Convergence versus divergence between European countries: the case of higher education systems

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Cet article a pour but de synthétiser et de comparer les principales tendances d’évolution des systèmes d’enseignement en Europe entre 1970 et 1990. Par le biais d’analyses en composantes principales et d’échelonnement multidimensionnel, on met en évidence deux axes principaux permettant de comparer, sur une base commune, l’évolution des systèmes d’enseignement supérieur de sept pays européens (RFA, Suisse, Finlande, Italie, Norvège, Pologne et Hongrie): une tendance à la massification de l’enseignement supérieur ainsi qu’un accroissement de l’engagement de l’État et une plus grande professionalisation. Trois groupes de pays peuvent être distingués. Le premier groupe, formé par la RFA, la Finlande et la Suisse connaît l’évolution la plus favorable en terme de participation accrue, de professionalisation et de soutien étatique. Le deuxième groupe, constitué de l’Italie et de la Norvège se distingue du premier groupe par une moindre professionalisation et un engagement moins important des pouvoirs publics. Finalement, les évolutions de la Pologne et de la Hongrie mettent en évidence un rapprochement de leurs systèmes d’enseignement supérieur vers les modèles prévalant en Europe occidentale (avec un certain retard dans le cas de la Hongrie).

Introduction

The cross-countries evolution of higher education systems has often been investigated by social scientists. They have highlighted some internationally wide common trends: democratization of access and increased enrollments (LEVY-GARBOUA, 1976; BOUDON, 1988; MASSIT-FOLLEA and

1 We would like to thank F. Thys-Clément, J. Nagels, A. de Palma, E. Ronchetti and J.E. Denis, as well as two anonymous referees for helpful suggestions.

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The existence of these internationally wide common trends suggests the relevance of analyzing the overall convergence, if any, among European higher education systems. This topic is particularly important in a context of increased economic and political integration at the European level. As far as education is concerned comparative studies are not unusual (see for instance, SCHRIEWER and HARNEY, 1988; OECD, 1989, MASSIT-FOLLEA and EPINETTE, 1992 and JALLADE, 1992). However they are mainly centered around one or two specific dimensions and never explicitly provide a global integrative comparison of educational systems in a dynamic perspective.

In this study we intend to provide an overall picture of the patterns of evolution of higher education systems in Europe, using data analysis techniques usually employed in clustering countries. Our main goal is therefore to highlight broad direction of change in higher education systems in Europe. We aim at showing, in a synthetic and quantiative way, the various elements separately stressed by various authors up to now. By the way, we intend to emphasize on the management of change. Even if our approach is narrowly quantitative, we will try to integrate, as far as possible, institutional peculiarities in the discussion of our results.

Moreover, our approach is essentially positive (in opposition to normative studies). It does not rely on any assumptions regarding the goals that higher education should serve (as is the case with performance indicators, see JOHNSTONE, 1981)

On the contrary, it emphasizes objective movements, enabling policy-makers to assess the relative position of the education system they govern within an international context.

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3 Our goal is not to link those evolutions with global economic changes in those countries (see for instance DEMEULEMEESTER and ROCHAT, 1995).
The structure of this paper is the following: after the presentation of our data sets and a brief summary of the empirical methodology in section II, we turn to the analysis of our results. The last section is devoted to some concluding remarks.

Data and Empirical Methodology

Our data set is drawn from the Unesco Yearbooks and consisted initially of all the variables related to higher education, i.e. variables representing mainly the responsiveness of students choices to the needs of the economy, the public finance issue, the R&D aspects and the democratization of higher education. Data were collected for five time periods: 1970, 1975, 1980, 1985 and 1990 and were initially related to all European countries.

However, a substantial number of missing observations along the period studied and among the countries resulted in the decision to keep 14 variables and 7 countries: Italy, Germany, Switzerland, Finland, Norway and Poland and Hungary. Such a reduced set of countries seems to us a priori nevertheless representative of quite different economic and socio-political systems in Europe. Moreover, as far as the classification of higher education systems between unitary or binary structure is concerned (JALLADE, 1992), Germany, Switzerland, Norway, Hungary are characterized by a binary system, i.e. coexistence of a university and a non-university sectors; whereas Italy, Finland, and Poland have a unitary system, universities dominating the higher education scene. The 14 original variables were TI, TIF, NBET, NBETF, DPG, DPENS, DP, RMED, RDING, ING, PROF, RENT, MED, ENC (see Table 1 in appendix for the list and definition of these variables). TI and TIF represent the percentage of a class age 20-24 enrolled at higher education institutions (all students and female).

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4 Although this data base has its own shortcomings, it allows us to include some Eastern European Countries in the analysis (OECD data sets do not allow that).

5 And after careful examination of the changes of those variables over time and across countries.

6 And quite homogenous in terms of economic development. That is the main reason why we excluded USSR from this sample.

7 We rely here upon UNESCO data sets which provide us with reliable statistics for the purpose of systematic international comparisons (limits of class age taken into consideration are accommodated to the specificities of the various countries).
NBET and NBETF measure the number of students (all and female) enrolled at higher education institutions relative to the number of inhabitants (students per 100 inhabitants). DP measures the percentage of ordinary public expenditures\(^8\) devoted to higher education in the GDP, whereas DPG gives the proportion of all ordinary public expenditures devoted to higher education\(^9\). Finally, DPENS gives the percentage of overall public ordinary expenditures on education devoted specifically to higher education. ENC is the students per teacher ratio. RMED and RDING indicates the proportion of engineers and scientists employed in R&D activities within higher education institutions affected to respectively medical and engineering research. Finally, four variables give a measure of the students choice: the percentage of students enrolled in disciplines orientated to future teaching and research activities (Humanities, Natural Sciences, Education) (PROF), in Engineering (ING)\(^10\), in Medicine (MED) and in rent-seeking activities as financial analysis, law or other services\(^11\) (students in Law, Business, Economic and Socio-Behavioral Sciences, RENT, see MURPHY, SHLEIFER and VISHNY, 1991).

This set of variables has then been reduced to avoid variable redundancy by means of usual data analyses which led us to keep 8 of those variables. The methodology that we applied is similar to the one recently used by CRAIG and al. (1992) -in a study of convergence in the macro-environments of industrial countries- and is conceptually quite usual in marketing and business literature (especially when international comparisons are concerned, see RONEN and SHENKAR, 1985; DAY, FOX and HUSZAGH, 1988; or DOUGLAS and CRAIG, 1991).

Formally, it consists of keeping the top loading variable of the principal components retained in principal component analyses\(^12\) performed for each of the

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\(^8\) Following UNESCO yearbook, public current expenditures on education encompass the following components: administration other than personnel; emoluments of administrative staff, teaching staff and other personnel; teaching materials; scholarships; welfare services; subsidies not distributed and other expenditures.

\(^9\) By the way, we decided to focus on the real effort of the states regarding higher education notwithstanding the weight of the public debt (and its consequences on real economy and the structure of public budget).

\(^10\) Respectively labelled later in this paper as prospective teachers and prospective engineers.

\(^11\) However, such activities can also be growth promoting, whenever they reduce transaction costs in the economy (NORTH, 1990).

\(^12\) With a number of components explaining at least 80% of the total variation (see EVERITT and DUNN, 1983).
five years studied. The 8 variables retained were the following (see Table 2 in appendix): TI, NBET, DPG, DPENS, ING, PROF, ENC, RDING. They pertain to various aspects of higher educational systems, i.e.: the choices actually made by students for various groups of disciplines, the effort of each nation towards higher education, the participation rate in higher education and the training staff in higher education.

Finally, a dissimilarities matrix (based on euclidean distance) for these 8 variables over the whole period was calculated and served as input to a multidimensional scaling routine (ALSCAL, see TAKANE et al., 1976). Following KRUSKAL and WISH (1991), two dimensions were retained for the analysis and the Kruskal coefficient of stress obtained (equal to 0.118) is quite fair (see KLAHR, 1965 or CHURCHILL, 1991).

This provided us with an easily understood basis for the discussion of the relative movements of the countries relative to the retained set of variables, as it allowed us to identify the intertemporal dimensions along which the various educational systems evolve. This is the main contribution of this study compared to other quantitative works aiming at clustering countries by comparing educational characterics\(^\text{13}\).

**Results and Discussion**

The results of the multidimensional scaling analysis are presented in figure 1 in appendix\(^\text{14}\). A careful sensitivity analysis led us to interpret the first (vertical) dimension as an axis corresponding to a concept of increased participation in higher education (higher TI when moving upwards).

\(^{13}\) See notably, JOHNSTONE (1977, 1981).

\(^{14}\) The lack of continuous observations for all our variables impeded us to work on average multiannual data. This might explain some atypical positions but does not jeopardize the general observed trends at all.
The second (horizontal) dimension might be interpreted as an axis towards increased public effort in favor of higher education (higher proportion of the public ordinary expenditures on education devoted to higher education), decreased students per teacher ratio and, in the meantime, a higher proportion of prospective engineers (i.e. more professionalization), when moving leftwards. Those two axes divide the space in four regions:

![Diagram](image)

The first one (A) corresponds to a low participation rate, low state involvement in higher education, and weak professionalization (weak proportion of engineers among students enrolled), i.e. a traditional academic model (Schils, 1992). All of the Western countries analyzed in this paper lie in this zone in
1970. The opposing model, the new academic model characterized by increased participation rates (i.e. democratization of access, or massification, see LEVY-GARBOUA, 1976; BOUDON, 1988), higher state commitment and greater responsiveness to the actual needs of the economy (i.e., producing more engineers), corresponds to zone D. We find here only some of the Western countries studied in 1970, and none of the Eastern countries. Zone B corresponds to low participation rates but high state commitment and a great proportion of prospective engineers. We find here all the Eastern European countries in 1970. Finally, zone C corresponds to increased participation, but low state commitment and low responsiveness to the productive needs of society. Some of the Western European countries considered in this study (Italy, Norway) are found in this zone in 1990.

*Evolution of the Eastern European countries*

In 1970, Eastern European Countries (Poland and Hungary) clearly constituted a common group, lying entirely in zone B. They were characterized both by a high state commitment towards higher education (in Hungary, 22.3% of the ordinary public expenditures on education devoted to higher education, 18% in Poland), a form of malthusianism\(^{15}\) (low participation rates: 10.12% in Hungary and 14.12% in Poland in 1970), but a greater (planned) responsiveness to the economic needs of society than Western countries. Indeed, during the seventies, higher education was severely biased towards engineering education (34.11% and 30.47% of prospective engineers in Hungary, 26.34% and 29.7% in Poland in, respectively, 1970 and 1975). This fact can be linked with the strategy of economic development carried out in Eastern Europe, following the model of Soviet-Union (see LANDAU and TOMASZEWSKI, 1985). Industry received all the attention (at the expense of agriculture) and, within industry, those sectors producing investment goods (for example steel and iron industry) were privilegated\(^{16}\).

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\(^{15}\) As RUPNIK (1992) points out: «while Western countries have experienced a considerable expansion of their university populations since the middle of the sixties corresponding to the new needs of a modern economy and society, the Eastern system has remained altogether Malthusian».

\(^{16}\) Through various channels (entrance examinations, numerus clausus favouring engineering departments...).
During the eighties both Poland and Hungary seemed to have modified their rigorous educational policy (see HALASZ, 1987 for the Hungarian case or MINK and SZUREK, 1995 for Poland). The proportion of prospective engineers among students dropped, first in Hungary (from 30.47% in 1975 to 11.33% in 1980), and afterwards in Poland (from still 26.39% in 1980 to 15.7% in 1985). This might be related to a weakening of the overall educational planning policy anticipating thereby the future overall change of political regime. This interpretation seems particularly true in the Hungarian case. Indeed, as far as the evolution of the global Hungarian educational system is concerned, BATHORY (1994) pointed out that «efforts to modernize the Hungarian system of education started in the late 1970s. Decentralizing educational administration and giving more autonomy to schools (...) constituted the major goals of that reform movement». Fortunately, Hungary and Poland seem to preserve their effort toward R&D in engineering in higher education institutions.

However, if this shift towards decentralization of choices seems to be common to both countries, some divergences appeared as soon as the early seventies. Hungary tended to continuously move towards a traditional Western academic model (characterized both by reduced participation rate and more prospective teachers, i.e. evolution from zone B to zone A). The decrease in the participation rate (from 15.5% in 1985 to 14.9% in 1990) is particularly worrying. BATHORY (1994) noted that, in terms of number of students per 100,000 inhabitants, «only Albania and Romania are lower on this indicator». Moreover, we cannot distinguish any shift towards more professionalization, as the proportion of prospective engineers among students enrolled (9.5% in 1990) is the lowest of all the countries we analyze.

Poland, on the other hand, remained in zone B. But, from 1985 onwards, its evolution was better than the Hungarian one, tending to close the gap with the positive evolution of Finland, Germany and Switzerland. Participation rates increased to 22% in 1990, while the percentage of total ordinary public expenditures on education devoted to higher education remained at 22% in 1990. Moreover, the proportion of prospective engineers (14.3%) appears to be as high as in

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17 In 1985 already, a new Educational Act was passed along those new lines (HALASZ, 1987).
18 In 1990, the Hungarian higher education institutions and the Polish ones respectively allocated 17.2 % and 26.8 % of their engineers and scientists to research in engineering and technology.
Switzerland in 1990. Thereby, Poland might well reach zone D in the near future (see MINK and SZUREK, 1995).

Trends of evolution among Western countries

All of the Western countries investigated (Italy, Federal Republic of Germany, Switzerland, Finland and Norway) seem to face a notorious change (north-westwards on the graphical display) in the functions of their higher education systems. The trends northwards clearly corresponds to an increased participation level. This democratization of access, at least in a macro perspective\textsuperscript{19}, seems to be common to all of the countries investigated (most particularly pronounced for Norway -from 15.9% in 1970 to 41.9% in 1990- and Finland -from 13.34% in 1970 to 46.8% in 1990).

The movement leftwards (westwards) is driven by various forces. On the one hand, it is linked with a growing state commitment towards higher education, characterized by an increased relative financing (proportion of public educational ordinary expenditures devoted to higher education). In this respect, the most remarkable evolution is Finland (from 9.8% in 1970 to 18.7% in 1990)\textsuperscript{20}.

On the other hand, as already pointed out in the case of the Eastern countries, a leftwards evolution reflects increased professionalisation of higher education (see on this topic MASSIT-FOLLEA and EPINETTE, 1992 as well as JALLADE, 1992). Such a pattern is characterized both by a higher proportion of prospective engineers and a decreased proportion of prospective teachers among students enrolled\textsuperscript{21}. This trend towards vocationalism has also been observed in specific country studies by PRATT (1992) in the United Kingdom and by

\textsuperscript{19} Due to the lack of more disaggregate data, we can not be sure that this macro movement is really concomitant to an equivalent increase in participation rates of all social classes. Indeed, various empirical studies (see DONNI and PESTIEAU, 1995 for Belgium and BIRR and PFEFFERKORN, 1995 for France) highlighted some form of social reproduction in higher education (BOURDIEU and PASSERON, 1970).

\textsuperscript{20} Moreover, all these countries know a reduced students-per-teacher ratio (contrarily to Poland and Hungary, explaining their eastwards movement on the graphical display). This might also be interpreted as an nation's effort towards higher education (increased quality, see BENVATOT, 1991).

\textsuperscript{21} Once more, especially in Germany, from 47% in 1970 to 29.3% in 1990 and Finland, from 48.0 to 34.0.
LAMOURE and LAMOURE-RONTOPOULOU (1992) in France. Consequently, the proportion of students intending to serve the economy at large has substantially increased. These evolutions are presented in table III in appendix.

However, besides this common evolution, two groups of countries might be distinguished. The first one, constituted by Germany, Switzerland and Finland, knows a real «golden path» leading from an old, traditional academic model to a new model (with high professionalization, high participation rates and increased preferences given to higher education in terms of relative financing – see above). Such a path is particularly interesting in Finland since it corresponds to a period of reform of the educational policy led by the Finnish authority towards raising the quality and quantity of higher education (see on this topic, HERRANEN, 1994).

The second one, including Italy and Norway lags behind (in zone C). This relative lag is partly due to the lower proportion of prospective engineers in 1990\textsuperscript{22}. However, the proportion of their public educational expenditures devoted to higher education (13.6% in Italy, and 15.2% in Norway) also greatly explains their position. Such an underfinancing of higher education has often been mentioned in the literature for the Italian case (which lies 23% under the OECD average, see for instance C.E.R.I., 1992).

Concluding Remarks

In this paper, we have highlighted some key elements characterizing the evolution of higher education systems. Two main dimensions of change have been isolated. The first is a shift towards increased participation. This democratization process characterizes all of the Western countries, and to a lesser extent Poland. Only Hungary has known a different evolution (no massification).

The second dimension of change pertains to the increased commitment of public authorities towards higher education, through the channel of a higher share of overall educational public expenditures devoted to it, and a lowered students-per-teacher ratio. This movement has also been accompanied by a

\textsuperscript{22} Only Hungary makes a poorer performance in this respect.
movement towards professionalization (more engineers, and often, less prospective teachers).

A group of countries (Germany, Switzerland, and Norway) has evolved along a golden path leading them from a traditional (non-vocational) elitist system towards a system simultaneously more democratic and more professionalized, where the national effort towards higher education is quite consequent. But some Western countries did not experience such a positive shift – Italy and Norway faced a democratization process not accompanied by an increased proportion of engineers.

Finally the two Eastern European countries considered in this study (Poland and Hungary). If Poland is bridging with most of Western European countries, the evolution of Hungary is quite worrying. It has continuously evolved towards a Western traditional academic model (HALASZ, 1987), i.e. the one predominating in the early seventies. This evolution parallels the broader socio-political change towards more decentralization. It suggests that a lack of centralized control by the State might well lead to suboptimal evolution of higher education systems. Recent literature (GOUVRAAN AND DE GROOT, 1993; DEBANDE AND DEMEULEMEESTER, 1995; SNOWER AND BOOTH, 1995) has indeed stressed the growing need for government policies to address existing market failure in training.

We are perfectly aware that the addition of some other major European countries (mainly United Kingdom and France) could enrich the content of this analysis. This could be considered in the future on the basis of more complete data information sets. Bridging the current data gaps in the various sources of information should definitely receive more attention from policy-makers and international organizations.
List of References


EVERITT, B.S. and DUNN, G. (1983) *Advanced Methods of Data Exploration and


**TABLE I**

**LIST OF VARIABLES AND DEFINITION**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>TI</td>
<td>Percentage of class age 20-24 enrolled in higher education (male and female)</td>
</tr>
<tr>
<td>TIF</td>
<td>Percentage of class age 20-24 enrolled in higher education (female)</td>
</tr>
<tr>
<td>NBET</td>
<td>Number of students enrolled in higher education per 100 inhabitants (male and female)</td>
</tr>
<tr>
<td>NBETF</td>
<td>Number of students enrolled in higher education per 100 inhabitants (female)</td>
</tr>
<tr>
<td>DPG</td>
<td>Percentage of overall ordinary public expenditures devoted to higher education</td>
</tr>
<tr>
<td>DPENS</td>
<td>Percentage of overall ordinary public expenditures on education devoted specifically to higher education</td>
</tr>
<tr>
<td>DP</td>
<td>Percentage of overall ordinary public expenditures devoted to higher education in the GDP</td>
</tr>
<tr>
<td>RMED</td>
<td>Proportion of engineers and scientists employed in medical R&amp;D activities within higher education institutions</td>
</tr>
<tr>
<td>RDMING</td>
<td>Proportion of engineers and scientists employed in engineering R&amp;D activities within higher education institutions</td>
</tr>
<tr>
<td>ING</td>
<td>Percentage of students enrolled in engineering and computing science</td>
</tr>
<tr>
<td>PROF</td>
<td>Percentage of students enrolled in humanities, arts, natural science and education (i.e. prospective teachers)</td>
</tr>
<tr>
<td>RENT</td>
<td>Percentage of students enrolled in law, business, economics and socio-behavioural science (i.e. mainly rent-seekers)</td>
</tr>
<tr>
<td>MED</td>
<td>Percentage of students enrolled in medical schools</td>
</tr>
<tr>
<td>ENC</td>
<td>Students per teacher ratio</td>
</tr>
</tbody>
</table>

TABLE II

SELECTION OF VARIABLES FOR THE MULTIDIMENSIONAL SCALING ANALYSIS

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Principal Component</th>
<th>Percentage of Variation Explained</th>
<th>Top Loading Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>3</td>
<td>0.85</td>
<td>NBET: 0.38, ING: 0.41, PROF: -0.42</td>
</tr>
<tr>
<td>1975</td>
<td>3</td>
<td>0.86</td>
<td>TI: 0.41, RDING: 0.45, DPG: 0.50</td>
</tr>
<tr>
<td>1980</td>
<td>3</td>
<td>0.84</td>
<td>TI: 0.40, ING: 0.45, DPG: 0.74</td>
</tr>
<tr>
<td>1985</td>
<td>3</td>
<td>0.87</td>
<td>TI: 0.42, DPG: 0.47, DP: -0.48</td>
</tr>
<tr>
<td>1990</td>
<td>3</td>
<td>0.88</td>
<td>DPENS: 0.36, ENC: 0.41, PROF: 0.48</td>
</tr>
</tbody>
</table>
TABLE III

EVOLUTION FROM A TRADITIONAL TO A NEW ACADEMIC MODEL

<table>
<thead>
<tr>
<th>Country</th>
<th>Participation Rate (%) of age class 20-24 years</th>
<th>% of prospective teachers among students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>13.41</td>
<td>36.1</td>
</tr>
<tr>
<td>Switzerland</td>
<td>9.99</td>
<td>27.4</td>
</tr>
<tr>
<td>Finland</td>
<td>13.34</td>
<td>46.8</td>
</tr>
<tr>
<td>Norway</td>
<td>15.94</td>
<td>41.9</td>
</tr>
<tr>
<td>Italy</td>
<td>16.69</td>
<td>29.8</td>
</tr>
</tbody>
</table>
