

Diversity analysis in cultural economics: theoretical and empirical considerations

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Septembre 2009

Document de travail du GRANEM n  2009-05-017

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Classification JEL : L82, Z11.

Mots-clés : diversité culturelle, industrie du livre, économie de la culture.

Keywords: cultural diversity, book industry, cultural economics.

Résumé : Une littérature abondante s'est attachée à identifier les déterminants à long terme de la diversité culturelle, mais elle passe presque systématiquement sous silence les questions de la définition et de la mesure de la diversité. Dans ce papier, nous analysons les apports et les limites de l'élaboration d'un cadre formel de la mesure de la diversité reposant sur trois dimensions : la variété, l'équilibre et la disparité. Nous étudions la pertinence de deux indices, l'entropie de Shannon-Wiener et l'indice de Stirling, et nous montrons que la prise en compte de la disparité nécessite d'autres formulations. Nous introduisons un nouvel indice (HBFP) offrant une meilleure compréhension du concept de diversité dans un pays donné en s'appuyant sur les distances culturelles. Nous utilisons ensuite les différents indices pour évaluer la diversité dans le cas de l'édition de livres (plus particulièrement pour les traductions en littérature) dans 20 pays de l'OCDE, de 1979 à 2005.

Abstract: A growing literature debates the determinants of long run cultural diversity, but this literature generally avoids the problem of precisely defining and measuring diversity. In this paper, we discuss the pros and cons of a formal framework for the measurement of diversity that takes into account three dimensions: variety, balance, disparity. We contrast the relevance of two indexes, the Shannon-Wiener entropy index and the Stirling index, and show that, if disparity is taken for granted, many other formulations may be needed. We introduce a new index (HBFP) in order to better understand the scope of diversity in a given country, as seen from the viewpoint of cultural distances. We use the different indexes for assessing diversity in the case of book edition (especially translations in literature), in 20 OECD countries, from 1979 to 2005. We put forward some elements of interpretation of the differences in the relative level of diversity between these countries, and outline a few strategies for the empirical analysis of diversity.

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Diversity Analysis in Cultural Economics: Theoretical and Empirical Considerations

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Abstract.

A growing literature debates the determinants of long run cultural diversity, but this literature generally avoids the problem of precisely defining and measuring diversity. In this paper, we discuss the pros and cons of a formal framework for the measurement of diversity that takes into account three dimensions: variety, balance, disparity. We contrast the relevance of two indexes, the Shannon-Wiener entropy index and the Stirling index, and show that, if disparity is taken for granted, many other formulations may be needed. We introduce a new index (H_{BFP}) in order to better understand the scope of diversity in a given country, as seen from the viewpoint of cultural distances. We use the different indexes for assessing diversity in the case of book edition (especially translations in literature), in 20 OECD countries, from 1979 to 2005. We put forward some elements of interpretation of the differences in the relative level of diversity between these countries, and outline a few strategies for the empirical analysis of diversity.

JEL Codes. L82, Z11

Key words: Cultural diversity; book industry; cultural economics.

1. Introduction.

Diversity plays an important role in economics, but its definition and measure usually remain implicit and even neglected. A wide academic research assimilates diversity to product variety. It makes the implicit hypothesis that diversity is desirable *per se* (Dixit and Stiglitz, 1977). Some analysts emphasize the ambiguous role played by diversity in economic development (Easterly and Levine, 1997; Nettle, 2000). Van den Bergh (2008) evaluates the benefits of diversity in terms of realizing system improvements and contributing to long-term efficiency.

In the field of cultural activities, a growing literature investigates the determinants of long run diversity (see among others: Peterson and Berger, 1975; Burnett, 1992; Alexander, 1996; Lopes, 1992 and Dowd, 2004). This literature is based on different approaches of diversity, and issues vary according to the definition adopted. Moreover, those studies recognize that it is difficult to explain the generating mechanism of diversity precisely. In the same way, cultural and social policies are ever more based on a very blurred concept of cultural diversity, especially at an international level (Acheson and Maule, 2004). In the literature devoted to the Unesco Convention on cultural diversity, diversity is seen as a set of “cultural specificities and identities” (Unesco, 2004, p. 17).

For Stirling (2007), “diversity is an attribute of any system whose elements maybe apportioned into categories”. In this paper, we adopt a definition of diversity inspired by research works in environmental economics. Diversity is defined through the three properties of such a system, variety, balance and disparity. The aim of our research is to build a reliable index that takes those properties into account.

In order to evaluate the relevance and the robustness of our definition, we apply it to the peculiar case of the book market. Even on this market, cultural diversity embraces as many categories as possible. Taking the example of literature, it could be associated to the variety of author’s origins, their genre, their religion, the differences in their biographies, and many other aspects. Diversity may also relate to content variety (length, style, etc). We emphasize an only specific aspect of such diversity: the linguistic origin of fiction books translated during a given period. We make the hypothesis that translations introduce diversity in the field of literature, by opening the spectrum of authors, styles, values, etc.

As Storti (2001) shows, languages reflect cultural differences. He explores how people from different cultures have different values, beliefs, ideas of good and evil, morality and immorality and shows that a wide part of those differences is reflected in the languages. He collects 51 cross-cultural dialogs and

analyses, paying special attention to both the explicit and the implicit differences between Americans and people from Britain, France, and Germany. Among these groups, Americans and the French have the least in common, while Americans tend to have relative affinity with Germans¹. In the same way, Sapiro (2008) emphasizes the role of the translations as a means to develop the dialog between cultures. Following this issue, we consider the study of the origins of literature a signal of the degree of cultural diversity supplied by publishers. Moreover, as Melitz (2007, p. 193) shows, “a variety of source languages in translations makes literary capital more valuable as such.”

The next section proposes a formal appraisal of issues related to diversity indexes. Diversity cannot be only associated to the sheer multiplicity of types, forgetting that their relative frequencies are also crucial for defining this concept. This is the reason why we support the Shannon-Wiener entropy index as a reliable tool for measuring diversity. But it is necessary to take into account the degree of similarity between any given pair of objects or types. This kind of consideration leads Stirling (1999) to propose a second, and to a certain extent complementary, index. We argue however that, once distances matter, the number of alternatives is much superior to the single Stirling’s version. We introduce, in particular, an index where the distance between all pair of types is weighted by their relative frequencies *and* the distance of each of them to a third type or element, called a referent.

In the second part of the paper, we apply the three indexes to the measurement of diversity in the case of book edition (especially literature). We compare their evolution through time, for 20 OECD countries, from 1979 to 2005. We make the hypothesis that a reliable (though non sufficient) criterion of diversity is the variety and distribution of the original languages of all the books, translated or in the national language. Indeed, the diversity of the origins of authors is a signal of the openness of a country to foreign cultures.

We also introduce the disparity between languages (Dyen *et al.*, 1992, Ginsburgh *et al.*, 2008). Following the work of Cavalli-Sforza *et al.* (2000) and Ginsburgh *et al.* (2008), linguistic distance evaluations seem an objective way to approximate cultural distances.²

¹ Germany, like the US, is more like a meritocracy, whereas France and Britain have an aristocratic history.

² Though measures of cultural distances exist (see Hofstede’s surveys (1980, 1983), we chose to use the measure of linguistic distance for two major reasons: (a) cultural distances are available for countries, not for languages, while UNESCO data are for languages ; (b) cultural distances are more arbitrary. Based on statistical surveys of wide panels of IBM employees in more than 70 countries, cultural distances between nations are analysed through work-related values: power distance, individualism, uncertainty, avoidance, long-term orientation. Beyond the inherently low reliability of pool surveys, especially when they make international comparisons, questions and answers are biased in two ways. Firstly, the words do not mean the same thing in different countries (what appears to be the

This concrete application illustrates the conceptual questions posed when we try to better understand and evaluate diversity. It raises new questions as well, dealing with the limits of indicators and the need for a strong theoretical and empirical framework. We emphasize the deep differences in the interpretation of the relative level and evolution of diversity according to the index selected for the same period and set of OECD countries.

2. Measuring diversity.

The present requirements on the (diversity) concept have made it mandatory to have a straightforward way of measuring the very diversity in concrete situations or markets. This led to the search of indicators or indexes to assess diversity. Supposing a suitably characterised context is given, basic elements for the construction of such indexes are a well-defined set of objects, outcomes or types, say 1, 2, ..., n, and an associated frequency (or probability) distribution p_i , $1 \leq i \leq n$, $\sum_i p_i = 1$.

A common mistake, still present in many studies and arguments, is to associate diversity with the sheer multiplicity of types (variety), forgetting that their relative frequencies are also crucial for defining “the amount of diversity” (balance). In spite of different options duly taking into account the two basic constituents above, the Shannon-Wiener entropy index seems to be most favoured and, to many a number of viewpoints, the best candidate. Indeed, since Shannon (1948), several proofs of optimality of the entropy index have been produced. Its definition, as known, is:

$$H_{SW} = - \sum_i p_i \ln p_i , \quad (1)$$

where, though in the theoretical developments the logs are assumed to be neperian, in practical applications they are often taken base 2.

Inspired perhaps in the works by Weitzman (1992, 1993), Stirling (1999) goes further and proposes a different index, taking into account three dimensions of diversity: variety, balance and disparity. Disparity is defined as the degree of similarity between any given pair of objects or types. Stirling’s proposal

same question on individualism is unlikely to be truly equivalent in Japan and in the South of Europe). Secondly, poll surveys cannot grasp or take into account the entire complexity of cultural differences, in which history, religions, ways of life, and the social contract that is in force play a crucial role. In a nutshell, these surveys on cultural differences are more suitable for pointing out differences in job relations and corporate governance between different countries.

introduces a new element in the set of basic constituents, where objects, till then, were considered uniquely, and intrinsically, distinguished, no differences in their (relative) *proximities* being at stake. However, even ecologists are aware of the ‘redundancy hypothesis’, related to different species with similar characteristics and, more importantly, similar functional roles. Systems with distinct H_{SW} would then show a nearly equivalent behaviour, as long as representatives of the same functional groups were present in both.

Cutting through more careful discussions on the problems raised by imposing a metric in objects’ space, Stirling assumes the existence of a distance function d_{ij} , well-defined for all pairs (i,j). In this, we may also see an implicit influence of Lancaster (1966)’s early ideas – pioneered, in their turn, by Gorman (1953, 1956 and 1961) - to incorporate quality in consumer theory, where products – i.e., types – are defined by transformations of an original attribute’s space³. In this way, a Euclidean distance can be naturally computed between products.

In the light of these assumptions, Stirling’s proposal is:

$$H_{St} = \sum_{i,j} d_{ij} p_i p_j \quad . \quad (2)$$

Distances between pairs of elements represent their mutual disparity (d_{ij}). Variety and balance can be captured by weighting distances by the product of the proportional importance in the system of each element in the pair ($p_i p_j$).

In its original formulation, the index is dependent on the measurement unit adopted for the distances, so that we prefer to impose a normalisation by setting the smallest distance, say d_{12} , equal to 1, and defining $d_{ij}^* = d_{ij} / d_{12}$, so that

$$H_{St}^* = \sum_{i,j} d_{ij}^* p_i p_j \quad , \quad d_{12}^* \equiv 1. \quad (3)$$

Written as above, the index is invariant to linear transformations on the set of distances, though, annoyingly, it continues not to be invariant to other classes of transformations, even affine ones.

³ As known, purely economic approaches to diversity can differ. Rosen (2004), for instance, is an example of another independent line, though based on standard ideas on product differentiation and imperfect competition.

Indeed, in spite of the fact that, in the cultural context, the more or less similarity among objects usually makes sense, use of (2), or (3), instead of (1) poses a few serious questions. While (1) enjoys important properties that aid in the interpretation of practical results⁴, Stirling's idea presents a confusing behaviour. In his favour, though, it should be mentioned that his purpose in proposing (3) was exactly to point out how diversity can change with the different similarity relations among the units at stake. Indeed, in his view⁵, Shannon's index bypasses this question, by precisely assuming that the units occupy the vertices of a regular simplex in characteristics (or similarities) space.

But acceptance of distances in object's space also opens a Pandora box as relates to the adequate way of ascertaining diversity. In very general terms, families of diversity indexes under the general formula

$$H_{GD} = \sum_{i,j} f_{ij} (\{d_{lk}, l, k \in \text{types}\}) p_i p_j \quad (4)$$

where $f_{ij} (.)$ is a given function of *all* distances (in principle) may be meaningful. We shall call this a generalized distance (GD) diversity index, Stirling's being obviously the special case

$$f_{ij} (\{d_{lk}, l, k \in \text{types}\}) = d_{ij} \quad \text{for all } i, j \quad (5)$$

Another example can be constructed. Use of (5) does not include any third element, or referent. Indexes (2), (3) consider distances between each pair of elements. they do not introduce the distance between each element and one focal element that could play the role of a referent. They may be relevant in order to measure diversity in some specific contexts, when the different types or elements are considered *equivalent*. By contrast, many economic problems need the introduction of a referent. An example illustrates this: we evaluate the level of diversity resulting from the introduction of new technologies by computing it taking into account not only the distances among the new technologies, but also those between them and the previous dominant technology. This is especially true in the case of literature. The diversity is not only measured by the proportion of translations among new publications, but also by the number of original languages, by the distance between these languages *and* by the distances between them and the referent language (which is the one of the country in which the level of diversity is being studied).

⁴ See the discussion later in this section.

⁵ Personal communication by Andrew Stirling.

More precisely, let us imagine a country A where French is the national language. The structure of the literature book production would be: French: 20%, others (translated languages) 80% with: Czech: 20%, Slovak: 20%, English: 20%, German: 20%. Let us imagine a country B where German is the national language. The structure of the literature book production would be: German: 20%, others (translated languages) 80% with: Czech: 20%, Slovak: 20%, English: 20%, French: 20%. Both countries would have the same Stirling index, in spite of the proximity of most translated five languages to German, in case B, and of a wider distance between French and the others in case A. As Stirling Index does not depend on a referent language, it may not be totally reliable. We need another index that reflects not only the proportions of original languages and their reciprocal distances, but also the openness of a specific country, from the viewpoint of its own language, its ability to translate distant languages, reflecting diverse original cultures.

Therefore, we introduce another index of the class of the generalized distance ones, taking into account the distance between all the types or elements (the languages in our case study) weighted by their importance *and* the distance of each type to the referent (the national language). With this:

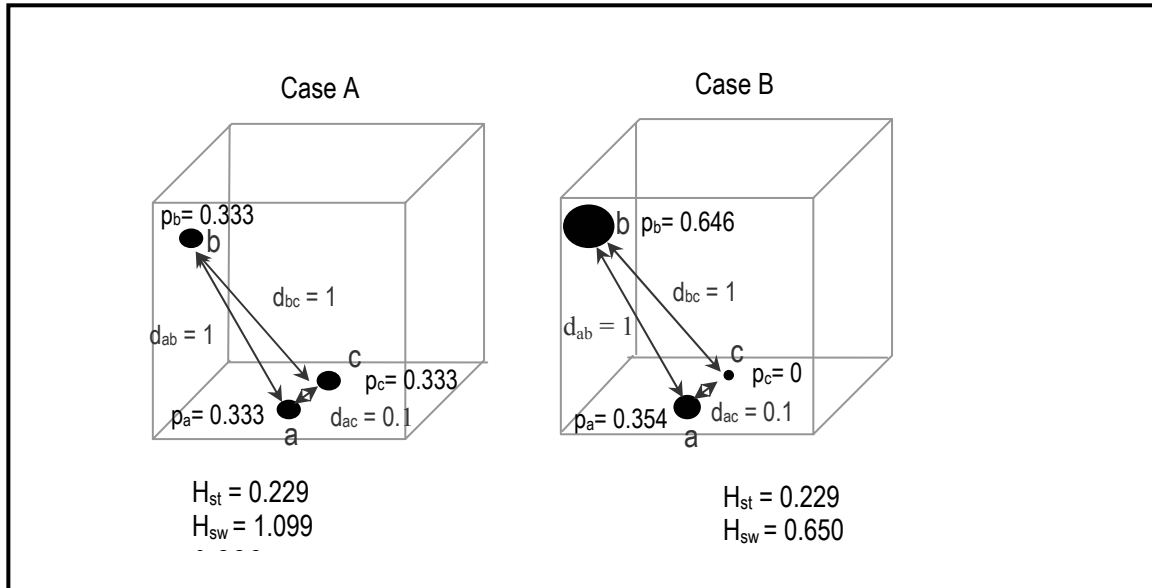
$$f_{ij} (\{d_{lk}, l, k \in \text{types}\}) = d_{ij} d_{ik} d_{jk} \quad \text{or all } i, j, \text{ with } k, \text{ fixed, the referent,} \quad (6)$$

and the corresponding index becomes

$$H_{BFP} = \sum_{i,j} d_{ij} d_{ik} d_{jk} p_i p_j, \quad \text{with } k, \text{ fixed, the referent.} \quad (7)$$

We mentioned before the lack of clear properties for Stirling's proposal. A major point has to do with the range of indexes for a fixed number n of objects. The Shannon-Wiener entropy, as known, achieves its maximum – equal to $\ln n$ - for the uniform distribution, a result which has a strong intuitive appeal, as well as many practical and theoretical implications. Even for fixed distances, something equivalent cannot be stated for H_{St} or for our alternative H_{BFP} . As shown in Box 1, two situations, characterised by fixed distances between three types (a, b, c) but strongly different in the probability distribution, could lead to the same value of the H_{St} . Although the Shannon-Wiener entropy without ambiguity shows that the diversity is higher in case A, use of Stirling's, as well as of our alternative, does not lead to a clear-cut conclusion.

Box 1



In more detail, for values of number of types (n) greater than two, H_{st} 's maximum is difficult to interpret, given its dependence on the set of distances. It is easy to see that by varying the distances, a wide spectrum of maximum values can be attained by the index⁶. Moreover, for a given set of distances, with 3 elements, the optimal probabilities may either be a corner solution, in the boundary of the simplex $\{ (p_1, p_2, p_3) \geq 0 \mid p_1 + p_2 + p_3 = 1 \}$, or indeed characterise a global maximum. Though in the latter case, the relative values of the probabilities follow some expected patterns, in both instances – particularly the former one - the solution bears a much less intuitive meaning.

Though nearly elementary, this may have disturbing consequences. On one hand, an important *and easy* reference value for assessing the diversity of a market or community with n types is lost. If we add the fact that the imposition of distances will be usually fraught with error, the meaning of the optimal frequencies for (2), (3) or (7) becomes even shakier. On the other hand, if one changes the target and fixes the probability distribution, (3) or (7) (or another member of class (4)) may provide insights on the impact of the different metrics implied by the (different) classifications used.

⁶ For a proof of this statement in the cases $n = 2$ and $n = 3$, see Flôres (2006).

3. Empirical Results and Discussion

In this part, we test the respective relevance of different indexes in the case of translations in literature. Proxies of diversity are not easy to define. We introduce a proxy that does not summarize all the dimensions of diversity, but that can be considered as a relevant sign of the openness of a given country to foreign cultures and authors. After a presentation of the data, we calculate the three indexes and show the contribution of the H_{BFP} to a more reliable evaluation of diversity.

Data

The number of titles translated come from the UNESCO's database⁷ that "contains cumulative bibliographical information on books⁸ translated and published in about one hundred of the UNESCO Member States since 1979 and totals more than 1.800,000 entries in all disciplines: literature, social and human sciences, natural and exact sciences, art, history and so forth. UNESCO provides the general public with an irreplaceable tool for making bibliographical inventories of translations on a worldwide scale. International cooperation makes the "Index Translationum" a work tool that is unique in the world"⁹. Each year, data are sent by the bibliography centres or national libraries in the participating countries to the UNESCO Secretariat bibliographical data on translated books in all fields of knowledge.

However, as Ginsburgh *et al.* (2008) underline, the UNESCO database is often criticized. Two main criticisms are usually addressed: (i) the definition of the book significantly differs among countries (some countries include doctoral dissertations, governmental, parliamentary and administrative documents, annual reports from firms, etc.)¹⁰, and (ii) the data show sharp fluctuations. We partly avoid both criticisms, since (i) we focus only on the predominant gender "literature" for which there is more agreement on the definition, (ii) and on the twenty OECD countries for which the collect of data is the most reliable and updated and (iii) we also withdrawn some data that appear as outliers. Note that Ginsburgh *et al.* (2008, p. 17), on a similar basis, choose to work on this data because, as Heilbron (1999) says, the "UNESCO source is the only international source that is readily available".

⁷ Data were collected on UNESCO's website at the following address:
<http://databases.unesco.org/xtrans/stat/xTransXpert.a?lg=1>.

⁸ The scope of the data is limited to books. Periodicals, articles from periodicals, patents and brochures are not included.

⁹ http://portal.unesco.org/culture/en/ev.php-URL_ID=7810&URL_DO=DO_TOPIC&URL_SECTION=201.html

¹⁰ Moreover, this definition may change in a given country. For example, France has widened the scope of the definition in 2005, by considering that geographical maps, tourist guides, music partitions, etc. should be considered as books (with a specific VAT rate).

Our sample includes 20 countries over 27 years (1979-2005), which should give 540 values per index. However, for several countries (the UK and Sweden for instance) some data are missing. Finally, 419 values have been calculated for each index. We selected seventeen languages representing the dominant (national) language of the set of countries studied (see Table 1). For each country, these languages always represent more than 80% of the literature books translated.

The measure of the distances between languages is based on the matrix of linguistic distances among Indo-European Languages proposed by Dyen *et al.* (1992)¹¹ (see Table 1).

Table 1 - The Dyen Matrix of Linguistic Distances

	Ck	D	Dk	E	F	G	Gr	I	Ice	Po	Pol	Ru	S	Slo	Sw
Ck	0	0.762	0.746	0.759	0.773	0.741	0.836	0.753	0.766	0.764	0.234	0.255	0.760	0.126	0.767
D	0.762	0	0.337	0.392	0.756	0.162	0.812	0.74	0.408	0.747	0.769	0.776	0.742	0.769	0.308
Dk	0.746	0.337	0	0.407	0.759	0.293	0.817	0.737	0.221	0.750	0.749	0.740	0.750	0.732	0.126
E	0.759	0.392	0.407	0	0.764	0.422	0.838	0.753	0.454	0.760	0.761	0.758	0.760	0.750	0.411
F	0.773	0.756	0.759	0.764	0	0.756	0.843	0.197	0.772	0.291	0.781	0.778	0.291	0.765	0.756
G	0.741	0.162	0.293	0.422	0.756	0	0.812	0.735	0.409	0.753	0.754	0.755	0.747	0.742	0.305
Gr	0.836	0.812	0.817	0.838	0.843	0.812	0	0.822	0.802	0.833	0.837	0.832	0.833	0.832	0.816
I	0.753	0.740	0.737	0.753	0.197	0.735	0.822	0	0.755	0.227	0.764	0.761	0.212	0.749	0.741
Ice	0.766	0.408	0.221	0.454	0.772	0.409	0.802	0.755	0	0.763	0.758	0.754	0.763	0.757	0.211
Po	0.764	0.747	0.750	0.760	0.291	0.753	0.833	0.227	0.763	0	0.776	0.773	0.126	0.760	0.742
Pol	0.234	0.769	0.749	0.761	0.781	0.754	0.837	0.764	0.758	0.776	0	0.266	0.772	0.222	0.763
Ru	0.255	0.776	0.740	0.758	0.778	0.755	0.832	0.761	0.754	0.773	0.266	0	0.769	0.259	0.754
S	0.760	0.742	0.750	0.760	0.291	0.747	0.833	0.212	0.763	0.126	0.772	0.769	0	0.756	0.747
Slo	0.126	0.769	0.732	0.750	0.765	0.742	0.832	0.749	0.757	0.760	0.222	0.259	0.756	0	0.758
Sw	0.767	0.308	0.126	0.411	0.756	0.305	0.816	0.741	0.211	0.742	0.763	0.754	0.747	0.758	0

Notes. Since Finnish and Japanese are not Indo-European languages, they are not described in this table. Due to their linguistic remoteness, these languages have been considered as very far from each other and to every language in the table. The linguistic distance, in any cases, was set equal to one. Ck = Czech, D = Dutch, Dk = Danish, E = English, F = French, G = German, Gr = Greek, I = Italian, Ice = Icelandic, Po = Portuguese, Pol = Polish ; Ru = Russian , S= Spanish, Slo = Slovene, Sw = Swedish.

¹¹ By comparison between 200 basic meanings, Dyen et al. estimated the linguistic distances for 95 Indo-European speech varieties (ie. languages and dialects). For our purpose, we only took the linguistic distances for the 15 dominant Indo-European languages of the 20 OECD countries of our sample. Since Finnish and Japanese are not Indo-European languages, they are not estimated. Given the strong difficulty to learn these languages for Indo-European population, we consider the linguistic distances between Japanese or Finnish to all other languages and between Japanese and Finnish to be maximum that is to say equal to one.

Based on lexicographic methods, the distance between two languages i and j is equal to the percentage of words in the two languages which do not descend from a common world. This distance, normalised, is comprised between 0 and 1. If the distance is close to 1, the two languages have completely different roots (for example, English and Japanese), and the distance is close to zero otherwise (like Slovak and Czech).

Basic Analyses

Tables A.1 to A.3, in the Appendix, provide basic statistics for the 20 series on each index. Notice that, as expected, H_{St} always dominates H_{BFP} , with the exception of Japan and Finland, when both coincide. Indeed, in both countries the referent is equidistant, with value equal to 1, to all translated languages¹². The sixty series are rather smooth, though more in the cases of the H_{SW} and H_{BFP} rather than for H_{St} . For this last index, differences between the minimum and maximal value can be more than four times, as in the case of Sweden. It is interesting that, over a period of 27 years, no shocks in the three diversities measured seem to have taken place.

The contribution of the H_{BFP} Index to diversity analysis

Does the H_{BFP} Index lead to a similar or a different evaluation of diversity than the Shannon and the Stirling indexes? Table 2 provides the average rank of the countries, for each index, over the whole period. We observe, as expected, that the hierarchy changes with the indexes, most dramatically as far as the H_{BFP} index is concerned. The Shannon and Stirling rankings are indeed nearly similar (the coefficient of correlation between them is equal to 0.924), with the five top countries and the five bottom ones (here with one exception, Denmark-Finland) coinciding. Hence, the mere introduction of the distances among translated languages does not change deeply the diversity rankings.

The average ranking with the H_{BFP} index leads to more significant changes. Table 2 shows that the average difference in the respective rankings is higher as soon as the H_{BFP} index is taken into account. Hence, though positive and significant, its correlations with the other two indexes are much lower (respectively 0.487 and 0.444). The most impressive differences in rankings concern Finland, Iceland,

¹² No Japanese authors were translated in Finland and vice versa.

Italy, Japan and Portugal. The case of the US deserves also an interpretation, since with the H_{BFP} index they lose the leading position.

Table 2 – Average rankings and differences among rankings (1979-2005)

Countries	Average Ranking H_{SW} [1]	Average Ranking H_{ST} [2]	Average Ranking H_{BFP} [3]	Differences of ranking of ranking between [1] and [2]	Difference of ranking of ranking between [1] and [3]	Difference of ranking of ranking between [2] and [3]
Austria	10.800	9.200	10.960	1.600	-0.160	-1.760
Czech Republic	8.000	8.308	5.462	-0.308	2.538	2.846
Denmark	11.885	11.038	15.115	0.846	-3.231	-4.077
East Germany	3.455	2.091	4.636	1.364	-1.182	-2.545
Finland	7.577	11.154	1.654	-3.577	5.923	9.500
France	11.346	11.462	8.500	-0.115	2.846	2.962
Germany	9.308	8.885	10.885	0.423	-1.577	-2.000
Greece	4.333	3.571	1.429	0.762	2.905	2.143
Iceland	6.571	10.048	13.810	-3.476	-7.238	-3.762
Italy	5.333	4.619	9.000	0.714	-3.667	-4.381
Japan	14.840	15.280	4.400	-0.440	10.440	10.880
Mexico	14.333	11.556	11.667	-2.778	2.667	-0.111
Netherlands	11.440	11.120	13.480	0.320	-2.040	-2.360
Poland	7.462	7.654	6.346	-0.192	1.115	1.308
Portugal	6.500	4.875	11.313	1.625	-4.813	-6.438
Slovak Republic	5.615	5.538	6.000	0.077	-0.385	-0.462
Spain	7.308	5.923	9.231	1.385	-1.923	-3.308
Sweden	13.182	13.909	14.818	-0.727	-1.636	-0.909
United Kingdom	2.455	3.455	4.727	-1.000	-2.273	-1.273
United States	1.042	1.333	2.667	-0.292	-1.625	-1.333
Average difference between rankings				1.101	3.009	3.218
Correlation				0.923***	0.487***	0.444***

*** significant at the 1% level. The coefficients of correlation are calculated on the whole sample of indexes data and not on the average ranks (though results would have been very close).

How can we interpret these differences? In the case of Finland, English represents the most part of the translations, an average of 66.5% over the period. The other languages are obviously underrepresented,

except Swedish and, to a lesser extent, German and French. The rank obtained with the H_{BFP} index results from the wide distance between the original language and the others (see Table 1, Notes) that keeps its value equal to that under Stirling's, while all the others go down. Though Italy does not translate many languages of the sample (8 languages are non present among the translations, and 4 of them reach 1% only), the balance between the 4 more translated languages is somewhat higher (English 57%, German 10%, French 17%, Spanish 6%). But distances to Italian are less important, therefore, the H_{BFP} rank is lower than those of the two first indexes. Japan is rather weakly open to diversity (81.7% English, 7.7% French, 5% German, three languages at about 1% – Spanish, Italian and Russian – and all the rest minor than 1%): its rank is 15 with the two first indexes, nevertheless, the introduction of the distances to the referent (always 1) allows Japan - as occurred with Finland - to reach a much better rank.

Hence, the H_{BFP} Index introduces a more accurate evaluation of diversity. Diversity does not depend only on the distance between the different pairs of languages. The three cases discussed show the combined effect of the weight of the distance between the different languages *and* the domestic language of the country studied. This helps assessing the openness of countries toward foreign *as well* distant cultures and languages. The example of the US bears evidence on this issue. The introduction of the distances between the English language and the other languages of the sample shows that the publishing sector is less open than what both the Shannon and Stirling approaches suggested. Indeed, the US top ranking according to both indexes lies in the balanced structure of translated languages: the dominant translated language – which is French – never exceeds 33% of market share.

The interpretation of the H_{St} and H_{BFP} indexes is not straightforward

As highlighted in section 2, contrary to the Shannon-Wiener index, the interpretation of the H_{St} and H_{BFP} indexes is much less intuitive. Two countries that obtain a close ranking according to the H_{BFP} index may display very different characteristics.

Let us take the example of Finland and the US. According to the H_{BFP} index both are very close, since their respective average rankings are 1.65 and 2.67 (see Table 2) and average indexes amount respectively to 0.150 and 0.123 (see Table A.3). However, when looking at the H_{SW} index a much more contrasted situation appears. The average ranking of Finland is 7.58 vs. 1.04 for the US (average H_{SW} indexes for both countries are respectively 1.26 and 2.09). Indeed, in Finland, as stressed above, the translated literature is dominated by two languages, English (with a market share just below 70%) and Swedish; languages considered as very distant from Finnish. The US case is strictly the opposite. The distribution

of translated languages is much more balanced, but the main languages are much closer to English. Here is the explanation of the closeness of the H_{BFP} index for both countries and their difference according to the H_{SW} index.

The evolution of cultural diversity over time

According to the Stirling and BFP indexes, for most countries, the level of diversity decreases over the period, bearing evidence of a trend toward more standardization and uniformity. The coefficient of correlation between both indexes and time is indeed negative for 15 countries in the case of H_{St} , and 16 for H_{BFP} ; out of these, 9 and 10, respectively, are significant at least at the 5% level (see Table 3). This overall trend is slightly more moderate as regards the H_{SW} , with 13 negative coefficients, 8 significant (at least at 5%). Sharp reversals in time behaviour are rare, and somewhat intriguing. An interesting one is the UK, where the positive significant trend of the H_{SW} and H_{BFP} becomes negative, though not significant, if use is made of Stirling's. The fact that such an effect is not observed with the H_{AI} index could suggest that some countries have an increasing trend to translate some literature books which original language is more and more distant from their home language.

Important countries consistently display the same decreasing (significant) trend for the three indexes: Finland, Iceland, Italy, Netherlands, Poland, Spain and the US. In Poland, the decrease could be due to Transition that was accompanied by a withdrawal in all the cultural activities, whatever their status (public or private) and their domain. We observe a decline in all cultural consumptions, due to a rise in prices, a fall in subsidies and a new interest for US cultural goods and services. As for Spain, the explanation of the drop for the three indexes lies in the raise of English (from 55.7% in average market share over the period 1979-83 to 66.7% over the period 2001-2005) mainly at the expense of French. This concentration effect dominates the fact that English is more distant from Spanish than French. Let us now consider the US case. The decrease of the three indexes over time is due to an increase of French, the already dominant translation language (from 25.7% in average over the period 1979-83 to an average of 32.3% over the period 2001-2005), Spanish (from 9% to 13.7%) and to a lesser extent of Italian (from 6.5% to 9.9%), at the expense of more distant languages: Japanese (dropped from 7.9% to 1.8%) or Russian (from 11.4% to 8.8%).

Conversely, in France, for instance, diversity tends to increase with time (though not significantly with the H_{SW}). Comparison of the different indexes for France is especially insightful. The fact that the H_{SW} index doesn't change much with time whereas both other indexes increase suggests an increased market

share for languages more different from the other translated languages and also more distant from French. Hence, whereas over the period 1979-1983, the average market shares of English, German and Japanese were, respectively, 76.2%, 9.7% and 0.8%, these figures amounted to 74.5%, 5.3% and 6.2% over 2001-2005. The raise of Japanese literature at the expense of English and German literature explains the increase of the distance index(es) for France.

Table 3. Correlations between indexes and the number of titles translated,
the population and time

Correlation coefficient	H _{sw} /titles	H _{st} /titles	H _{BFP} /titles	H _{sw} /pop	H _{st} /pop	H _{BFP} /pop	H _{sw} /time	H _{st} /time	H _{BFP} /time
Total	-0.306***	-0.311***	-0.259***	0.409***	0.351***	0.308***	-0.307***	-0.295***	-0.070
Austria	-0.517***	-0.497***	-0.482**	0.600***	0.474**	0.454**	0.499***	0.354*	0.332*
Czech Rep.	0.011	-0.142	-0.406	-0.772***	-0.650**	-0.357	0.827***	0.715**	0.462
Danemark	-0.702***	-0.459**	-0.312	-0.943***	-0.516**	-0.306	-0.880***	-0.467**	-0.096
E. Germany	-0.546*	-0.163	0.853***				0.563	0.561	-0.551
Finland	-0.209	-0.296	-0.296	-0.760***	-0.738***	-0.737***	-0.587***	-0.559***	-0.559***
France	-0.170	0.215	0.502***	0.048	0.385*	0.551***	0.064	0.430**	0.621***
Germany	-0.299	-0.382	-0.410	-0.313	-0.294	-0.142	-0.346	-0.447	-0.354
Greece	-0.190	-0.417*	-0.423**	-0.308	-0.484**	-0.481**	-0.317	-0.525**	-0.527**
Iceland	0.425**	0.380*	0.338	-0.838***	-0.842***	-0.548***	-0.827***	-0.833***	-0.539***
Italy	-0.309	-0.388*	-0.265	-0.625***	-0.677***	-0.776***	-0.531**	-0.605***	-0.672***
Japon	-0.333*	-0.446**	-0.446**	-0.329*	-0.478**	-0.478**	-0.251	-0.383*	-0.383**
Mexico	-0.481	-0.532	-0.407	-0.263	-0.199	-0.407	0.006	-0.113	-0.036
Netherlands	-0.613***	-0.758***	-0.719***	-0.769***	-0.894***	-0.866***	-0.780***	-0.907***	-0.881***
Poland	-0.900***	-0.908***	-0.917***	-0.870***	-0.850***	-0.829***	-0.896***	-0.896***	-0.877***
Portugal	-0.091	-0.387	-0.640***	-0.015	-0.458*	-0.487**	0.123	-0.211	-0.677***
Slovak Rep.	0.000	0.288	0.626**	0.238	0.003	-0.038	0.382	0.030	-0.188
Spain	-0.193	-0.376*	-0.250	-0.635***	-0.682***	-0.488***	-0.663***	-0.730***	-0.528***
Sweden	0.567*	0.886***	0.896***	-0.498*	-0.784***	-0.703**	-0.298	-0.626*	-0.526*
UK	-0.222	0.226	0.011	0.607**	-0.402	0.417	0.712***	-0.185	0.611**
United States	0.413**	0.392**	0.431**	-0.732***	-0.793***	-0.731***	-0.712***	-0.781***	-0.711***

*significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

Further discussion of the results

Though it is beyond the scope of this paper to study the determinants of the diversity values, we provide hereafter some further elements of interpretation. We analyze the potential links between diversity and the size of the country, in terms of population¹³, and between diversity and the number of titles translated.

In developed countries, like those belonging to our sample, the size of the population should affect positively the level of diversity. Indeed, the larger the size of the population, the larger niche markets constituted of readers interested in foreign literature very distant from the domestic one. Furthermore, minorities and migrants – often over-represented in large Western countries – constitute another source of the development of profitable niche markets. All three diversity indexes, if one considers totals, are positively and significantly correlated with the size of the population (see Table 3), suggesting that, as expected, uniformisation tends to be lower in large countries¹⁴.

It turns out that the values of the diversity indexes are correlated to the number of titles translated from a foreign language (including languages that are not in our sample). Oddly enough, this correlation is predominantly negative and significant for the three indexes (see Table 3).

The negative correlations lead to qualify the high level of diversity of countries that translate a low number of titles of foreign literature. Indeed, as shown in Table 4, for all indexes, the four leading countries always translate a low number of titles. Hence, both the number of titles translated and the three diversity indexes contribute to the diversity analysis. Do notice that had the data on the whole number of titles of literature published in each country (domestic and translated) have been available, this correction of the diversity indexes by the number of titles translated would have been taken into account by the diversity indexes themselves.

¹³ The data on population comes from the World Bank database.

¹⁴ Do notice that this result, as regards ‘total’, still holds even if the US are withdrawn from the sample.

Table 4 – Average diversity indexes, average number of titles translated and average population over the period.

Countries	Average H_{SW}	Average H_{St}	Average H_{BFP}	Nb. of titles translated	Population (in millions)
Austria	1.081	0.164	0.052	160	7,797
Czech Republic	1.145	0.154	0.081	1782	10,276
Denmark	0.953	0.147	0.029	1275	5,210
East Germany	1.984	0.276	0.111	480	na
Finland	1.262	0.150	0.150	866	5,018
France	1.075	0.140	0.063	3349	56,908
Germany	1.165	0.160	0.050	4480	81,798
Greece	1.430	0.219	0.153	447	10,445
Iceland	1.317	0.155	0.037	198	0,258
Italy	1.313	0.198	0.057	861	57,086
Japan	0.766	0.103	0.103	1621	123,330
Mexico	0.941	0.146	0.046	159	80,996
Netherlands	1.084	0.150	0.037	1614	15,133
Poland	1.448	0.195	0.086	1036	37,830
Portugal	1.313	0.206	0.051	408	10,012
Slovak Republic	1.248	0.175	0.080	311	5,374
Spain	1.255	0.186	0.056	3690	39,234
Sweden	1.095	0.132	0.034	1116	8,424
United Kingdom	2.016	0.266	0.110	390	56,729
United States	2.094	0.274	0.123	490	255,472

na : non available

Let us now consider back the negative correlation between diversity indexes and the number of titles translated on a country basis (we focus on countries that obtain homogeneous results whatever the diversity index considered). We would expect that diversity increases when the number of titles translated grows. Yet, for countries like Austria, Netherlands or Poland, when translations are more numerous, some languages seem to grow in importance. We can assume, among different hypotheses, it to be due to learning effects that induce readers to be more interested in the foreign literatures that they have already discovered and learnt to understand. Familiarity would create a propensity to be interested in novels that are translated from close languages.

Conversely, the US case fits with expectations¹⁵ (see table 3). Naturally, there is no effect of the domination of the English language among the languages translated in this country. The US are not concerned by the polarization generally observed between American and domestic cultural products (Cohen and Verdier, 2008). Therefore, translations are spread among a relatively wide range of languages. Moreover, the peculiarity of the structure of the population, with a wide variety in the origins of the population, and an important proportion of the population whose native language is not English, is a strong ground for diversity.

4. Concluding remarks

Measuring cultural diversity is less easy than it may seem, demanding key conceptual decisions and careful statistical procedures. It is a stake in the implementation of cultural policies, but also in order to better understand the process of globalization. We have shown that, in the context of our study, the combination of different indexes provides better information on the degree of openness of a country to different cultures. The H_{BFP} Index, by taking into account variety, balance and distances not only among languages but also among translated languages and the domestic language, seems to be the most satisfying approach. However, a caveat is evident: diversity analysis is a tricky field and, usually, one measure of diversity won't be enough. Complementary ideas, like polarization might also be useful.

The paper emphasizes only the supply side. Further analysis should introduce the demand side: diversity in supply does not necessarily lead to the consumption of a wide diversity of goods and services; complementary research is necessary in order to investigate the scope of demand for diversity. It should consist in the measure of the diversity consumed (Van der Wurff R. and J. Van Cuilenburg, 2001, Benhamou and Peltier, 2007) and address the correlation between the diversity supplied and the diversity consumed. Notwithstanding, in all empirical studies, a partial or general (market) equilibrium hypothesis would be implicit. This adds further questions on how to know the actual supplied and demanded diversities.

In spite of a plea for 'higher diversity' in different contexts – in the movie and music markets, in the printing media, in the expression of local cultures/communities, in the right to post any kind of content in the web – there is no idea whatsoever on the desired levels of diversity. We still ignore the actual *level* desired for diversity, something that must urgently be addressed. More generally speaking, we highlight the ignorance on optimal diversity levels. One may question the necessity to have an optimal diversity

¹⁵ We ignore the case of Sweden because of too many missing data for this country.

value, but indexes should help on finding this. Unfortunately, one of the problems plaguing most applications is the lack of interpretative content of the indexes themselves. Reference values – though not necessarily “optimal” ones - would be of great use. The absence of clear, sensible upper bounds for the indexes, when we depart from the equally-distant-types assumption of Shannon-Wiener’s world, makes things even more difficult. Ranking diversities in different settings, as we did in this paper, may be a proxy way to tackle the problem. Comparative studies, using the same set of indexes, are them a must.

We also need to establish links between cultural diversity and measurable properties or services. Relevant further research should collect data on the potential determinants of diversity. Beyond the basic influence of the size of the population (and titles, in our case), we can underline the level of economic development, the existence of ex-colonialist links, sharing of a common frontier or a common language, the geographical distance between countries, towns or other units related to the types, the proportion of migrants, etc. Regressions could help in identifying stylized facts on the roots of diversity.

Finally, time also plays a major role. In this paper we started a very coarse time series analysis of the evolution of diversity. This line should be pursued, trying to relate the series properties to events influencing diversity. In particular, series in which shocks either to the distribution of preferences, or to the structure of supply have taken place, could help in better understanding the relations discussed in the previous paragraph.

Acknowledgements

We are indebted to Andrew Stirling for discussions and detailed comments on matters in section 2. Though his points were partially taken into account, the authors remain solely responsible for the whole text. Thanks also go to Jacques Olivier, for insightful comments, and the participants at the CEPR/PSE Conference on Models of Cultural Dynamics and Diversity, Paris, December, 2008.

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Appendix: basic statistics for the three indexes.

Table A.1: The Shannon-Wiener index (H_{sw})

Countries	Average	Standard Deviation	Median	min	max
Austria	1,081	0,381	1,046	0,721	1,724
Czech Republic	1,145	0,159	1,107	1,016	1,349
Denmark	0,953	0,534	1,188	0,456	1,337
East Germany	1,984	0,032	1,980	1,923	2,056
Finland	1,262	0,026	1,295	0,928	1,482
France	1,075	0,054	1,078	0,880	1,419
Germany	1,165	0,028	1,156	0,958	1,581
Greece	1,430	0,384	1,424	0,972	1,785
Iceland	1,317	0,352	1,332	0,905	1,568
Italy	1,313	0,020	1,317	1,132	1,475
Japan	0,766	0,173	0,747	0,568	1,039
Mexico	0,941	0,073	0,928	0,641	1,175
Netherlands	1,084	0,126	1,070	0,810	1,688
Poland	1,448	0,658	1,104	0,963	2,147
Portugal	1,313	0,026	1,305	1,196	1,425
Slovak Republic	1,248	0,174	1,280	1,093	1,474
Spain	1,255	0,053	1,254	1,102	1,429
Sweden	1,095	0,094	1,089	0,950	1,201
United Kingdom	2,016	0,106	2,018	1,927	2,099
United States	2,094	0,224	2,104	1,836	2,273

Table A.2: The Stirling index (H_{st})

Countries	Average	Standard Deviation	Median	min	max
Austria	0,164	0,038	0,155	0,113	0,249
Czech Republic	0,154	0,015	0,147	0,140	0,178
Denmark	0,147	0,003	0,145	0,118	0,173
East Germany	0,276	0,002	0,275	0,270	0,282
Finland	0,150	0,003	0,153	0,106	0,177
France	0,140	0,010	0,143	0,106	0,183
Germany	0,160	0,007	0,160	0,128	0,225
Greece	0,219	0,051	0,222	0,184	0,256
Iceland	0,155	0,061	0,153	0,102	0,189
Italy	0,198	0,008	0,199	0,166	0,223
Japan	0,103	0,038	0,099	0,075	0,157
Mexico	0,146	0,005	0,147	0,089	0,188
Netherlands	0,150	0,059	0,144	0,105	0,219
Poland	0,195	0,096	0,146	0,120	0,285
Portugal	0,206	0,022	0,211	0,181	0,226
Slovak Republic	0,175	0,012	0,174	0,142	0,203
Spain	0,186	0,008	0,187	0,161	0,212
Sweden	0,132	0,075	0,142	0,035	0,152
United Kingdom	0,266	0,002	0,265	0,258	0,278
United States	0,274	0,042	0,277	0,230	0,295

Table A.3: The Benhamou-Flôres-Peltier index (H_{BFP})

Countries	Average	Standard Deviation	Median	min	max
Austria	0,052	0,011	0,049	0,036	0,079
Czech Republic	0,081	0,003	0,079	0,075	0,090
Denmark	0,029	0,007	0,028	0,021	0,043
East Germany	0,111	0,008	0,112	0,100	0,119
Finland	0,150	0,003	0,153	0,106	0,177
France	0,063	0,013	0,061	0,047	0,091
Germany	0,050	0,002	0,049	0,039	0,075
Greece	0,153	0,035	0,156	0,129	0,179
Iceland	0,037	0,014	0,036	0,024	0,051
Italy	0,057	0,004	0,056	0,046	0,066
Japan	0,103	0,038	0,099	0,075	0,157
Mexico	0,046	0,004	0,046	0,031	0,061
Netherlands	0,037	0,014	0,034	0,027	0,056
Poland	0,086	0,022	0,079	0,063	0,111
Portugal	0,051	0,012	0,050	0,041	0,066
Slovak Republic	0,080	0,000	0,079	0,066	0,091
Spain	0,056	0,002	0,056	0,047	0,065
Sweden	0,034	0,023	0,037	0,004	0,042
United Kingdom	0,110	0,006	0,111	0,097	0,118
United States	0,123	0,016	0,125	0,102	0,142

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