
APPENDIX C

TECHNICAL NOTES

Appendix C: Technical Notes

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Notes on the number and size of institutions

Country notes

All countries

Vocational-technical colleges are included where information for them is available, but worksite programs, job training centers, and apprenticeship programs and their students are not unless otherwise specified. Adult education and correspondence programs are also excluded unless otherwise specified.

Generally, free-standing art and design schools are included at the higher education level where it is clear that the institutions were free-standing institutions, separate from universities.

Higher education enrollments are headcounts. Thus, part-time students are counted as equivalent to full-time students.

Australia

Special education schools and students are included, as there was not enough information in sources by which to separate them out. Technical and Further Education (TAFE) schools are free-standing (i.e., not worksite programs) and are considered to be non-university higher education.

Sources: Australian Bureau of Statistics, *Schools Australia*, 1992, Table 2. APEC.

Canada

Source: Statistics Canada, *Education in Canada*, 1996, No. 81-229-XIB., pp. 23, 50.

France

Sources: National Ministry of Education, Research, and Technology. Direction de l'Evaluation Et de La Prospective, *Note d'Information: Les classes préparatoires aux grandes écoles*, 1997, pp.1-2. National Ministry of Education, Research, and Technology. Direction de l'Evaluation Et de La Prospective, *Note d'Information: Les sections de techniciens supérieurs (establishments publics et privés)*, 1997, pp.1-2. www.education.gouv.fr/syst/orgs6b.htm.

Etudiants=2,167,436 dont 1,485,583 dans les universites et les ecoles d'ingenieurs dependantes des universites. Statistiques (1995-96) et dans France metropolitaine + DOM.

Germany

University counts include both universities and fachhochschulen, ISCED 6 and 7 institutions. Non-university higher education counts only include kunsthochschulen, or art schools, ISCED 5.

Sources: *Der Bundesminister fur Bildung und Wissenschaft, Grund-Und Strucktur Daten*, 1996-97, pp.145, 153.

Italy

University-level counts include students enrolled in programs that offer the Diplome (2-3 year program) and Laurea (5 year program). Both are considered to be at ISCED level 6 and 7.

Source: *Instituto Nazionale di Statistica (ISTAT), Statistiche dell'istruzione universitaria, anno accademico 1993-94*, collana d'informazione edizione 1995, no. 3, pp. 11, 18, 19, 33.

Japan

Special Training Schools, Miscellaneous Schools, and correspondence schools are excluded, but correspondence students at regular higher education institutions are counted. Non-University higher education institutions consist of colleges of technology and junior colleges.

Sources: Ministry of Education, Science and Culture, *Monbusho*, 1996, p.17.

Russian Federation

Source: State Committee on Science and Technology and the Russian Academy of Science, Centre for Science Research and Statistics, *Higher Education in Russia, Data Book*, 1996, p. 17.

Spain

Only universities were counted. The number of and enrollment in non-university higher education institutions are significantly smaller.

Source: Ministerio de Educacion Y Cultura, Consejo de Universidaes, *Estadisticos Universtaria, curso 1996-97*, p. 37.

Sweden

Includes universities that fall under the responsibility of the Ministry of Education and Science and the Ministry of Agriculture.

Sources: Organisation for Economic Co-operation and Development, *Review of National Policies for Education: Sweden*, 1995, p 53. Swedish Ministry of Education and Science, *Strategies for Education Research*, 1995, p 21.

Switzerland

Source: Garke, E. In W. Wichremasinghe (Ed.), *Handbook of world education*, 1992, p. 153-4.

United Kingdom

Only universities were counted at the ISCED 6 level. While some colleges of higher education are at ISCED level 6, they were all included at ISCED level 5 since the indicator for colleges of higher education did not differentiate between ones at ISCED levels 5 and 6.

Students numbers represent both full-time, sandwich (internships), and part-time students and exclude further education students.

Sources: *Structures of the Education and Initial Training Systems in the European Union: England and Wales*, EURYDICE/CEDEFOP, 1995, p. 24. *Structures of the Education and Initial Training Systems in the European Union: Scotland*, EURYDICE/DEEFOP, 1995, p. 44-46.

United States

Both 4-year colleges and universities are counted at the university (ISCED 6,7) level here. Two-year degree-granting institutions (e.g., community colleges) are considered non-university higher education institutions (ISCED 5).

Source: U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1997*, Table 209.

Problems in comparing the number of institutions and their sizes across countries

Substantial variation in how countries count students and institutions, and in which students and institutions they count, create problems in comparing their institution sizes. The variation tends to arise chiefly in the specialized areas of education. These areas include: special education; adult education; vocational and technical education; correspondence programs; and private schools.

Some countries, for example, simply do not consider special education to be the responsibility of the education ministry, rather it is assumed by a human services ministry. Programs outside the purview of the education authorities tend not to have good statistical accounting in data collections managed by public education authorities.

The exact location of each "boundary" between level and types of education also varies from country to country and even within each country. In Canada, for example, vocational/technical students in Québec who so choose enter vocational/technical college in the 12th grade. In the other Canadian provinces with vocational/technical colleges, entry is at the 13th or the 14th grade. Thus, vocational/technical students in the other provinces spend more time at the upper secondary level. The more time the average student spends in a level of education, the greater will be the number of students at that level. This can affect school or institution size.

In order to improve comparability in the institution size statistics, the following decisions have been made with regard to the data:

- Types of institutions are excluded if their exact number or their number of students could not be determined. All efforts were made to avoid double-counting of institutions.
- Programs are excluded if it cannot be determined precisely how to allocate students and institutions between levels of education. This issue arises particularly with vocational-technical programs, which straddle the secondary and higher education levels in some countries, not laying wholly in one level or the other.
- Each country's own definition for which grades or age-groups comprise the different levels of education have been accepted, because countries count their students and schools within their own classification systems. It should be remembered, though, that the break point between levels of education varies across countries and even within countries. Thus, in comparing two countries' by a particular level of education, one may actually be comparing two different grade-level groups or age groups.
- Only those programs that each country considers to be "education" programs have been counted. This issue arises in some country or another with special education, adult and continuing education, and even vocational education.
- Since some countries do not count worksite programs, technical training centers, and apprentice programs and their students, these activities are excluded from all calculations here. Adult education and correspondence schools are also excluded.
- Where possible, free-standing special education schools are excluded, because some countries do not count them as part of their "education" statistics, whereas others do. Moreover, double-counting could emerge as a problem if students spend part of their time at a regular school and the other part at a special school. Moreover, double-counting could be a problem with apprentice programs if students are counted once at their regular school and then again at their worksite.

- Countries with long first higher education programs have begun to create shorter programs. While other countries may consider these programs non-university level, or ISCED 5 (e.g., the United States' community colleges), countries with long first programs still include their shorter programs as part of university education (e.g., Italy's Diplome programs). Even if the enrollments between these types of education are differentiated, it is difficult to calculate the average institution size without double counting the institutions.

Problems in calculating the number and size of higher education institutions: headcount versus full-time-equivalent enrollment counts

Another comparability problem—that of headcount versus full-time-equivalence (FTE) enrollments—can represent a major problem at the higher education level. A headcount enrollment counts every student as one student regardless of the level of participation. Theoretically, a student who takes one hour a week of class at a university could be counted as one student just as a full-time student, taking fifteen hours a week of class would be. In practice, however, some education authorities impose a minimum participation threshold on the numbers in order to not count the most casual students. All students participating, say, at least half-time, might get counted as students in the head count.

Full-time equivalency would count part-time students as partial students, and their weight in the count would be determined by the degree of their participation in school. A half-time student would get counted as a 0.5 student rather than 1. A quarter-time student would get counted as a 0.25 student, and so on. FTE counts give a more accurate picture of the size of an institution as it is practically being used.

If there are any part-time students, full-time-equivalent counts are lower than headcounts at the same institution.

Since all but three of the countries publish headcounts exclusively, we used headcounts in this report. Three countries, however, did publish their numbers of part-time students along with their full-time numbers. Counting the part-time students, somewhat arbitrarily, as 0.5 students, we can calculate an FTE enrollment for these countries, Canada and the United States. Table C.1 displays these FTE enrollments for the average higher education institution in each country, next to the equivalent headcount enrollment.

As the table below shows, using FTE enrollments rather than headcounts does not affect the relative ranking of school sizes across these three countries, but it is conceivable that it could make a difference with a larger sample of countries. Part-time students make up a larger proportion of the student population in the United States than in the United Kingdom or Canada, for example. The proportion of part-time students in a student population may vary across other countries as well and, so long as it does, the two different accounting methods—head count and FTE—can produce different school size rankings.

Table C.1: Average size of higher education institutions, by counting method and country: Various years

Country	Headcount enrollment	Full-time equivalent enrollment
Canada, 1994-95	4,806	4,034
United Kingdom, 1992	7,295	5,831
United States, 1995	4,023	3,450

SOURCE: See country notes above.

Threat to reliability inherent in language translation

Finally, it must be considered that misunderstandings could occur at any point where country statistical reports were translated from one language to another.

The statistical reports used from Australia, Canada, the United Kingdom, and the United States were written in their original form in English. The statistical reports used from Japan, the Russian Federation, and Sweden were translated into English by officials in those countries. The statistical reports used from France, Switzerland, Spain, Italy, and Germany were read in French, Italian, Spanish, or German and translated by the author (in the case of France, Switzerland, and Spain) or by the author with assistance (in the case of Germany and Italy).

Note on enrollment and completion ratios

Enrollments

Enrollment ratios allow comparisons across states and countries by standardizing enrollment in education at a particular level to the size of the population in an age group typical for enrollment in that level. The ratio should not be interpreted as an enrollment *rate* (that is, as the percent of students in a particular age range who are enrolled at that level of education). This ratio compares the number of students enrolled in particular levels of education to the number of people in the age *ranges* that represent the usual ages of students at those levels of education. More importantly, the *width* of the age range best approximates the average duration of study at these levels of education.

The ratio is calculated by dividing the number of students of *any* age enrolled in particular levels of education by the population in the *enrollment reference group* (the population in the age range typical for enrollment at those levels) and multiplying by 100:

$$\text{enrollment ratio} = \frac{\text{students of any age enrolled in education level}}{\text{population in enrollment reference group}} \times 100$$

This ratio thus represents the number of enrolled students per 100 people in the enrollment reference group. Under some conditions the enrollment ratio would be a fairly good estimate of the enrollment rate. For example, if in a particular country all students begin primary (elementary) education at nearly the same age, say 6, and if grade retention, repetition, and skipping is rare, then the ratio of students enrolled in grades 1 through 6 divided by the number of children between the ages of 6 and 11 would be a good estimate of the enrollment rate in elementary education. However, these conditions rarely hold for enrollment in higher education, and often do not hold for enrollment in upper secondary (high school) education.

To identify enrollment reference groups for each country, countries specified an age typical for beginning education at each level and the number of years typically required for completing education at each level. If this number of years is less than the actual average number of years required for completing education at that level, then, in a sense, the population reference group is too small, and the ratios too large. This is more likely to be a factor in education systems where retention and repetition are common, where a substantial number of students attend part-time, or where a substantial number of students enter the system again even after already earning a credential at that level.

Fortunately, because the sizes of different age cohorts within the same general age range are approximately equal, an enrollment ratio is relatively insensitive to the selection of the age typical for beginning students, but relatively sensitive to the selection of the age range or typical duration of education at that level. For example, dividing the number of students enrolled in upper secondary school in Norway by the population in the 16- to 18-year-old age range would yield almost the same result as dividing it by the population in the 17- to 19-year-old age range, an age range of 3 years in both cases. The reason is that the population of 16-year-olds and 19-year-olds are likely to be similar and so the result insensitive to whether one includes one age cohort or the other in the population reference group. However, dividing by the population of 16- to 19-year-olds, an age range of 4 instead of 3, would yield a substantially (approximately 25 percent) smaller ratio. So it is important that the age range in the population reference group be a close approximation of the actual average duration required to complete a particular level of education.

Tables A.1, A.4, A.5, and A.6 in Appendix A: Basic Reference Tables show countries' reference age groups, enrollment reference groups, and higher education entry and graduation reference ages.

Higher education completion

Similarly, the numbers of higher education degree recipients were standardized for comparison purposes as ratios of higher education graduates per 100 people at the *graduation reference age*. Even though many students receive degrees at ages other than the graduation reference age, the ratio nevertheless allows useful comparisons across countries because it places the number of graduates in relation to the size of a typical cohort of students. Assuming that the sizes of different age cohorts within the same general age range

are approximately equal, the ratio will not be significantly affected if large numbers of students receive degrees at ages other than the graduation reference age. This measure may include some graduates receiving second higher education degrees.

Entry to higher education

Similarly, the numbers of entering students were standardized for comparison purposes as ratios of new entrants per 100 people at the *entry (or, starting) reference age*. Even though many students enter higher education at ages other than the entry reference age, the ratio nevertheless allows useful comparisons across countries because it places the number of new entrants in relation to the size of a typical cohort of students. Assuming that the sizes of different age cohorts within the same general age range are approximately equal, the ratio will not be significantly affected if large numbers of students enter higher education at ages other than the entry reference age. It will, however, be significantly affected if large numbers of students *re-enter* university for second higher education degrees (entrants to graduate programs are not included).

Note on expenditure comparisons

How expenditures are compared across countries

To compare public expenditure per student in the United States with expenditures per student in other countries, expenditures must be converted to a common currency.

Purchasing Power Parity Indices (PPPI) are calculated by comparing the cost of a fixed market basket of goods in each country. Changes over time in a PPPI are determined by the rates of inflation in each country. A PPPI is not as volatile as market exchange rates.¹ Measures of education expenditure and GDP/GSP used in this report have been adjusted with a PPPI.

Because the fiscal year has a different starting month in different countries, within-country consumer price indexes (CPI) calculated by the International Monetary Fund were used to adjust educational expenditure data to allow for inflation between the starting month of the fiscal year and July 1, 1994.

Problems in comparing education expenditures across countries

There exists some variation in the coverage and the character of the education expenditure data that countries submit to the OECD. Sometimes, an individual expenditure item may be included in the expenditure data from one country, but not included in the expenditure data from another. Discrepancies arise because one country may collect certain kinds of data that another country either

¹ For a further argument against using market exchange rates, see Rasell, Edith M. and Lawrence Mishel, *Shortchanging Education*, Economic Policy Institute, January 1990.

does not collect, or does not collect in its “education” data collections. Or, one country may define what constitutes an “education” expenditure differently than another country does.

Discrepancies between which expenditure items are included in one country's expenditure figures and not in another's tend to arise in three general domains:

- **Non-instructional (or, ancillary) services**—Some countries provide fewer ancillary services in their schools and, thus, include fewer expenditures for such services in their education expenditure figures. Examples of ancillary services are: school cafeterias; dormitories; school sports programs; school health clinics or visiting school nurses; attendance (i.e. truancy) services; and speech or psychological therapy services. U.S. schools tend to subsidize relatively more ancillary services through their education budgets than do schools in most other countries. In some countries (e.g. Germany), *none* of the aforementioned services are provided at the primary and lower secondary levels by many schools.
- **Private expenditures**—Some countries' education systems receive large private contributions. The most common forms of private contributions to education are student tuition or fees; organizational subsidies, such as those provided by religious denominations to their own schools; and corporate in-kind contributions, such as those provided by German and Austrian firms that provide vocational courses on the shop floor for participating youth apprentices. Private expenditures have not been included in the indicators used in this report, in part because precise figures for private education expenditures are not available for the U.S. nor for several other countries.
- **The boundaries of education**—There exist fewer (though, still some) inconsistencies in comparing just the *instructional* expenditures for *primary and secondary public* education in just the *academic* track. But, the specialized areas of education cause comparability problems. These areas include: preprimary education and daycare; special education; adult education; vocational and technical education; and proprietary education. Some countries, for example, simply do not collect expenditure data for private “center-based” daycare as they do not define such to be “education.” Indeed, in some countries, even public daycare is not managed by education authorities; rather, it is the responsibility of human services departments.

The exact location of each “boundary” also varies from country to country and even within each country. In Canada, for example, vocational/technical students in Québec who so choose enter vocational/technical college in the 12th grade. In the other Canadian provinces with vocational/technical colleges, entry is in the 13th or the 14th grade. Thus, vocational/technical students in the other provinces spend more another year or two at the upper secondary level. The more time the average student spends in a level of education, the greater will be the expenditure at that level.

Even these three domains do not include all the possible comparability problems. There remain, for example, inconsistencies in how different countries treat public contributions to teacher retirement and fringe benefits, student financial aid, and university research and hospitals.

The National Center for Education Statistics (NCES) sponsored two studies designed to examine the issue of the comparability of national figures of education expenditure. The studies,

entitled *International Education Expenditure Comparability Study: Final Report*, Volumes I and II, involved ten countries and examined, in detail, the content of their education expenditures, as they were reported to the OECD.²

Thus far, participating education ministries have been receptive to the idea of improving comparability in the OECD data collection. Indeed, most countries have modified their data submissions to the OECD for subsequent years, thus improving the comparability of education expenditures across countries for the data collection used in this report. These changes were motivated in part by preliminary findings from the NCES expenditure comparability studies.³

Note on apprenticeship in the United States and Germany

Apprenticeship in the United States and Germany

Apprenticeship programs enroll a significant proportion of upper secondary students in many OECD countries. Apprenticeship is a method of teaching job-related skills through hands-on, work-based training. Skills are developed as the apprentice observes, assists, and is taught by one or more skilled workers, assuming responsibility for progressively more challenging tasks until all the necessary skills are mastered. Although the workplace is the principal location for training, related theoretical instruction is also part of the curriculum. Typically, the standards for completing an apprenticeship are explicitly stated and apprentices meeting those standards are certified to practice a particular occupation.

Apprenticeship systems in the United States and Germany are in many ways the polar opposites of each other. The similarities and differences between apprenticeship programs in these two countries highlight many of the ways in which these programs vary between countries. The United Kingdom and Canada have apprenticeship systems that are in many ways similar to that in the United States, while Austria, Denmark and Switzerland have systems similar to the one in Germany.

Apprenticeship in the United States

Apprenticeship programs in the United States operate primarily as training for young adults (typically in their late 20s), providing upgrading and retraining for those who are already employed. Apprenticeship programs can be sponsored by employers, employers' associations, or jointly by employers and unions. Apprenticeship programs are not closely linked with school-based vocational and technical education.

In general, apprenticeship is not widely used as a training strategy. Two-thirds of all U.S. apprentices are in 20 of the 830 apprenticeable occupations; and of those 20 occupations, all but three

² U.S. Department of Education, National Center for Education Statistics. *International Education Expenditure Comparability Study: Final Report, Volume I, Working Paper No.97-16*, by Stephen M. Barro. Project Officer, Shelly Burns. Washington, D.C.: 1997; and U.S. Department of Education, National Center for Education Statistics. *International Education Expenditure Comparability Study: Final Report, Volume II, Working Paper No.97-17*, by Joel D. Sherman and Richard P. Phelps. Project Officer, Shelly Burns. Washington, D.C.: 1997.

³ See Barro, Stephen M. *Preliminary Findings from the Expenditure Comparability Study*, SMB Economic Research, Inc., June, 1993.

are in the construction and metal trades. Three-quarters of apprenticeships in the United States are concentrated in the unionized sector of commercial-industrial construction and in the maintenance departments of major manufacturers. Apprenticeship leads to formal, official credentials – a Certificate of Completion and journeyman status. Little public money is spent on apprenticeships in the United States, especially in comparison with school-based training in public community colleges or postsecondary vocational-technical institutes.

Apprenticeship in Germany

Unlike the United States, apprenticeship is the predominant form of upper secondary education in Germany – enrolling between one-half and two-thirds of the youth population between the ages of 16 and 18. While apprenticeship programs in the United States are mostly confined to two industrial sectors, approximately 370 occupations in Germany have apprentices.

The objectives of apprenticeship programs in Germany are: a full professional qualification, thorough training in practical and technical skills and thorough theoretical instruction; an enhancement of general knowledge; the promotion of the student's personality and his or her sense of responsibility; a basis for modular technical and general education and for continuing education and training. The organizational frame of these programs involves: compulsory schooling in educational institutions of the public or private domain; a compulsory apprenticeship contract with the employer; supervision of the work-based component and inspection of the school-based component by public authorities and specially trained and certified authorities in companies. A typical apprenticeship in Germany lasts three years, mixing on-the-job training and school attendance, at a ratio of about 3 to 2. Employment in many apprenticeable occupations is effectively limited to those holding apprenticeship completion certificates.

The German states (*Länder*) pay for apprentices' schooling. Employers pay apprentices' wages and the costs of their on-the-job training. Apprentices' earnings are typically half those of what skilled workers earn in the same occupation. A large firm might spend as much as \$10,000 to \$15,000 per year on each apprentice. These firms employ full-time trainers and provide on-site classrooms, shops, and laboratories. Smaller firms often offer less thorough training. As the greatest proportion of the cost of apprenticeship is born by employers, private employers are, in effect, directly subsidizing the society's cost for educating its youth.⁴

⁴ S.F. Hamilton and R. Glover, "Economics of Apprenticeship," in T. Husén, T.N. Postlethwaite (eds.), *International Encyclopedia of Education*, Vol. I, Pergamon, 1994.