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Higher Education at the Crossroads

Tradition or Transformation?

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The Predictability of Educational Expansion: Examples from Secondary and Higher Education

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Growth in Tertiary Education. The Difference Between Males and Females

It is often stated that there has been an explosion in enrolments in secondary and higher education in the 20th century. This seems to be born out by the UNESCO statistics, which show impressive expansion in many countries and is clearly observed in the historical statistics (Mitchell, 1998a,b). The development of the post-industrial society in the latter part of the 20th century accentuated the value attributed to human capital, which derived mostly from increased education. The high value put on education, coupled with economic growth, enabled the expansion of the educational system, which resulted in a sudden and massive increased participation in post-compulsory education. Apparently, equality in educational opportunities for men and women has also been attained during this period, especially in most of the developed countries where it is assumed that men and women should be offered the same educational opportunities. Thus the differences between the sexes should be expected to disappear. In this paper, some general features of this growth in educational participation will be examined. The general character of this participation and, in particular, the qualitative changes that may have taken place in the latter part of the 20th century will also be considered. One important feature of the investigation will be the focus on the equality that seems to have been reached between the sexes in education in most developed countries.

Reference will initially be made to tertiary education, which includes all post-secondary education, university and non-university programmes alike. The type of data available makes it possible to make analyses that give, first, an overall view of higher education. Subsequent data analyses allow a closer examination of narrower categories within higher education. No comparison between the different categories will be attempted as the distinction between non-university and university education is often somewhat arbitrary and certainly not consistent between countries. The UNESCO statistics for tertiary education show clearly a substantial expansion in the last quarter of the 20th century. The

[1] I am grateful to Professor Ingemar Fägerlind and the staff at the Institute of International Education at the University of Stockholm for the facilities provided while working on this data.

measure used here for participation in tertiary education is the *Gross enrolment ratio*.[2] Figures 1 and 2 compare three groups of countries along this variable. The first group is North America (Canada, USA), where there has been a strong tradition for general higher education during most of this century. The second group includes the Nordic countries – Denmark, Finland, Iceland, Norway and Sweden, which have had very close ties for a very long time. Three European countries – France, Netherlands and UK, with strong economies and very strong educational tradition, constitute the third group. The data is presented for males and females separately. Jónasson (1995, 1997) has shown that there are such massive and robust differences in the development of educational participation between the sexes, at least in Iceland, that they require separate analyses.

These rather simple graphs tell several interesting stories. Perhaps most noteworthy is that the often recounted increased influx into higher education in the seventies and eighties was largely due to female participation. In fact, the participation ratio for males remained quite stable for nearly two decades. Even though the educational systems differ substantially between the three groups of countries, and are admittedly also heterogeneous within the groups, it is nevertheless interesting to note how similar the developments are.

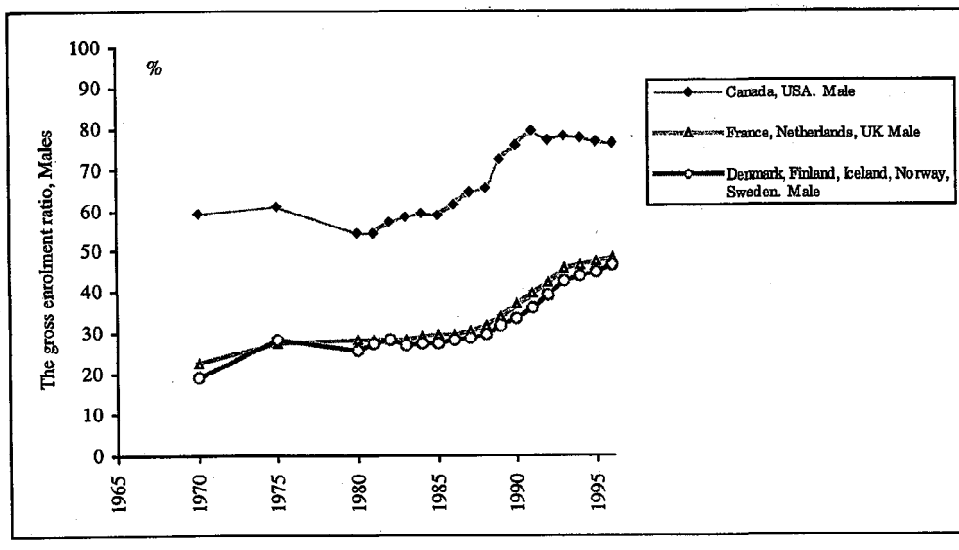

Figure 1. The gross enrolment ratio for males in tertiary education averaged for three groups of countries.

[2] See, http://unescostat.unesco.org/indicator. The definition of the *Gross enrolment ratio is*: Total enrolment in a specific level of education, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education in a given school-year.

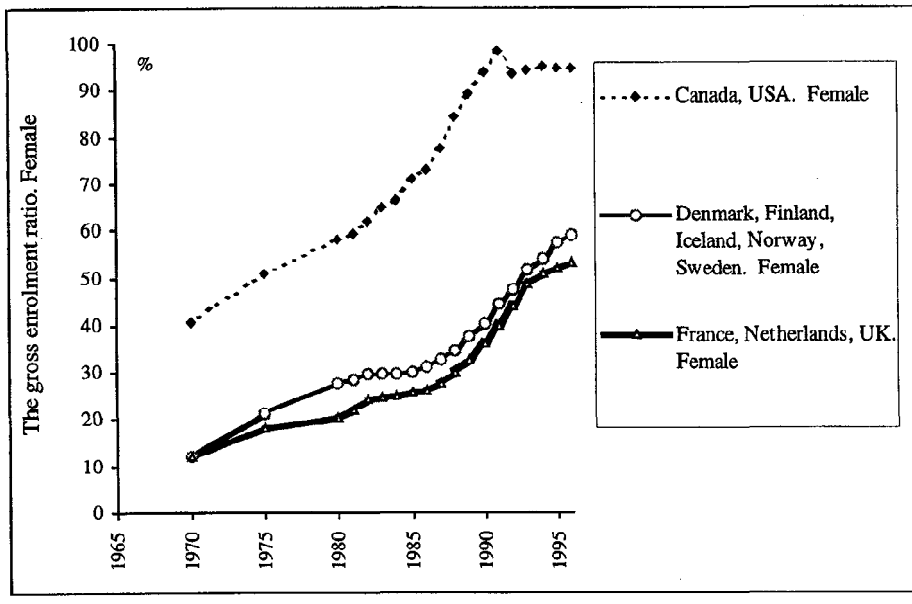

Figure 2. The gross enrolment ratio for males in tertiary education averaged for three groups of countries.

Even the rather dramatic difference between the sexes seems to develop similarly in the three groups. This is shown in Figure 3, which shows the difference between the female and male enrolment ratios at the tertiary level as these are shown in Figures 1 and 2.

The nearly revolutionary changes seen in the pattern between the sexes is difficult to fathom. In only 20 years, a difference of –20, to the disadvantage of women, turns into an advantage of +20 in the two North American countries. Qualitatively the same impressive pattern emerges for the other two groups even though the changeover is somewhat less dramatic. But though the change is very swift, it develops orderly and is very robust. The first two figures support the notion that higher education is becoming accessible to the masses, and thereby its nature and relevance are changing in important ways, presumably both for the students and society as a whole.

However, this is only a part of the story. Given this data, it also seems that the higher education system develops very differently for the two sexes, perhaps to the extent that at least two different accounts should be given of its development, one for males and another for females. One account would be given of a system of educational opportunities changing fairly slowly but surely, the other would be an account of a social system totally transformed in only a few decades. Obviously, the latter account is the intriguing one.

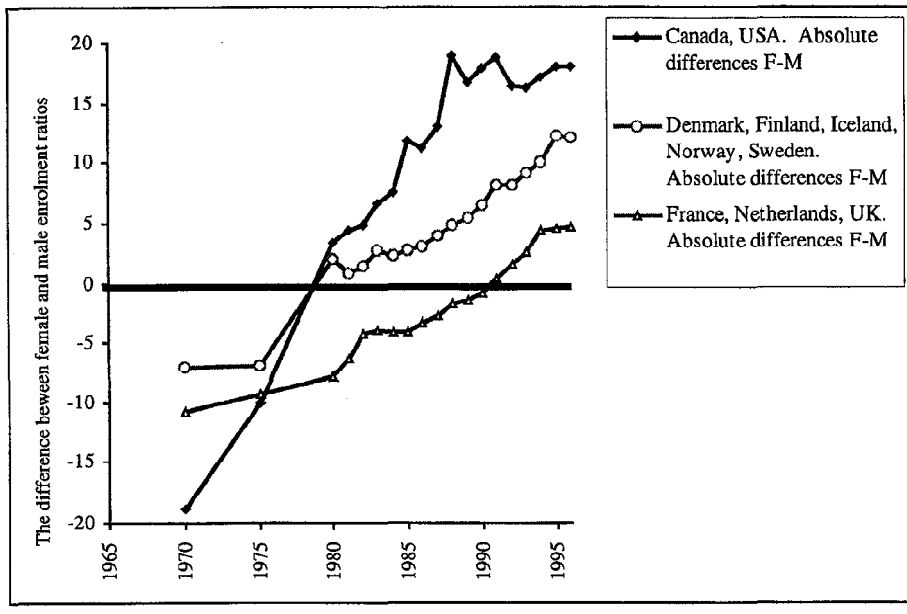

Figure 3: The difference between female and male enrolment ratios, derived from the data presented in Figures 1 and 2.

One can wonder about what happened after the 1970s. Why has this dramatic change occurred? Was it totally unexpected? I have previously argued that attendance at the university level in Iceland grew remarkably consistently during the whole 20th century (Jónasson, 1995). During most of this period, university education in Iceland was practically synonymous with higher, or tertiary, education. I looked for this stability in growth in secondary, academic (or general education) and found a similar regularity, this time in the growth of the Icelandic university entrance examination (Jónasson, 1997). It was argued then that the expansion was well described by simple exponential growth, remarkably consistent for the whole century, but very different for males and females. But is it possible to learn anything worthwhile about development of education in general from the very small and perhaps peculiar Icelandic system? Furthermore, can it be used to throw any light on the development of secondary and higher education in other European countries, and perhaps elsewhere, especially related to the dramatic change of female participation in higher education? To answer these questions consider first the development of university education in a number of countries during the 20th century.

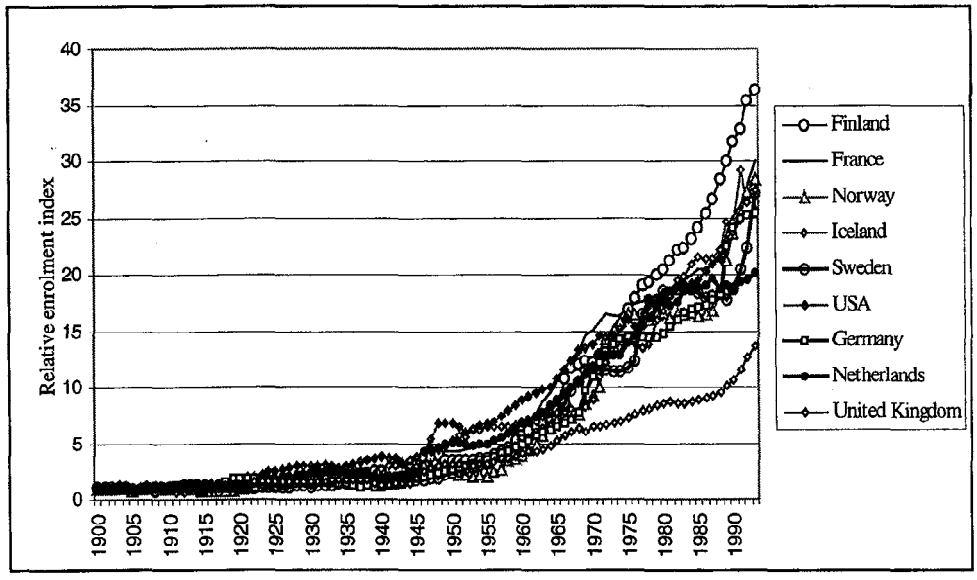

Figure 4: The attendance at universities, expressed in terms of the average size of the cohorts 20-24 (Mitchell, 1998a,b). Furthermore the average for the years 1900-1909 is set = 1. Data for Iceland and United Kingdom is set at the average of the other countries, as data was not available for the base level period. The order of countries in the legend is in the same order as at the rightmost point for each line.

The growth of tertiary education has been dramatic in most developed countries during this century. Typically, the growth in participation ratios has been 20-30 fold in spite of many countries having a fairly tight control of the number of available places at universities. But comparisons between countries are somewhat problematic. The age range for students attending higher education varies between countries, as does the length of studies and the types of studies classified as university studies (as opposed to non-university studies). But instead of making a cross-sectional comparison, it is of considerable interest to compare developments within countries. Even though the absolute levels vary considerably, the development for the past century is quite similar for most of the countries, as shown in the graph (see also Table 1). It can also be inferred from Figure 4 that it might be reasonable to assume that the lessons learned from the development in Iceland may apply to other developed countries.

Exponential and Logistic Growth

The case for describing the expansion of certain parts of an educational system in terms of an exponential function has been argued on empirical grounds at some length in Jónasson (1997). Growth is termed exponential if the increment is a function of previous amount. A simple case is where the change Δy is directly proportional to the previous amount, Y, that is

$$\Delta y = k * Y$$

Here the constant of proportionality is k. In this case the function of time, y(t) describing the amount is

$y(t) = Y_0 * e^{kt}$ where Y_0 is the initial amount at t=0.

Four remarks should be made here about exponential growth. The first one concerns the question whether the growth should be considered variable or constant. From one point of view it is variable because the absolute increment changes from one interval to the next. If the implicit model for educational growth is linear, then from that perspective the increment for each time interval seems to be variable, and it would be tempting to maintain that educational participation was growing at an ever increasing rate. If one, however, assumes that the growth is exponential, for instance, if the increment is proportional to the existing quantity, the growth can be regarded as constant. It is the same for the whole period. This would for instance be the function describing the population growth, if the population would increase by say, 0,1% a year. Similarly, it would be the function describing the growth of capital with some fixed interest rate. In this sense the exponential growth can be said to be constant. It is important to note that the increment is simply directly proportional to what was already there. The second comment follows from the first. Even in a stable system, the quantity growing seems in a sense to explode even without any fluctuations in the conditions. Assume for example that at the beginning of the century somebody had capital worth one unit in a bank account and the interest rate had been 6% for the whole century.[3] The exponential line in Figure 5 would describe this situation. In the latter part of the period the growth seems to become "explosive" even though the exponent is constant.

In addition to the example previously cited, which describes the growth of capital with a constant interest rate, thirdly, it should be noted that exponential growth describes a host of widely varying phenomena, which range from the population growth of living organisms to the increase in demand for many types of consumer goods. When one finds a phenomenon that grows exponentially, it is of much interest to speculate which analogy is most helpful to understand its nature. For instance, if it is accepted that the expansion of education is well described by exponential growth, it is reasonable to inquire if it is more analogous to the growth of a living organism or a consumer product. The fourth and last comment to be made is that, in real life, exponential growth can rarely be sustained for very long, even though it appropriately describes growth for a limited period. This holds for populations, for epidemics, for the use of certain energy resources and for consumables. There is normally a constraining factor. If some characteristic of a cohort is to be described, as, for example, its participation in education the upper limit cannot be higher than 100%. This means that the growth slows down when approaching this limit, and the most parsimonious model is one where the limiting factor is a function of the distance from the limit. The function describing this situation is the so-called logistic function or the S-function, which is the lower curve in Figure 5.[4]

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[3] Note, for further reference that this was roughly the situation in upper secondary education in some of the Nordic countries, especially for females. The participation ratio was somewhere around 0,5% of the relevant cohort (here equivalent with the amount=0,5) with a growth rate on average in the region of 6%.

[4] In educational statistics, when the there is a custom to use specific cohorts as base line for reference, even though the group attending that level of education has different age range, the gross enrolment ratio can be higher than 100%. This does not affect the basic reasoning presented here.

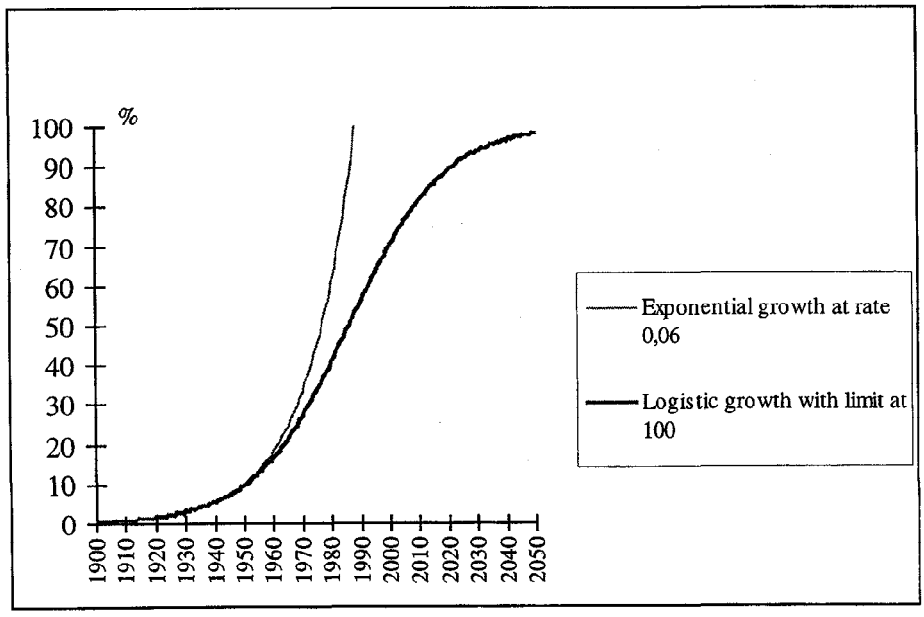

Figure 5. The figure describes exponential growth of some quantity, which starts at 0,5 and grows at the rate of roughly 6% per year. It also describes the logistic function with an upper limit at 100%.

If the growth of tertiary education is approximated by an exponential growth, the rates for this century are in the neighbourhood of 4% for most of the countries included here. Table 1 shows the exponents derived from a best line fit assuming an exponential curve. The first column shows that the exponent for the 20th century for the ten countries[5] have ranges varying from 3,8% to 4,6%.[6] When the century is divided into three roughly equal periods, it is noteworthy that for six out of these ten countries, the exponential rate of growth is greater for the second period than for the third. These countries are not selected randomly and thus no attempt is made to generalise from this statement. But this pattern is nevertheless a clear warning that one should be very careful when suggesting that the rate of growth of higher (tertiary) education is greater in the final than in the middle third of the century. The simple fact is that if the exponential model is assumed in many of these countries, the tertiary education system has grown more rapidly between 1931 and 1960 than between 1961 and 1993. However, this does not apply to Denmark, Finland and Norway.

[5] Compared to the countries investigated earlier, Canada has not yet been included in the analysis.
[6] The difference between referring to the exponent and the growth rates on a yearly basis is very slight. See note 2 in Jónasson (1997).

Table 1. The estimated exponent describing the growth of enrolment in tertiary education in a number of countries for different periods.

	1900-1993	First period 1900-1930	Middle period 1931-1960	Final period 1961-1993	Difference: Final and Middle
Denmark			0,012	0,039	0,027
Finland	0,043	0,015	0,027	0,052	0,025
France	0,043	0,023	0,035	0,035	0,000
Germany	0,038	0,024	0,047	0,046	-0,001
Iceland	0,046	0,056	0,057	0,047	-0,010
Netherlands	0,038	0,031	0,042	0,033	-0,010
Norway	0,039	0,020	0,018	0,048	0,030
Sweden	0,040	0,007	0,046	0,040	-0,006
United Kingdom	0,034		0,039	0,030	-0,009
USA	0,038	0,044	0,041	0,030	-0,011

Note: The participation numbers are expressed as ratios of the average of the 20-24 year cohorts. The numbers are equivalent to k in the equation $y(t) = Y_0 * e^{kt}$.

Differential Growth for Males and Females. Evidence from Secondary Education in the Nordic Countries

It has now been established that there has been an impressive and robust growth of higher education in the 20th century. This growth has been fairly regular, but perhaps greater in the middle than in the final third of the century. Reference has been made to the fact that the Icelandic data is well described by the exponential function and no reason exists to assume that the Icelandic system has very different characteristics at the surface level from other kindred systems. The enrolment in higher education requires obviously the completion of secondary education and thus a corresponding growth should be evident at that level. The data considered here extends over the whole e century and concerns the development of the secondary stage. It involves the preparation for an important section of the tertiary level, namely the university preparation examinations in the Nordic countries. This is the precursor to the higher level and, thus, signs of the expansion might be seen prior to the 1970s.

In this context, rather specific examples will be considered from the growth of secondary education in the five Nordic countries, namely Denmark, Finland, Iceland, Norway and Sweden. In (Jónasson, 1997) it was shown that the growth rates for males and females in Iceland were very different. This is again demonstrated in Figures 6 and 7.

The data are based on the number of examinees completing the upper secondary education, which is the level required to gain access to university education. The systems in these countries are somewhat different and they have also been changed somewhat in recent decades, especially in Denmark, Norway and Sweden. Thus, it is certainly debatable what figures are the proper indicators. The data will be briefly discussed presently, but for detailed discussion, see Jónasson (1999).

Figures 6 and 7 show the curves relative to university entrance examinations for males and females, respectively. There are at least two points to consider. One is the similarity between the five countries. The curve for males shown in Figure 6 indicates that,

except for Denmark in the last decade, all the Nordic countries group together with impressive proximity.

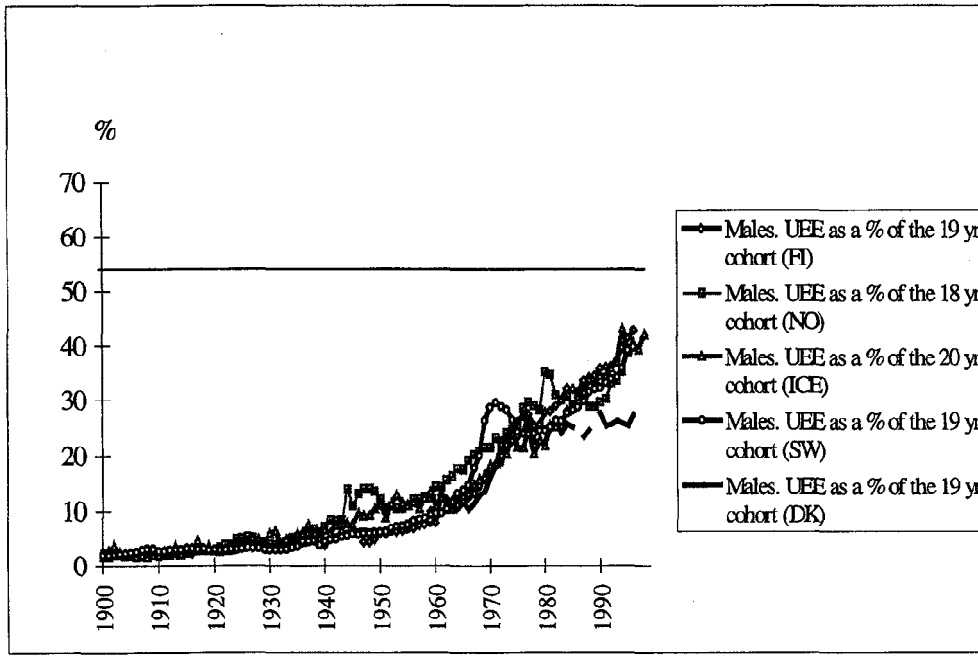

Figure 6. University entrance examinations for males in the five Nordic countries – Denmark, Finland, Iceland, Norway and Sweden – expressed as a percentage of a reference cohort. The order of countries in the legend corresponds to the rightmost point for each line.

Figure 7 shows more divergence in the female data than in the corresponding data for the males in Figure 6. Direct comparisons between countries of the actual ratios should however be done with great care. The systems in theses five countries are somewhat different and the graphs are meant to emphasise the trends within the countries rather than the comparisons of absolute numbers between countries. It may be debated to what extent the actual numbers used are exactly equivalent. In spite of reservations about comparability, some general remarks can be made about the data. The tendency to complete academically oriented education at the secondary level has had a similar growth in all the countries and the increments in recent years have been impressive. But it seems that there are interesting differences between the growth patterns observed in the curves for males and females at the secondary educational level. A similar pattern was observed for tertiary education. What seems most noteworthy is that the completion ratios for women seem to be somewhat independent to that of men. It might have been expected that when the completion ratios for women had reached the same level as for men, these would have subsequently followed more or less the same pattern. This is not so. The growth for the two sexes is simply best described by two different functions, which do not seem to have very much to do with the actual balance between the completion ratios.

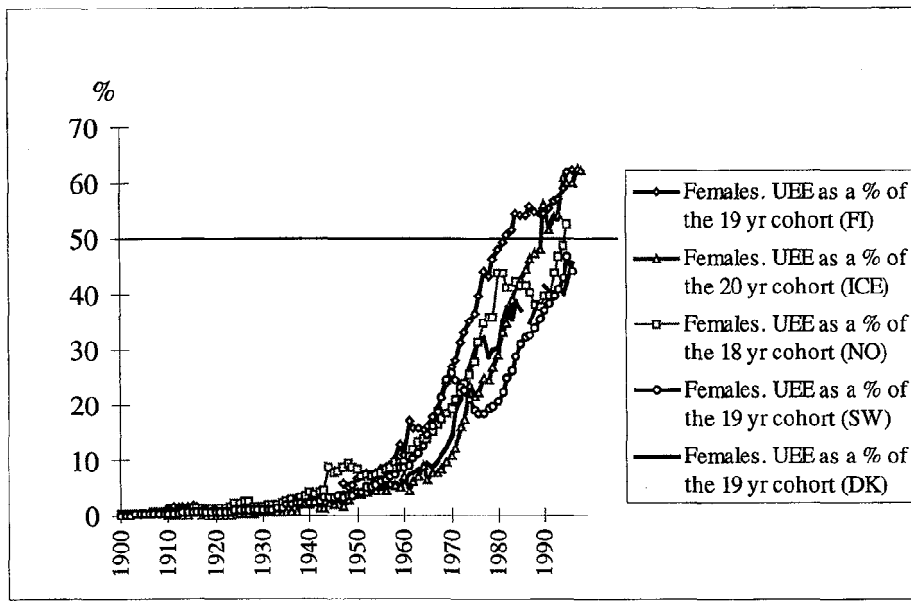

Figure 7. University entrance examinations for females in the five Nordic countries, Denmark, Finland, Iceland, Norway and Sweden as expressed as a percentage of a reference cohort. The order of countries in the legend is corresponds to the rightmost point for each line.

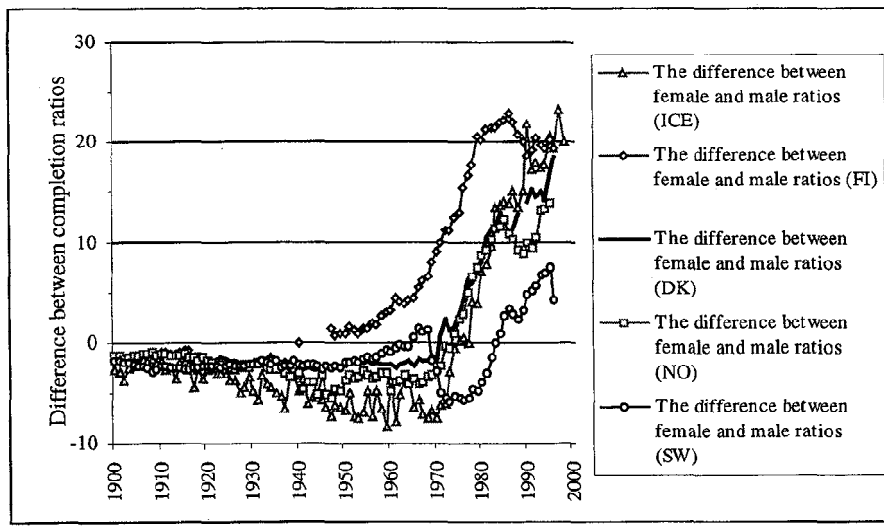

Figure 8. The difference in the completion ratios between females and males in the University entrance examinations in the five Nordic countries – Denmark, Finland, Iceland, Norway and Sweden.

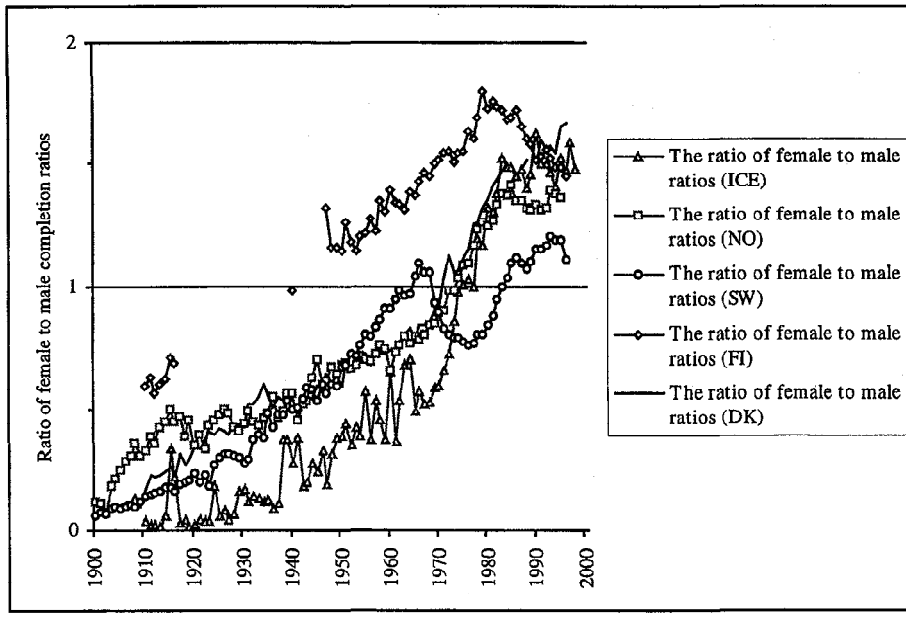

Figure 9. The ratio of the completion ratios of females and males in the University entrance examinations in the five Nordic countries – Denmark, Finland, Iceland, Norway and Sweden.

One way of inspecting this difference is to look at the actual difference between the graphs for males and females as shown in Figure 8. It is impressive to note that after the equality in terms of completion ratios is reached, the women in four out of five countries not only surpass men, but the difference continues to widen. The curve for Sweden represents the only exception to this development, even though the trend there has recently become exactly the same as in the other countries. Furthermore, in Finland the divergence seems to have stabilised at about 20% for the time being. But the difference between two exponential functions grows in an exponential fashion and this is exactly what transpires in Figure 8. Such result supports the inference that the growth for the two sexes is appropriately described by exponential curves, and furthermore that these hold for long periods. The time at which the completion ratios become equal does not seem to be of any particular significance. This fact is better demonstrated in Figure 9, which shows the ratio between the completion ratios of women to that of men. Except in the case of Sweden, there does not seem to be any discontinuity at the crossover point.

Predictability. Evidence from Females in Secondary Education in the Nordic Countries

The analysis of graphs presented previously confirms that the growth of the participation in secondary and tertiary education has been impressive in recent decades, especially for women. At the same time it has been argued that by looking at the growth in tertiary education as exponential, it is in fact fairly stable and no more dramatic in the last third than in the middle third part of this century. Similarly it was concluded that this applied also to completion ratios in secondary education in the Nordic countries. The stability of the growth extends perhaps to longer periods than might be assumed from superficial inspection of the growth curves, especially if that inspection is coloured by an assumption of linear growth. It has also been inferred that the growth in the completion ratios is well described by an exponential function. The upsurge for females is obviously more dramatic than for males. The fact that it continues apparently without deviation, after the point of equal completion ratios is reached, seems to support the inference that it is appropriately described by the exponential function perhaps for an extended time period.

The apparent stability that characterises the expansion of education will now be explored by the following method. It will be assumed that the growth of the system is exponential for the first half of the century and on that basis the development throughout the second half of the century will be "predicted". The regularity or stability of this growth will be assessed by how well this extrapolation, on the basis of the first half of the 20th century, predicts the growth actually seen during the latter half of the 20th century. The analysis is based on data for female completion ratios from four of the Nordic countries.[7]

Figures 10-13 are based on the number of students finishing a university entrance examination, expressed as the ratio of what has been traditionally the most common age at which students have completed this examination. This has for a long time been the University entrance examination (the UEE).[8] The definition of the university entrance examination, or its related equivalents in the different countries, is complex and debatable in all the countries except perhaps in Iceland. It is defined however by using the official statistics in the respective countries and calculating the numbers of examinees as a proportion of the cohort most typically taking the exams. These difficulties will be referred to when discussing data from individual countries, but for a fairly detailed discussion, see Jónasson (1999). Figures 10 to 13 represent also the estimates of exponential growth and estimated logistic growth. These are based on data from the years 1910-1950. The year 1910 is chosen as a starting point because for most of the countries the proportion of about 0.5% is becoming solid enough to use as a basis for calculations.

It is often assumed that fundamental changes occurred in most western societies in the post-war era. The year 1950 is therefore chosen here as the end of the previous era, assuming that the year 1951 counts as the first year of the post-war period. Note that those who started their gymnasium studies close to the end of the second World War are concluding their university entrance examination just before, or around, 1950. Thus the "predictions," or "forecasts," are based on data prior to the post-war period, but certainly extending right across it. The procedure of the investigation is the following. The number of

[7] There is not enough data available to the author from the early part of the century for females in Finland specifically to make the same predictions. This is being assembled however.

[8] The Icelandic term is *Stúdentspróf* and a similar term exists for the corresponding examination in the other Nordic countries. This corresponds roughly to the *Abitur* in Germany and the *baccalauréat* in France.

females completing the UEE as compared to the cohort of the official completing age for the period from1900 up to the present time was assembled (the available data at the time of calculation was normally up to or including the year 1996). The second stage in the investigation is to fit the best exponential line to the data from 1910-1950. In all the figures, the vertical line in the figure is meant to remind the reader that the fitted lines are not based on data later than 1950 and might therefore be regarded as forecasts for the latter half of the century. The third step is to fit the logistic function (S-line) to the data, assuming that the upper limit is 100%.

The Danish data

The system in Denmark is somewhat complex, but the data reported in the publications by the Danish Statistics (*Danmarks Statistik*) were sufficient to conduct analyses and make predictions. Data from the gymnasium final examination (*studentereksamen*) plus the special entrance examinations to some special technical or university faculties (*adganskursus to teknikum*) indicate that, until the late sixties, the situation was fairly straightforward. From then on the situation becomes somewhat more complex and one has to examine the data rather carefully. Data from final examinations in the HF-courses and the *studentkursus*[9] are used in addition to the grades of final examinations in the academically oriented upper secondary schools (*gymnasium avgangseksamen*). From the late seventies the figures are the sum total of the leaving examinations, the general academic education in upper secondary schools (*Almene gymnasiale uddannelser*). Recently, upper secondary school examinations account for about 70% of the data.

Figure 10 illustrates the Danish data. The data curve certainly rises above the logistic curve but even though a very steep rise can be seen in the seventies, this seems to correct itself. Presently the data curve is in the region predicted by the pre-1950 exponential curve. Thus from the point of view proposed in this paper, the completion ratio has relaxed to its "normal" state. But if the development should, however, rather be expected to follow the S-curve rather than the exponential curve, it may be said that the growth of this sector in Denmark has been somewhat faster than might have been predicted around 1950.
century. The two smooth curves are the exponential and logistic fits, based on data from 1910-1950.

[9] These are special courses outside the academic upper secondary education.

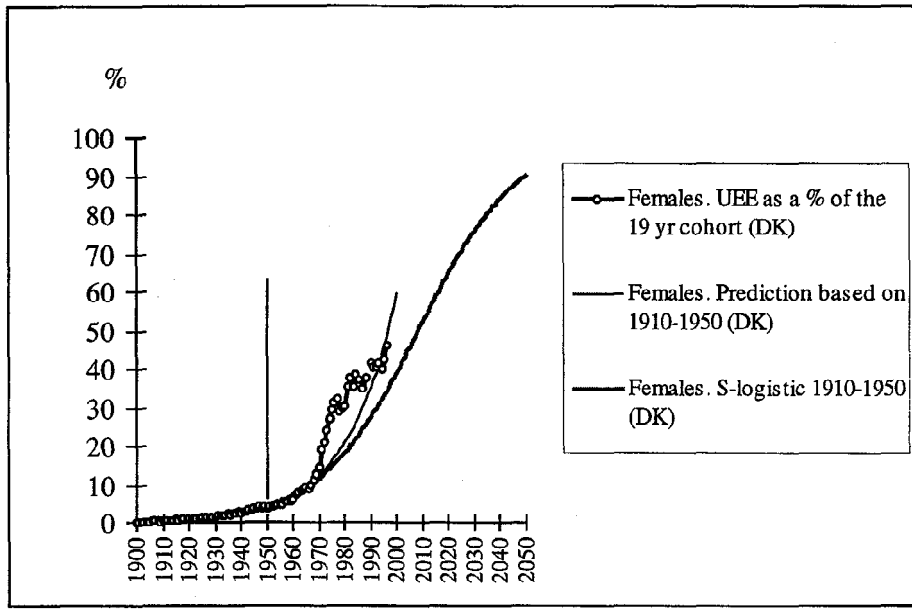

Figure 10. The University entrance examination ratios for females in Denmark in the 20th

The Icelandic data.

The Icelandic graphs are based on data obtained from the Icelandic Statistical Bureau (*Hagstofa Íslands*). The definitions are simple, as there have been no changes of names in the system in as far as the link between the upper secondary and university education is concerned.

Figure 11 shows the development in Iceland. Even though inspection of the graph does not indicate that much growth is to be expected on the basis of the data between 1910 and 1950, it turns out that the underlying trend is there. Compared to the logistic curve, the pattern of growth has been remarkably well predicted. It is quite interesting to note that the growth of female UEE's for the whole of the latter part of the 20th century is more or less predicted by data from the first half of the century. The dramatic rise that actually occurred was exactly of the character that was expected, except that it came five to seven years later than anticipated.

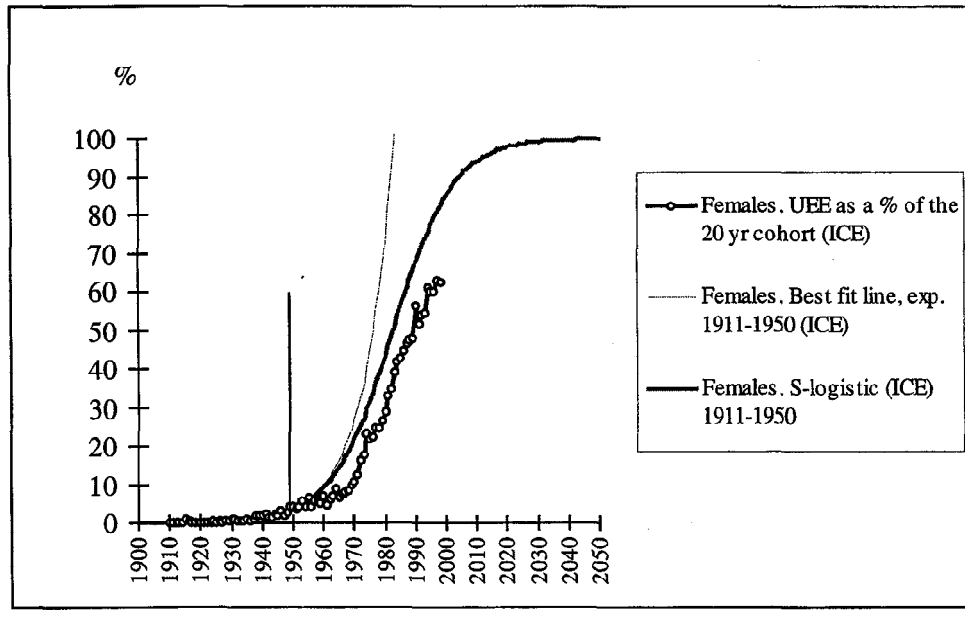

Figure11: The University entrance examination ratios for females in Iceland in the 20th century. The two smooth curves are the exponential and logistic fits, based on data from 1910-1950.

The Norwegian data.

The data are obtained from Central Bureau of Statistics (*Statistisk sentralbyrå*) and follow more or less the same trend as done by the Icelandic data. Until 1980 the figures are for those who completed the final examinations for academically oriented upper secondary schools (*examen artium*). By then a unitary three year upper secondary school (*Den videregående skole*) had replaced the prior system (see e.g. Myhre, 1997). Since then the data refer to those who completed the upper secondary school level.

Figure 12 shows the development in Norway. The growth for thirty years from 1950-1980 follows quite well the predicted exponential curve, which was based on the pre-World War II data. The decrement, probably largely due to formal changes in the system, lasts for a decade and then the upsurge is to be seen again. For the last twenty years, the growth curve is adapting itself to the predicted logistic growth. Once again the growth in the latter half of the century seems to be inherent in the characteristics of the growth during the first half.

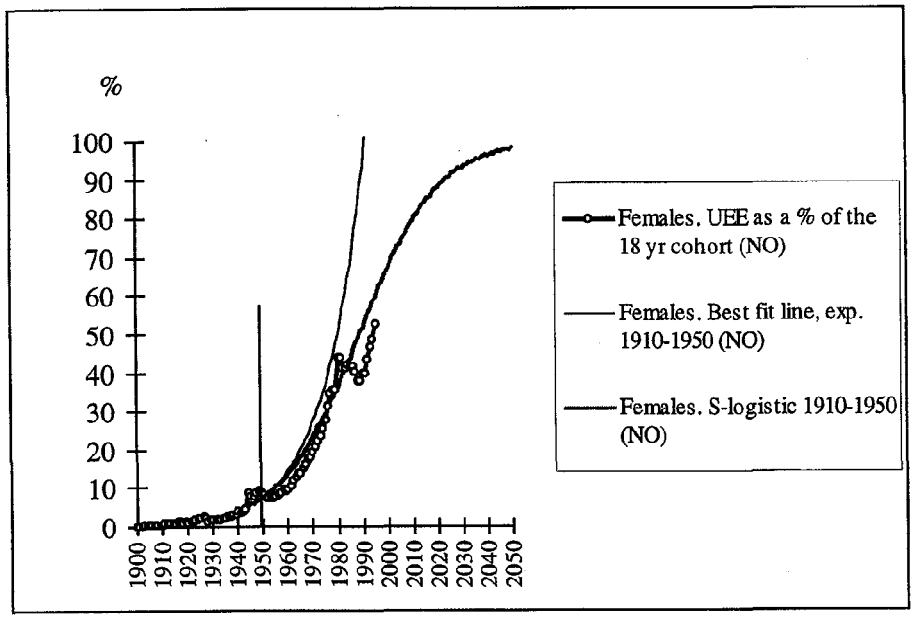

Figure 12: The University entrance examination ratios for females in Norway in the 20th century. The two smooth curves are the exponential and logistic fits, based on data from 1910-1950.

The Swedish data

The Swedish data are obtained from the Statistics Sweden (*Statistiska centralbyrån*). The cohort chosen is the 19-year cohort, which would be the official leaving age if the students went straight through the system. The data up to 1968 are reasonably straightforward as they represent the *studentexamen*[10]. Thereafter the picture becomes more complicated, until perhaps in the 1996 figures, when essentially only two umbrella programmes remain, the natural and social science programmes. The main criterion for including a programme is that it is a preparatory programme for higher education of at least three years duration. As the rules for qualifying for higher education were made more flexible already in 1971, and even more so in 1977, there are a number of grey areas. One of these are the technical courses, which are four year programmes, from which one could obtain a leaving certificate after three years and enter the university, but it was also possible to continue for a year and obtain a technical qualification. The fourth year is not included here, as it is not seen as a preparatory or intermediate qualification, even though people could certainly go on to higher education having obtained it.

The Swedish curves are shown in Figure 13. It is of special interest to inspect the deviation seen in the upsurge in the number of females obtaining the University entrance certificate in the period between 1960-1970. Largely due to changes in the upper secondary system in this period, the pressure is taken off the system but the growth is not stemmed but

[10] Leaving examinations in the academically oriented upper secondary schools.

it relaxes down to the growth predicted by the exponential and logistic curves, again based on data from the first half of the century.

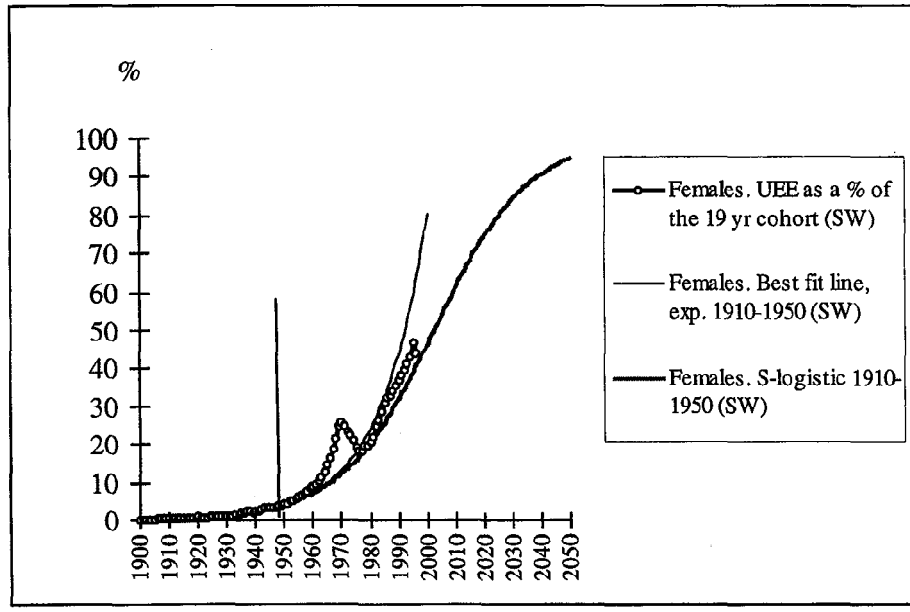

Figure 13. The University entrance examination ratios for females in Sweden in the 20th century. The two smooth curves are the exponential and logistic fits, based on data from 1910-1950.

From these four examples some conclusions are drawn. First, it seems that the exponential curve well approximates the growth seen for the females completing general secondary education in other Nordic countries during most of the century. This has not been investigated directly but it may be deduced from the figures. Second and the principal conclusion is the inference that the development from the first part of the 20th century predicts quite well the developments in the latter half. In this connection, it should be reiterated that this prediction is based on data from the forty years between 1910 and 1950. Thus the mechanism(s) controlling or underlying this growth is not peculiar to the post-war period. It is not necessary to invoke new forces, different mechanisms or government intervention in order to account for the overall growth in the latter half of the century as compared to the former half, as far as this feature of the education system is concerned. The third conclusion drawn from the data concerns the deviation from this regularity seen in three of the four countries. In the case of Denmark, Norway and Sweden, there are substantial, but temporary deviations from the exponential or logistic extrapolations shown. There are two things to be said about these deviations. In Denmark and Sweden, but less so in Norway, they show dramatic growth far exceeding the exponential growth from the previous period. In those cases one might talk about explosive increases in completion ratios. Then the governments' reactions seem to have been to modify the secondary system in these countries. In all cases this was done by taking the pressure off the students, who seem to have felt the need to complete a particular type of examination, namely the

university entrance examination, in order to keep the options open for the tertiary level, which in most of the Nordic countries has been dominated by the universities. The preconditions for access to university and related tertiary education were relaxed to some extent allowing more people than only those completing the traditional *examen artium* to continue to the tertiary level in general, and to the universities in particular.

Discussion

Many countries have experienced dramatic increases in the participation in secondary and tertiary education in the 20th century. This rather cursory analysis implies that this growth is well described by an exponential or perhaps a logistic function.

One can probably argue that there is nothing remarkable about this conclusion. As mentioned in an earlier section, the development of a host of organic and market driven phenomena is best described by such function. Meyer, Ramirez, and Soysal, (1992) have argued that the development of primary education in many countries can to a certain extent be described by such an S-function. The description by Dahllöf (1990, Figure 2) probably shows the same pattern. Thus the only result of the speculations in this chapter is simply to accept that education, or at least some of its components, obeys the laws of exponential growth.

From another point of view this is a rather dramatic conclusion. To begin with, one should be forced to consider whether education, or at least its general part, should be considered as analogous to a consumer product on the market, or to a population of living organisms, perhaps developing as an independent species, but of course interdependent with its environment. But an even more dramatic implication of this conclusion relates to the manipulations of the educational system by governments. In the light of what has been implied here, these actions are not likely to change the basic direction of development, except perhaps in very extreme instances. This is similar to the conclusion reached by (Müller, 1987) who observes that "the consequences of state intervention must not be overestimated" (p.16). Those actions that are likely to have some effect are those, which go along with fundamental changes that are inherent in the system. These changes are probably benevolent and reactive rather than proactive ones; changes that enable the underlying development to take its course. There is perhaps, more regularity, continuity and robustness in educational growth, than is often felt by those in the midst of the turmoil of government intervention, reform movements or current debates about changing roles and nature of education. There may be dramatic fluctuations or stagnation periods lasting up to a decade, but then the systems seem to relax towards their "natural" course of development. It will be particularly interesting to investigate in some detail, from this perspective, the apparently considerable changes presently taking place in tertiary education.

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