$ (i.e. there are only fixed costs), the value of n^0 is n^* and the value of β becomes:

$$\beta = \frac{1}{2}\frac{P - n^*}{P - 0.5n^*} \tag{4.3}$$

For a big jurisdiction, the correction factor $(P - n^*)/(P - 0.5n^*)$ approaches one and β becomes 0.5. That states that a medium strength commitment to justice is necessary to justify rights for the minority community. If the jurisdiction is small, say $P = 1.5n^*$ and the size of the minority remains at $n = 0.5n^*$ (that is, the minority makes up a third of the population), β becomes:

$$\beta = \frac{1}{2}0.5 = 0.25 \tag{4.4}$$

and a higher commitment to justice is required to justify the allocation of rights to the minority. One would say that not giving rights to the minority in this case is more understandable than in the first case. The size of the minority is the same, but the costs imposed on the rest of the population are *per capita* higher. That is, giving rights involves a higher sacrifice and not giving rights is not as unjust as in the bigger jurisdiction. Taking the percentage size of the minority as an indicator would, of course, lead to the opposite result.

5   RECOGNITION INDICATORS

We are now ready to define indicators of linguistic justice. For minority language i of size n_i spoken in a jurisdiction of size P, calculate the β values in expression 4.2 for a given policy measure m characterized by $c(n_i)$ on the supply side and $b_m = \eta_m b_0$ on the demand side, or, equivalently by σ_{im}, n_{im}^*, and n_{im}^0. Then we have the following definitions:

DEFINITION 5.1   **(Individual indicator of recognition)**

1. If a minority language i is recognized for policy measure m, the individual indicator of recognition for that measure is $I_{im}^r = 1$.

2. If a minority language i is not recognized for policy measure m, the individual indicator of recognition for that measure is $I_{im}^r = 1 - \beta_{im}$.

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 5.2 **(Aggregate indicator of recognition)** The indicator of recognition for a certain policy measure m in a jurisdiction is defined as the weighted arithmetic average of the individual indicators of recognition:

$$I_m^r := \sum_i \gamma_i I_{im}^r \tag{5.1}$$

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

5.1 PROPERTIES

The indicator I_{im}^r 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), the size of the minority necessary for the policy measure to be efficient (n_m^*), as well as the elasticity of provision of the language related good(s) with respect to the number of beneficiaries (σ_m). If $P \leq \sigma_m n_i + (1 - \sigma_m)n_m^* = n_{im}^0$, the value of the indicator is one and if $n_i \geq n_m^*$ it is zero. It is characterized by:

PROPOSITION 5.1 The indicator I_{im}^r has the following properties:

1. The value of the indicator I_{im}^r decreases (or stays equal to zero or one) as P increases.

2. (a) The value of the indicator I_{im}^r decreases (or stays equal to zero or one) as n_i increases if $P \geq n_m^*$.

   (b) The value of the indicator I_{im}^r can increase or decrease (or stay equal to one) as n_i increases if $(1 - \sigma_m)n_m^* < P < n_m^*$.

   (c) The value of the indicator I_{im}^r is equal to one as n_i changes if $P \leq (1 - \sigma_m)n_m^*$.

3. The value of the indicator I_{im}^r increases (or stays equal to zero or one) as the size of n_m^* increases.

4. The value of the indicator I_{im}^r decreases (or stays equal to zero or one) as the size of σ_m increases

5. The value of the indicator I_{im}^r decreases (or stays equal to zero or one) as the size of η_m increases

For a proof, see appendix C.

PROPOSITION 5.2 The properties of the individual indicators all carry over to the aggregated indicator.

PROOF Trivial ∎

The first proposition simply states that if the size of the total population increases, the indicator of justice decreases, one requirement in Section 2 for a sensible indicator. The dependence on n requires some further comments. If $P > n^*$ condition 2.6 is always fulfilled,[24] and $\beta > 0$ for all values of n and increasing in n, which corresponds to the intuition in Section 2. For the (rather unrealistic) case $P < n^*$, the reader is referred to the proof of the proposition. 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. The same type of argument can be brought for η_m. An increase leads to a decrease in n_m^*, increasing A_m and β. 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 intolerance.

5.2 DERIVED INDICATORS

We can derive and define an alternative indicator as:

DEFINITION 5.3   **(Indicator of inclusion)** We define:

$$I^{inc} := 1 - \sum_{i^r} \gamma_i^{no} \beta_i \qquad (5.2)$$

where the sum is over the non-official minority languages and $\gamma_i^{no} := \frac{n_i}{\sum_{j^{no}} n_j}$.

Of course, the two indicators are closely related:

PROPOSITION 5.3

$$I^r = 1 - (1 - I^{inc})\phi \qquad (5.3)$$

where ϕ is the fraction of all minority-language speakers whose language is not recognized.

PROOF   Trivial   ■

The indicator basically tells us the fraction individuals, whose languages are not recognized, when each language is weighted by the indicator of recognition. The indicator is a measure of the degree of "belongingness" of the population of the jurisdiction. If $I^{inc} = 1$, the entire population speaks recognized languages and I^r is also one. If $I^{inc} = 0$ – that is, all $\beta_i = 1$ (all excluded minority speakers speak languages with more than n^* speakers) –, I^r is the fraction of the population speaking (the) recognized language(s).

A natural interpretation of the βs is indicators of manifested intolerance:

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[24] $\{P > n \wedge P > n^*\} \Rightarrow P > n^0$.

DEFINITION 5.4   **(Indicator of intolerance)**

$$I^{int} := \sum_i \gamma_i \beta_i = 1 - I^r \tag{5.4}$$

Similarly, indicators of implementation of rights could be defined as the percentage of documents etc. available in official languages weighted by the indicator of recognition.

6   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.

6.1   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:

$$\kappa = n^* b (1 - \sigma) \tag{6.1}$$
$$\lambda = b \sigma$$

and:

$$\sigma = \frac{\lambda}{b} \tag{6.2}$$
$$n^* = \frac{\kappa}{b - \lambda}$$

With estimates of the fixed costs and the marginal costs of implementing a measure, the policy maker has to estimate b. If the policy maker instead knows n^*, and σ, he has implicitly found $b = \lambda/\sigma$. If we are only interested in comparing different jurisdiction with respect to the same one measure, we can set $\beta = A$, and we don't need a value for b, determining n^* and σ being 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 two different values for n^* with a realistic magnitude in regard to the rules in countries like Slovakia (less than the size of the minority in the two *kraje/ kerület* where Hungarian is official) or Romania (comparable to the size of the minority in a typical *judeţ* where the minority language is official), and well above the number of speakers necessary to make a language official in Finland.[25] 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). The value of η is then of no consequence for the rankings and can be set equal to one.

---

[25] As discussed in Section 1, Slovakia uses a 15% rule 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 and a typical jurisdiction size of 400 000 imply a critical value of 80 000. In Finland, with only 3 000 individuals or 8% necessary, the critical value is, of course, much smaller.

6.2 SOUTHERN SLOVAKIA AND THE CHOICE OF JURISDICTIONAL BORDERS

In table 6.1, we have calculated the indicator for Hungarian in the jurisdictions of Slovakia bordering on the Danube. In two *kraje/kerület*, Hungarian has official status and the value of the indicator is one. In the other three, Hungarian has 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. Note that with the Finnish rule, all jurisdictions would give Hungarian official recognition making all indicator values equal to one.

TABLE 6.1   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	I^r	n^0	I^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

TABLE 6.2   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	I^r	n^0	I^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. In WICKSTRÖM (2020b), in a small *Gedankenexperiment*, the two jurisdictions Nitriansky kraj / Nyitrai kerület and Banskobystrický kraj /

Besztercebányai kerület were reorganized in a new southern and a new northern jurisdiction. The result is displayed in table 6.2. From the table we can with the help of the recognition indicator directly infer that such a reorganization considerably increases the level of linguistic justice without changing the rules for providing official status. The indicator for the jurisdiction with no rights increases from 0 to 0.41 or 0.07 to 0.77, respectively.

6.3 TRANSYLVANIA AND INCONSISTENT RECOGNITION

In tables 6.3, 6.4, and 6.5 we have calculated the indicator for two multilingual Romanian jurisdictions (*judeţe*) without official minority languages and for one, where Hungarian has official recognition.

TABLE 6.3   Recognition indicators in *judeţ* Cluj-Napoca/Kolozsvár, $P = 691\,106$.
Source: Own calculations based on 2011 census, INSTITUTUL NATIONAL DE STATIS-TICĂ (2011)

i	n_i	γ_i	$n^* = 30000$		$n^* = 90000$	
			n^0	I_i^r	n^0	I_i^r
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	

Cluj-Napoca/Kolozsvár is the jurisdiction in Romania with the largest non-official Hungarian minority. Hungarian had official status until 2002. Sălaj/ Szilágy is a jurisdiction 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.[26] 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 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.[27] The language policy is inconsistent, and the indicator of recognition is a suitable instrument to demonstrate this.

TABLE 6.4   Recognition indicators (recognition marked *) for *judeţ* 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	I_i^r	n^0	I_i^r
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

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 6.6, 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.

As already noted, one can look at the β s as manifested intolerance with the indicator I^{int} of Sibiu/Nagyszeben/Hermannstadt equal to 23% or 6% depending on the chosen value of n^*, of Cluj-Napoca/Kolozsvár 94% or 92%, and of Sălaj/Szilágy only 4.7% or 1.5%.

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[26] 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.

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

TABLE 6.5   Recognition indicators for *judeţ* 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	I_i^r	n^0	I_i^r
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	

TABLE 6.6   Recognition indicators for *judeţ* 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	I_i^r	n^0	I_i^r
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	

7 CONCLUSIONS

It is well known that language is both a means of communication and an identity tool with a strong symbolic value (EDWARDS, 2009). Contact between languages and between groups can be peaceful and characterized by mutual respect, understanding and cooperation. Sometimes, however, the coexistence of languages on a territory can be difficult, generate tensions and in extreme cases lead to conflicts (NELDE, 1987). Conflicts between groups can arise from both dimensions of language: the practical and the symbolic. There can be conflicts between groups arising from communication difficulties, but also conflicts due to real or perceived inequalities in the symbolic recognition of one group in relation to others. Language policy, therefore, can be used to improve understanding and trust between groups in society, or for divisive purposes which ultimately can generate conflict. Different approaches can be followed to manage linguistic diversity in a territory. For example, the approach followed by the High Commissioner on National Minorities (HCNM) of the Organization for Security and Cooperation in Europe (OSCE) focuses on supporting integration processes within diverse societies in OSCE participating states (HCNM, 1998, 2012). In this approach, integration means a process in which all the different components of society commit to an effective participation in political, economic, and social life of a country or context. In practice, this implies striking a balance between pursuing effective multilingualism and allowing national minorities to use their own language, and the need for all members of society to learn and speak official and unifying languages (HADÎRCĂ, ROMANS, and IRYN ULASIUK, 2018).

In terms of policy implementation, this requires supporting minorities in acquiring a reasonable command of the state language, and providing them with the opportunities they need in their mother tongue in different domains of social life, including public services, and in the quality of and access to health care, social services, education, employment advice, justice and public administration. The symbolic and/or official recognition of the cultural value of languages and therefore of the dignity of their speakers is certainly important in this respect, but clearly not sufficient. Language policy must also include substantive interventions aimed at providing linguistic mediation services (translators, interpreters, and cultural mediators) and/or publicly provided goods and services in the minority language in addition to the majority language, for example, public signage and place names, official documents, bilingual public offices – which implies training bilingual public servants –, tribunals and courts, and in political elections. It can also involve the provision of goods that are private in nature but that in many countries are publicly provided for reasons of social equity such as bilingual education and health care services.[28] The implementation of a balanced language policy aimed at integration, in the sense used by HCNM, involves the direct involvement and intervention of the public sector, in particular public administration, education, and health care. The question, of course, is to what extent and under which conditions minorities are entitled to obtain publicly provided goods in their language.

This article provides a theoretically based, measurable indicator that can contribute to the design of suitable language policies addressing this issue. It embodies both the dimensions of efficiency and equity, the cost structures of different language planning measures, and the number of speakers of minority and majority languages. Through a rank order of the treatment

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[28] The promotion of minority languages in the media and in economic activities could be added, although the private sector dominates here.

of minorities in terms of linguistic justice, this indicator provides evidence that can be used to set priorities, and to nudge language policy towards more acceptable and reciprocal structures of societies characterized by tension and conflict.

An important question, of course, is which linguistic minorities to consider in an index. This is a separate and fundamental issue that cannot be addressed in this article, because it is context dependent and if refers to a question that logically precedes the first one, that is, who belongs to society. In other words, who is a member of the club and under what conditions were they accepted? At least in the treatment of "new" and "old" minorities, there seems to be no consensus about this issue, see also WICKSTRÖM (2014). But there are also other questions of principle. For instance, should in the process of nation building a former oppressor's language be included in the canon of languages considered? The decision on questions like these has to be taken by the evaluator and might be context dependent; this article develops a consistent and sensible approach to the comparison of different jurisdictions once this overriding question has been resolved.

APPENDICES

A PROOF OF LEMMA 3.2

PROOF The alternative measure a is characterized by $b_a = \eta b_0$ and A_a defined by expression 4.1. Further, $e^0 = e_n^1 + b_a - c_a/P_a$ and $e_N^1 = e_n^1 + b_a$. We know from expression 3.7 that:

$$A_a = \frac{\frac{u(e_N^1) - u(e^0)}{c_a/P_a}}{\frac{u(e^0) - u(e_n^1)}{b_a - c_a/P_a}} = \frac{u(e_N^1) - u(e^0)}{u(e^0)} \frac{b_a - c_a/P_a}{c_a/P_a} \tag{A.1}$$

Writing the utility function explicitly we find:

$$A_a = \frac{\frac{b_a}{b_a + \beta(b_0 - b_a)} - \frac{b_a - c_a/P_a}{b_a - c_a/P_a + \beta(b_0 - b_a + c_a/P_a)}}{\frac{b_a - c_a/P_a}{b_a - c_a/P_a + \beta(b_0 - b_a + c_a/P_a)}} \frac{b_a - c_a/P_a}{c_a/P_a} \tag{A.2}$$

and simplification leaves us with:

$$A_a = \frac{\eta\left[b_a - c_a/P_a + \beta(b_0 - b_a + c_a/P_a)\right] - (b_a - c_a/P_a)\left[\eta + \beta(1 - \eta)\right]}{\left[\eta + \beta(1 - \eta)\right] c_a/P_a} \tag{A.3}$$

$$= \frac{\beta}{\eta(1 - \beta) + \beta}$$

∎

B WELFARE-FUNCTION INTERPRETATION OF THE BASIC ANALYSIS

If we agree to the interpretation of the choice behind a veil of ignorance being a choice of just distributions, expected utility can be reinterpreted as a welfare function:

$$W = nu(e_n) + Nu(e_N) \tag{B.1}$$

The difference in welfare between the two types of society is:

$$\Delta W := W^0 - W^1 = n\left[u(e^0) - u(e_n^1)\right] + N\left[u(e^0) - u(e_N^1)\right] \tag{B.2}$$
$$= n\beta_n\left(b - \frac{c}{P}\right) - N\beta_N\frac{c}{P}$$

or:

$$\Delta W = b\beta_n\left[n - n^0\alpha - \frac{\beta_N}{\beta_n}n^0(1-\alpha)\right] \tag{B.3}$$

or:

$$\frac{\Delta W}{b\beta_n} = n - n^0\left[\alpha + \beta(1-\alpha)\right] \tag{B.4}$$

β_n and β_N can now be interpreted as the weights the policy maker attributes to a member of the minority and majority, respectively, and β is simply defined as the ratio of the two; that is the relative weight of a member of the majority relative to the weight of a member of the minority for the reference propensity to pay ($b = b_0$); for different value of b, the ratio of the weights changes according to expression 3.10. Again, $\beta = 0$ means full solidarity – the change in welfare of the minority is all that counts –, and $\beta = 1$ means full equivalence – a change in the implicit income of a minority individual is evaluated in the same fashion as of a member of the majority. If justice is interpreted as trade-offs between equity and efficiency, β is an indicator of this trade-off. $(1 - \beta)/\beta$ is a measure of what society as a whole is prepared to pay in terms of loss of efficiency for moving closer to equity. If $\beta = 0$, only equity counts; if $\beta = 1$, equity is totally unimportant. If $\beta = 0$, equation B.4 becomes:

$$\frac{\Delta W}{b\beta_n} = n - n^0\frac{n}{P} = n\left[1 - \frac{n^0}{P}\right] \tag{B.5}$$

and the welfare increases due to the introduction of rights for a minority independently of its size if $n^0 < P$, and it never increases if $n^0 > P$. If $\beta = 1$, the welfare increases if $n > n^*$.

C   PROOF OF PROPOSITION 5.1

PROOF   In general, the cases with $P \geq n^*$ and $P < n^*$ have to be treated separately. In figure C.1, the behavior of β for $n \leq n^*$, $P \leq n^*$, and for a constant σ is illustrated. In the upper parts of the figure, n^*, n^0 and P are drawn. It is readily verified that the slope of n^0 equals σ. Of course, $n < P$, since the "minority" has to be smaller than the total population. If $P \leq (1 - \sigma)n^*$, it is always less than n^0, and $\beta = 0$ for all values of n. The interesting case is the one in the figure; here, $(1 - \sigma)n^* < P < n^*$. For small n, P is above n^0 and β will be positive, but will approach zero both when n approaches zero and n^0 approaches P. For n^0 greater or equal to the value making $P = n^0$, of course, $\beta = 0$. It is readily seen that if $P = n^*$ and σ a constant, then β is an increasing function in n going from zero to σ on the interval from zero to n^*. Further, for $P > n^*$, β takes on values from zero to one as n increases from zero to n^*. That is, if $n = n^*$, β is discontinuous at $P = n^*$ as a function of P. However, since $n < P$, this case will never occur in reality.
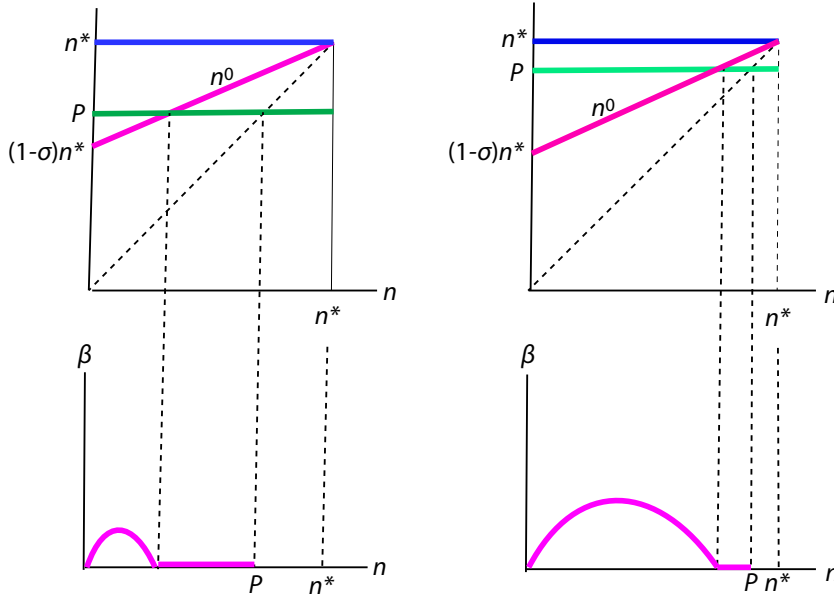
FIGURE C.1   Behavior of β when the population P is below n^*

1. Take the derivative of β with respect to P:

$$\frac{\partial \beta}{\partial P} = \frac{n^0 - n}{(P - n)^2} \frac{n}{n^0} > 0 \qquad (C.1)$$

The inequality follows, since $P > n$ and $n^0 > n$ on the interval from zero to n^*. From figure C.1 we see that for the cases of $\beta = 0$, an increase in P leads to a positive value of β or no change. Similarly, if $n > n^*$, P has no influence on β.

2. (a) If $P \geq n^*$, we can take the derivative of β with respect to n:

$$\frac{\partial \beta}{\partial n} = \frac{P(1 - \sigma)}{[(P - n)n^0]^2} \left[n^*(P - n^*) + \sigma(n^* - n)^2 + 3\sigma n n^*\right] > 0 \quad (C.2)$$

   (b) Follows directly from figure C.1.

   (c) Trivial

3. Again, we have to distinguish the cases $P > n^*$ and $P \leq n^*$. For $P > n^*$, we can take the derivative of β with respect to n^*:

$$\frac{\partial \beta}{\partial n^*} = -\frac{(1 - \sigma)nP}{(P - n)(n^0)^2} < 0 \qquad (C.3)$$

If $P \leq n^*$, we can take rescue in figure C.1. An increase in n^* will increase n^0 for any given value of n and lower β if it is positive or leave it at zero if it is equal to zero.

4. Again, we distinguish between the cases $P > n^*$ and $P \leq n^*$. For $P > n^*$, we can take the derivative of β with respect to σ:

$$\frac{\partial \beta}{\partial \sigma} = \frac{nP(n^* - n)}{(P - n)(n^0)^2} > 0 \qquad \text{(C.4)}$$

If $P \leq n^*$, we go to figure C.1. An increase in σ will decrease n^0 for any given value of n and increase β or leave it at zero.

5. Trivial

$I_i^r = 1 - \beta_i$ which implies that a change in β_i leads to the opposite change in I_i^r. ∎

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