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## A tool to translate scores across different systems

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### Abstract

One of the main consequences of the globalization process of education is the mobility of students between different countries. It is vital for the success of mobility programs that the work done by a student could be easily accredited in other countries. Calculation of equivalences is also crucial in any competitive process in which one has to compare average scores across all candidates.

This paper presents a general method to translate scores based on the percentile distribution of grades achieved by students in the different countries. The objective is to provide a tool to assess a student's academic record regardless of the evaluation system, avoiding imbalances in student scores from different countries. The method is illustrated with an application, where equivalences are obtained between two different grade systems. The question of whether areas of knowledge should be considered is also addressed. This method could be easily extended to any country where information about distribution of grades is available.

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### 1. Introduction

Nowadays, and even more in the future, university students may spend part of their educational journey in a university away from their home country. This situation has special relevance in Europe, with the creation in 1999 of the European Higher Education Area (EHEA) and the use of a single measurement system (European Credit

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Transfer System, ECTS). Since the rating systems of the countries are distinct, it is essential to make an equivalence with the objective that no changes to the values occur in the scores of students participating in mobility programs and, therefore, in the final average mark of their academic records. The fair and proper interpretation of the various grading systems is an important issue not only for students (participating in a mobility program, applying for a place or a grant in higher education institutions) but also for university staff who must assess their records. Although there is a large and varied set of formulas, they often forget the complexity of such processes. As mentioned in Haug (1997), 'foreign grades are not just numbers that can be calculated by applying a mathematical formula.... Simple mathematical formulas with their claim to universality are nothing but a fallacious over-simplification of a reality they fail to capture.'

This paper presents a statistical method for the calculation of equivalent scores in different assessment systems, based on the comparison of the percentage distribution of grades. This idea follows the theory developed in Linn (1993) and in Petersen, Kolen and Hoover (1993) related to the process generally known as equating, and more specifically the idea of equipercentile equating (Angoff 1984). As described in Kolen (1984) this is a two-stage process where relative cumulative frequency distributions are tabulated, and then scores with identical relative cumulative frequencies are equated. Although the problem to solve is complicated, this idea is simple and the application of our methods only requires the knowledge of the frequency distribution of grades in each country considered. It works with all types of scales, not only numerical, but also qualitative although obviously, one thing they all have in common is their ordinal nature. Our objective is to show an easy way to implement these techniques and to encourage administrators and teaching staff to make use of these tools in their institutions. To illustrate this method, an example is developed, in which equivalences are obtained using as a reference a numerical scale from 0 to 10, with one decimal place. We have taken this system since it is a very common scale.

Finally, the question of whether we should consider the areas of knowledge is considered. We conclude that there are differences between the records of students in terms of the scientific area and, therefore, this variable should be taken into account in the method.

## **2. Methodology**

Suppose we have a rating system A (source system), this could be the rating system used in any country, with any type of scale; on the other, we have a rating system B (reference system) which uses a numerical scale. The information available on these two rating systems can be summarized through the distribution of frequencies of the different points of the scales. These distributions are often available either from the Education Departments of the countries considered or online in pages as the World Higher Education Database (WHED). The question is how to calculate the equivalent of grades obtained in the system A to the system B so that a credit rated with a specific point of the scale used in system A corresponds to a credit rated with an "equivalent grade" of system B. Our proposal is based on the statistical concept of quantile, a generalization of the well-known concept of quartile (see for example p. 74 in Clarke and Cooke, 2004). Given a certain grade in system A, this corresponds to a specific quantile of the distribution of frequencies (A). Its equivalent grade in system B will be the grade assigned to the same quantile in the distribution of frequencies (B). Our method is in fact a search for the quantile equivalent position in another system.

The rigorous theoretical formulation is contained in Appendix 1. This appendix contains the necessary technical notation and all the details of the methodology. In spite of providing all this information, we strongly believe that reading it is not necessary in order to neither understand nor apply the method. The reading of the example in the following section should be enough to apply the method. This means that, although the formulation of the methodology is complex, the application of the method is simple and affordable for any individual even without specific training in quantitative methods.

## **3. Application**

We will use real data corresponding to Spain, one of the countries where this scale is used. More specifically, a sample of 819 records of students who have applied for different grants to the Spanish Ministry of Education has been used. In this sample, 236634 credits have been graded, each one with a number from 5.0 to 10.0. The results are shown in Table 1.

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