Students Passing the Icelandic University Entrance Examination (UEE) 1911–94

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Introduction

Iceland, as most Western countries, has been through major changes during this century. The term 'revolution' is often used to define some of them. Education is one sector that seems to have undergone deep transformations. Where the university student population represented between 2% and 3% of a single cohort at the turn of the century, it now represents some 150%. During this period, important laws were passed that affected the development of the educational system, efforts were made to enhance vocational secondary education and there was absolute consensus about steps to eliminate any sex discrimination that might survive.

In this article, we shall attempt to describe the rise of the modern educational system in Iceland by stressing the stability of its development. This is manifest in the university student population and the academic secondary school programmes but does not seem to have been greatly affected by legislators. The growth curves show the domination of the academic secondary school population, despite apparent emphasis by the government on vocational tracks at different periods and the invariant difference between the sexes during the century.

In a paper on the development of university education in Iceland, I showed (Jónasson, 1995) that the population of university students, dominated by students at the University of Iceland, has grown with singular regularity since the creation of the University in 1911. The growth of the University is seen in Figure 1. An exponential fit of the total enrolment at the University [1] shows a growth in the region of 6% a year. The stability of the growth curves is evaluated by dividing the period under consideration (1911–93) into two parts (1911–52 and 1953–93) and comparing them. The consistency in the exponential growth for the whole period (see Figure 1 and Table I) is of particular interest, since the exponent for the second period differs from that for the first by only some 2%. From this somewhat unexpected long-term stability, it follows that the number of university students (and new entrants) in the 1980s and even the 1990s could have been predicted with considerable accuracy as early as 1952 by simply extrapolating the exponential best fit to data with a midpoint in the 1930s. This consistency must be directly related to the stability in the growth of the number of students who obtain the University entrance examination (UEE). This article analyses several aspects, first to establish the regularity of the growth and second to discuss its nature. An attempt will then be made to shed new light on important aspects of the Icelandic education system.

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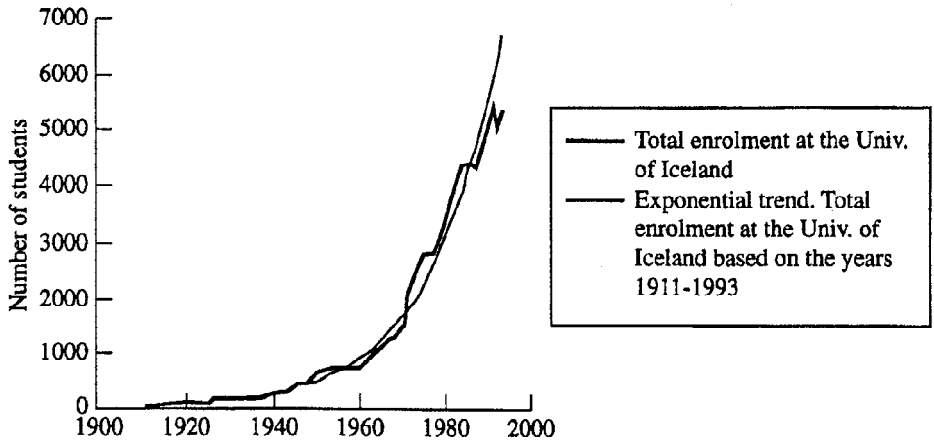

FIG. 1. Growth of the student population at the University of Iceland. The actual numbers and the best exponential fit. (Adapted from Jónasson, 1995.)

TABLE I. The linear coefficients obtained when regressing the $\log_e$ of the number of students at the University of Iceland on calendar years [2]

				Difference between the two periods	
	1911–93	1911–52	1953–93	Δ	%Δ
Total enrolment	0.0596	0.0620	0.0606	−0.0014	−2.3

These coefficients correspond to the b in the equation: Number of students $= c * e^{b * \text{year}}$. The regression is calculated first for the whole period 1991–93 and then separately for the periods 1911–52 and 1953–93.

A Brief History

The most prominent forerunners of the Icelandic upper secondary schools are the Latin schools Their primary purpose was to train boys for the ministry. Their principal role gradually became more general, as they began to train students for a university education which mainly trained future civil servants. This change of emphasis was confirmed with the creation of a School of Divinity in 1846. Thus, a school with a strong vocational mission but with a classical and academic curriculum was formally turned into a general education institution. This may be seen as an important sign of later developments. At present, the School is roughly equivalent to the Scandinavian *gymnasia.*

Several women's schools were founded in the 1870s (the first was academic, but the subsequent schools were domestic science schools), soon to be followed by schools for doctors, farmers and sailors. Then, for more than half a century, a concerted and apparently successful effort was made to develop vocational education and also, to a certain extent, to build up general (or practical as opposed to classical) academic education. It was not until 1930 that a second *gymnasium* was established. During the second half of the 20th century, the number of *gymnasia* gradually increased. Their final examination, the *Studentsprof,* will simply be called the university entrance examination (UEE) in this article. In the 1980s, schools

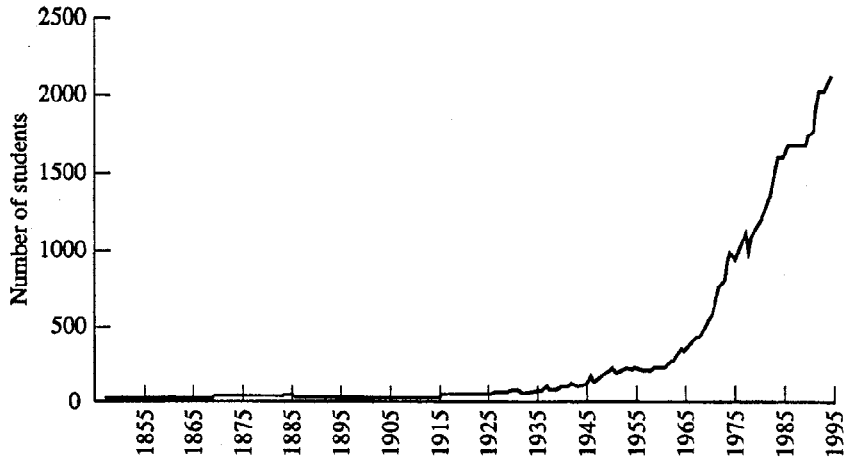

FIG. 2. Number of students passing the UEE 1846 to 1994.

that were not *gymnasia* (in particular the comprehensive schools) could run their own programmes which prepared for the UEE. The curricula of the various *gymnasia* had traditionally been controlled by the Ministry of Education but the examinations were set independently by each school. Despite an apparent general and long-lasting consensus about the limited need for a large number of *gymnasia* graduates, their number has been increasing for the past 150 years (see Figure 2). This article will concentrate on a period which extends from 1911 to 1994 [3]. During this period, compulsory education was prolonged from four to ten years and the development of general education was thus far greater than that shown in the data presented here. At present, the UEE dominates the secondary education system, as can be seen in Table II. Recent studies have shown that nearly half of the cohort succeeds in this examination and that this group constitutes 70% of those who complete secondary education. The dominance of the UEE was not due to official policy. On the contrary, it can even be argued that stated public policy during the last part of the 19th century and the best part of the 20th century has been to build up alternative educational tracks to the abstract and academic curriculum offered by the *gymnasia*. The oldest are the industrial-trade schools, which have enjoyed considerable public support and popularity. This interest, however, is on the wane. There were also a number of specialised schools, for

TABLE II. The percentage of the cohort who obtains the UEE

Exam category	22-year-olds	25-year-olds
UEE	35	42
Industrial-trade licence	7	13
Other	3	3
No examination completed	55	42

Based on two studies (Jónasson & Jónsdóttir, 1992, Table 2.1; Óskarsdóttir, 1995, Table 7.3) of the same cohort, that is, people born in 1969.

example, for sailors, farmers, machine-operators and pre-school teachers, and others which have now disappeared. In addition, two types of schools with a practical emphasis and non-classical academic curricula were gradually absorbed into the general compulsory education system. These were the 'real schools' (*gagnfræoaskólar*) in the urban areas, which provided general but practical training, and the 'provincial schools' (*héraosskólar*) in the rural areas, which played a kindred role.

Growth of the UEE population

Table III shows the regular growth of the population obtaining the UEE, whether the whole of the UEE student population is considered, or females and males separately. By comparing the transformed and untransformed data in the table it is clear that the growth is better described by an exponential than a linear line, even though a linear regression can explain much of the variance. An exponential curve ($y = e^{bx}$) clearly explains the best part of the variance, that is between 95% and 98%, depending on the group considered. Yet it is interesting to note the great discrepancy between males and females. The former has a growth exponent of 3.3% and the latter of 8.2%, using the percentage of the cohort as reference groups.

For data concerning both males and females, the absolute numbers give a better exponential fit than the data based on the percentage of the cohort. The difference is very slight and the latter data are of much more theoretical interest, since they show changes within the population, irrespective of changes due simply to population growth. The $\log_e$-transformed data stress two aspects of this growth. One is that it has been very consistent during this period. The second is that the very different growth rates of male and female students make them somewhat qualitatively different. For a closer analysis of these two features, the period under consideration is divided into two parts, which are then compared. The total period spans the years 1911–94 and is split into equal halves, from 1911 to 1952 and from 1953 to1994. The linear coefficients for the $\log_e$ (ln) regression are shown in Table IV. The number of students who passed the UEE is first analysed as a single group and subsequently with males and females divided into separate groups.

TABLE III. Regression of (i) numbers of students passing the UEE on year of graduation, corresponding to the equation: Number of students $= c + b*$year and (ii) $\log_e$ (number of students) regressed on year of graduation, corresponding to the equation: Number of students $= c*e^{b*\text{year}}$

	Untransformed		Log$_e$ transformed	
	R^2	b	R^2	b
UEE all students	0.738	21.7	0.981	0.059
UEE all students, % of cohort	0.779	0.49	0.980	0.044
UEE all males	0.817	9.31	0.978	0.048
UEE all males, % of cohort	0.869	0.39	0.969	0.033
UEE all females	0.670	12.5	0.959	0.096
UEE all females, % of cohort	0.702	0.59	0.946	0.082

TABLE IV. The linear coefficients obtained in a regression of $\log_e$ (number) on calendar years

	1911–94	1911–52	1938–52	1953–94	Difference between the two periods Δ	Δ%
UEE, all as % of cohort	0.045	0.042		0.051	0.009	21
UEE, females all as % of cohort	0.082	0.100		0.072		
UEE, females all as % of cohort	0.082		0.071	0.072	0.001	1
UEE, males all as % of cohort	0.033	0.035		0.034	−0.001	−3

The coefficients correspond to the b in the equation: Number of students $= c * e^{b * \text{year}}$.

The Total Population of Pupils Passing the UEE (see Figure 3)

The average exponential growth is about 4.5% per year (see Table IV). The growth was slower during the first half (4.2%) than the second half (5.1%) of the 20th century, as could be expected if one believes that education was more highly valued in the latter half of the century. It will emerge, however, that the more detailed picture gives a different impression. The prediction based on the 1911–52 data holds pretty well until the 1970s, but after that, the rise becomes greater than predicted on the basis of the early data.

Women Passing the UEE (see Figure 4)

The average annual increase of some 8% is very high. As there were very few women in *gymnasia* at the beginning of the century, one could have expected a rise

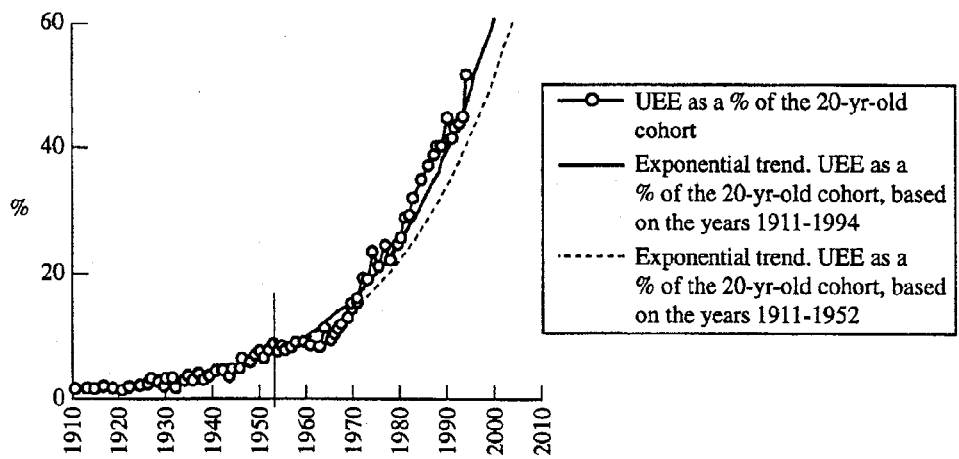

FIG. 3. The total number of students passing the UEE as a percentage of the 20-year-old cohort. The circled line shows the percentage of the cohort passing the UEE every year. The thick exponential line is the best fit for the whole period. The broken line is the fit based on the data from 1911 to 1952.

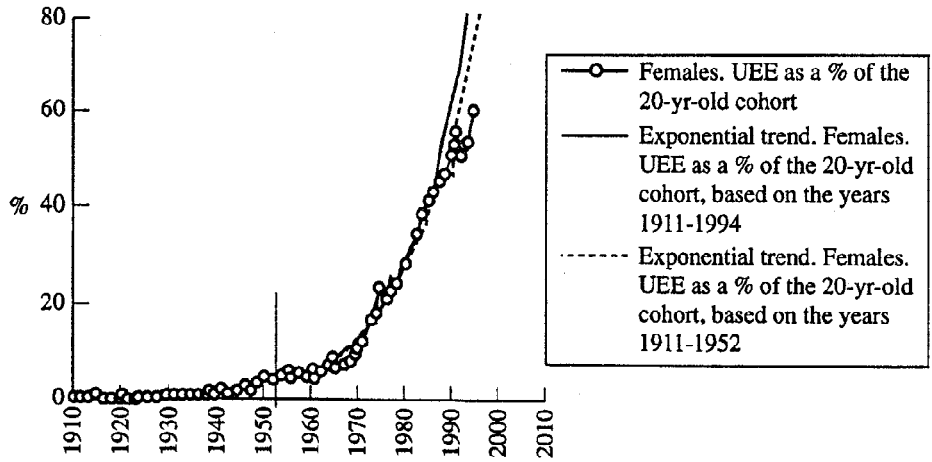

FIG. 4. The total number of female students passing the UEE as a percentage of the 20-year-old cohort. The circled line shows the percentage of the cohort passing the UEE every year. The thick line is the best exponential fit for the whole period. The broken line is the fit based on the data from 1911 to 1952. The dotted line is the fit based on data from 1938 to 1952.

in the number of women students that would have fallen to the level of the male population when the female population had reached the level of the growth in the male population. But this was not the case. The growth rate fell from nearly 10% during the first period to some 7.2% in the second, but remained more than twice that of the males (2.1 times, see table IV) during the second half of the 20th century. Because data on women during the early years of the century were unreliable, it was arbitrarily decided to analyse the data as from 1938, when women examinees represented over 1% of the cohort mark. Therefore, the period 1938–52 replaces the 1911–52 period for women in part of the subsequent discussion (see Table IV).

Men Passing the UEE (see Figure 5)

The growth rate of the male UEE population was fairly low (3.3%) but remarkably stable during both halves of the century (3.5% and 3.4% for the first and second half respectively, see Table IV). It was, if anything, slightly higher during the first half, predicting a slightly higher number of students obtaining the UEE than subsequently transpired. However, the last data point (for 1994) happens to lie precisely on this line.

Summary of the Main Features of the Data

The growth of the strongest component of the Icelandic non-compulsory educational system at the secondary level was exponential and seems to have lasted throughout the century. It should be noted that this relative growth is calculated in relation to the cohort and is therefore independent of the population growth. The exponential nature of the growth has certainly lasted throughout the century. It is clear from Figures 3–5

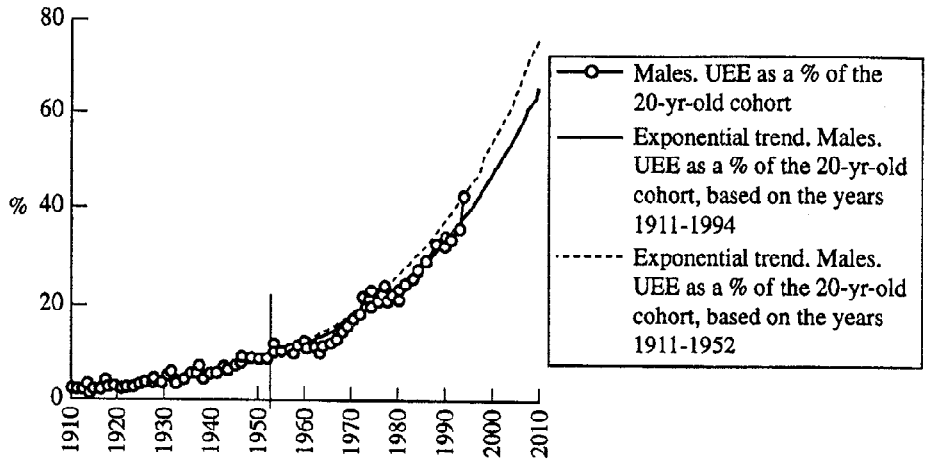

FIG. 5. The total number of male students passing the UEE as a percentage of the 20-year-old cohort. The circled line shows the percentage of the cohort passing the UEE every year. The thick line is the best fit the whole period, 1911 to 1994. The broken line is the best fit based on the data from 1911 to 1952.

that the exponential fit holds for both periods. But clearly such exponential growth has a limit and the data in Figure 4 show that growth may be on the wane for the female population, even though the number of girls obtaining the UEE is growing. Figure 6 shows a logistic best fit (S-curves), based on the assumption that saturation is at 100%. The curve seems to indicate a continued substantial growth, with some tapering off in the first decades of the 21st century, well above the 80% mark. A similar best fit of a logistic curve based on the 1938–52 data would have predicted a much earlier falling off. However, nothing in the present data suggests any substantial changes in the male pattern and the present curve still seems to rise above a logistic best fit, irrespective of whether the prediction is based on data from the 1911–94 or the 1911–52 period.

The growth rate for males and for the whole student population is very stable. The growth rate certainly shows a remarkable stability which seems to persist, despite very substantial changes in the Icelandic education system (Elíasson, 1946; Jóhannesson, 1984; Jónasson, 1990, 1992a,b) and society as a whole (Ólafsson, 1993a,b). It is, of course, true that, even though the growth has been exponential in the long-term, it is very difficult to discern changes in the growth rate pattern from exponential to linear growth (see Table II). Yet the difference explained by the exponential curves can hardly be better accounted for.

The long-term predictions for males and for the whole student population are fairly accurate. One way of showing the stability of the exponential growth is to analyse the accuracy of predictions made on the basis of early data for later years. Table V shows the predictions derived from the 1911–52 data for the year 1994. It should be noted that the midpoint of the base period is in the 1930s.

The prediction for the male data is close to the value, showing a difference of about 2% of the cohort, the prediction being higher than the value. Similarly,

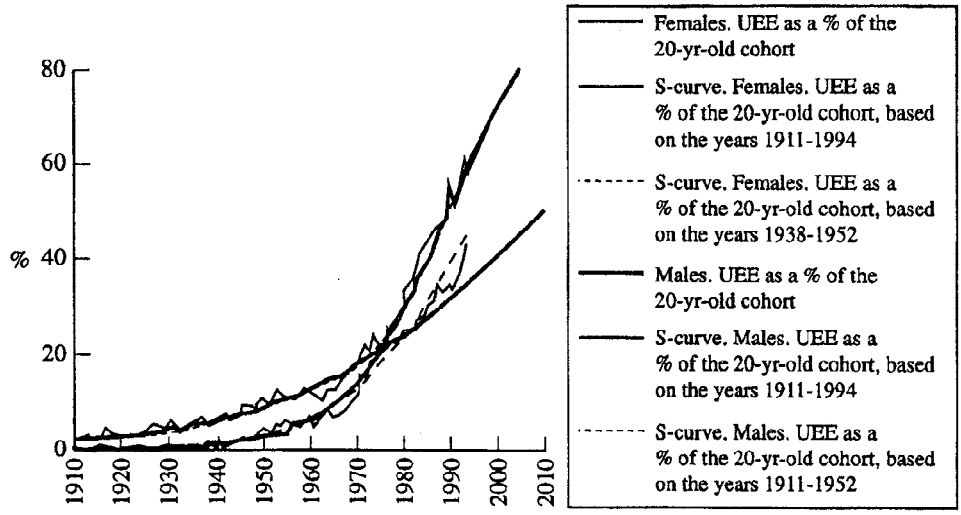

FIG. 6. The number of students, females and males, passing the UEE as a percentage of the 20-year-old cohort with logistic best fits. Six lines are shown: Three for females and three for males: the actual numbers and the best logistic fit, both based on the data for the whole period and also a logistic fit based on the data for the first period. The two different predictions for the males practically coincide.

the prediction for both sexes combined is in the right region, the prediction underestimating the actual rise in the total student population. The prediction for the females is slightly further off the mark, since it overestimates the rise in the female student population: the prediction was that the 1994 value should have been reached in 1990. This is not a great difference, given the time span involved. These data again underscore the difference in the growth rate between the sexes during the whole period.

The difference between the growth rates for females and males is substantial. The huge and consistent difference between the male and female student exponential growth rates is remarkable, both by its size and its consistency. This is seen in Table IV and Figure 6.

TABLE V. Predicted trend based on the data from 1911 to 1952 (all students and males) and from 1938 to 1952 (females) and the actual values for the year 1994. The numbers refer to the percentages relative to the cohort

	Prediction (%)	Actual value (%)	Δ
All students (1911–52)	40.9	51.9	11.0
Females (1938–52)	77.5	60.9	−16.6
Males (1911–52)	44.9	43.2	−1.7

The exponential growth rates for both males and females were lower in the second half than in the first half of the century. As the exponential growth seems to be the underlying regularity, it is of interest that it was more rapid in the first than in the second half of the century. Absolute growth obviously cannot increase indefinitely and thus a drop in the exponential component could be expected. But, as common wisdom tells us that it is the second half of the century that should be considered as the 'period of educational expansion', especially in relation to those who passed the UEE, it is interesting that, in relative terms, it was the other way round.

General Discussion

The growth in the number of Icelandic students passing the UEE between 1911 and 1994 is remarkable for several reasons. First, it was not planned and does not seem to be a response to any explicit demands, and certainly not at the rhetoric level. Furthermore, there were many hurdles to jump or diversions to ignore. For a long time, a fairly strict entrance examination to the *gymnasia* was compulsory. Yet during most of the 20th century (e.g. intense discussions at the University of Iceland in 1927) there seems to have been a general consensus that too many students graduated from the *gymnasium* in Reykjavik. The Ministry of Education introduced a *numerus clausus* in 1928. A law that was passed in 1946 established a national entrance examination to the *gymnasia (Landspróf)* but, at the same time, the option of a new double-track vocational and academic system was introduced in the hope of diverting a large number of students into more vocationally-oriented disciplines. In 1955, the State took financial responsibility for the industrial-vocational schools in order to secure the existence of this type of education and, in 1966, some of the apprenticeship requirements were eased. In 1969, continuation classes were created for 17–18-year-olds to divert them from the *gymnasia.* The comprehensive system introduced in the years 1975–85 was again explicitly meant to balance the status of vocational and academic disciplines and offer students the possibility of choosing (or gracefully retreating to) vocational disciplines within the same school without being sensitive to the problem of status. It is clear that the official policy was to stem the growth in the number of students opting for the UEE. Present data indicate that this effort may have been, at best, marginally successful but has had little overall effect. This must be a manifestation of the strength of the university preparatory programme in an environment which was attempting to undermine it (Jónasson, 1996).

This growth must be seen as reflecting on a society that fosters it. The social or economic environment may play a greater role in the development of the system than the nature or the structure of the education system *per se.* It should be noted in this respect that the UEE is a prerequisite for a university education which used to mainly train civil servants but has expanded to cover various academic professions (Jónasson, 1995). It is, however, a non-compulsory secondary education programme that does not give independent vocational status or rights, except the right to enter university. It is therefore by no means obvious why this programme has expanded in such an orderly and forceful fashion. This strong growth must also lead one to reflect on the nature of a programme that has developed so steadily over such a long period. What are the ingredients or formal aspects that have left it practically untouched during great economic and social changes for a whole century? Basic factors seem to include its high status, the fact that general education

is considered to be of great value, preparation for university study which often leads to well-paid and respected professions, and a waiting option, since students can defer any decision concerning what they want to do by following this respected four-year programme.

In Figure 4, one can see a noteworthy feature of the male UEE population. If one considers the extrapolated curve based on data from the first half of the century (1911–52), it seems as if the points for the latter half (as from 1953) show a curve which seems to obey the same law of growth as in the first half of the 20th century. Thus, if it is assumed that the expansion of educational attainment among males follows a certain pattern that is inherent either to society or to the education system, then any government initiative to expand or attempt to control educational opportunities must be seen as reactive rather than proactive. The government is then (rightly!) allowing the present young generation to follow the route it wishes. Hence, the controlling dynamic factor seems to be the student population and its search for a particular type of education, rather than the educational enterprise itself, or any other enterprise for that matter. In other words, the education system adapts to rather than controls or directs the expanding student population. This is rather dramatic but not totally unexpected. But the implications are interesting. To begin with, it implies that this part of the education sector has a life of its own and obeys fairly strong laws of growth. Second, it implies that perhaps it matters little who is responsible for the education system or how it is controlled by the government. It develops on its own, regardless. Third, it implies that if the academic programmes at the secondary level develop so rapidly, the vocational programmes at the same level are only temporary auxiliaries which fade away when the academic programmes need the resources both in terms of student numbers and money. Hence, a call for enhanced vocational programmes at the secondary level from most parties concerned, which was consistent throughout the early 1990s, can be regarded as an indirect call from the academic system for more students, many of whom could be recruited via nominal vocational options. The development of the system shows a strongly pronounced academic or general drift that is very stable and could resemble what is discussed in Ringer (1987) in the case of France. Fourth, it indicates that, with this growth in the UEE output, the tertiary system will continue to expand at the same exponential rate as before, eventually accepting the whole cohort of 20-year-olds in the same way as the secondary school now prepares itself to accept the whole of the 17-year-old cohort.

The growth rate for the male and female population was very different during the whole period. This must again imply something about the more immediate educational environments in which they evolve. These environments seem to change in a very orderly fashion. The environment for the males is more stable and more balanced, even though the academic sector is gradually gaining ground. The balancing forces in the educational environment for women seem to be weaker and have been so for the whole period, but even more so in the first half of the century, which essentially offered only one education option and thus caused a rise in the number of females opting for the UEE. This somewhat dramatic rise lasted longer than might have been expected, that is to say right into the early 1990s. It should be taken as a sobering reflection on the educational opportunities offered to the female population at the secondary level.

The absence of strong interaction between the two populations suggests that they operate in very independent educational (and thus social) environments and

that the labour markets for which they are preparing are also distinct. If women were pushing men out of certain attractive sections of the labour market by improving their general education, an effect on the growth curve of males might have emerged. No such effect is to be seen. The dramatic increase in the level of female general education has not had any effect on the growth function for the male population. Yet a slowing down of the growth rate for females was observed, which, however, cannot be attributed directly to influences from the male population.

NOTES

[1] Reliable statistics for the total university-level population are only available for the past few decades. The lack of data is primarily due to the difficulty in assessing the number of students in the past who went abroad for their university education.

[2] The exponential function describes growth where the increment per unit time is proportional to the amount present at that time and is typical of a host of organic systems. The coefficient b represents this proportion. The average growth, g, expressed as a percentage over a unit interval (e.g. financial interest over a year) is obtained by the equation $b = \ln(1 + g/100)$. If $b = 0.0596$, when time is expressed in years, then $g = 6.14\%$ pa. In the text, these two are used synonymously for the sake of simplicity, as they differ only slightly. In all cases, the numerical value presented is the exponent derived from the line of best fit.

[3] Based on data used for analysing the development of the University of Iceland, which was founded in 1911 (Jónasson, 1995), even though Schools of Divinity and Medicine were established in the 19th century. In the present article one year (i.e. 1994) was added to data analysis discussed in the previous paper.

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