The measurement of educational attainment in the FFS:
Comparing the ISCED-classification with information from educational histories in 17 European countries

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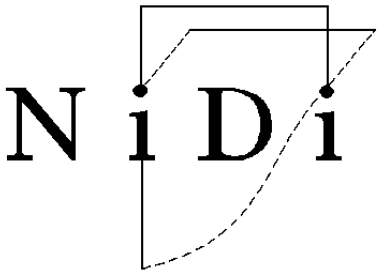

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Summary

In the FFS the ISCED-classification is used as an indicator of educational attainment. This paper explores the validity of this indicator for comparative research. In addition, we propose to use the age at which women leave the educational system as an alternative indicator of educational attainment. This career-indicator is superior to the ISCED-indicator in several respects: (1) the differences in the educational distributions between countries are much smaller and better interpretable, (2) models of the impact of educational attainment on the timing of first childbirth fit better and produce smaller standard deviations, and (3) the effect of educational attainment on the timing of first childbirth is stronger and more consistent across Europe. It is concluded that the career-indicator is much better suited for comparative research than the ISCED-indicator.

Introduction

Educational attainment is an important determinant of almost all demographically relevant behaviours. This is not only true with regard to mortality (Kunst, 1997) and migration (Kritz, Kim & Zlotnik, 1992; Massey & Espinosa, 1997), but also with regard to family formation. The higher educated marry later and have their first child later than people with a low level of education (Blossfeld, 1995; Blossfeld & Huinink, 1991; Liefbroer & Corijn, 1999).

Although educational attainment seems to delay family formation in all Western European countries (cf. Blossfeld, 1995), it is unclear whether its impact is basically the same in all these countries or shows substantial differentiation. In addition, it is not known whether or not the impact of education in Eastern European countries is comparable to that in Western Europe.

The FFS-data are ideally suited to shed light on issues regarding the impact of education on family formation across Europe. The realisation of this potential, however, depends on the cross-country comparability of the indicator used to measure educational attainment. Only if educational attainment is measured in an equivalent way in all participating countries can differences in the effect of educational attainment on family formation safely be attributed to substantive differences between countries rather than to measurement error. Given that educational systems differ strongly between countries, the valid and reliable measurement of educational attainment is by no means self-evident. In the FFS, measuring educational attainment is accomplished by classifying the highest level of education people have completed according to the International Classification of Education (ISCED). However, it is unclear whether the resulting ISCED-classification is reliable. For instance, when comparing

the distribution of the educational level of women in 15 countries, Beets (1997) found considerable differences and expressed serious doubts about the reliability of this measure.

In this paper, we will study the quality of the ISCED-indicator of educational attainment by comparing its properties with those of an alternative indicator for educational attainment derived from people's educational histories. This comparison will be made in two ways. First, we will compare both indicators with regard to how respondents within and between countries are distributed across the different levels of educational attainment. Second, the impact of both indicators of educational attainment on the timing of the birth of the first child will be analysed. The results of models in which either the ISCED-indicator or the career-indicator are used will be compared and discussed.

Measurement issues with regard to educational attainment

In comparative research, a major issue concerns the comparability of the indicators used in the respective countries. Only if a concept is measured in an equivalent way in all countries, can one safely attribute differences between countries to substantive causes (Welkenhuysen-Gybels & Billiet, 1999). In general, three levels of equivalence can be distinguished (Van de Vijver & Leung, 1997 cited in Welkenhuysen-Gybels & Billiet, 1999), namely construct equivalence, measurement-unit equivalence and scalar equivalence or full-score comparability. Construct equivalence presupposes that an indicator measures the same latent concept in all countries. Measurement-unit equivalence supposes that an indicator also measures a concept with the same interval-scale in all countries. Finally, scalar equivalence presupposes that the indicator measures the concept with the same ratio-scale in all countries. The higher the level of equivalence the better a measure is suited for comparative purposes. As will be clear, constructing such equivalent measures, and in particular constructing measures with measurement-unit or scalar-equivalence, is by no means a simple process.

When studying the impact of educational attainment on family formation, the problem of equivalence is particularly relevant for two reasons. First, educational attainment is viewed as a very important determinant of family formation behaviour. This is evident, for instance, in Becker's (1981) economic theory of fertility. He assumes that having children and pursuing a career are hard to combine. This implies that forming a family reduces the time women spend in a paid job, and as a consequence reduces their earnings. For higher educated women, these so-called opportunity costs are larger than for lower educated women. Consequently, the former will postpone childbearing compared to the latter. Subsequent research (cf. Blossfeld, 1995; Liefbroer & Corijn, 1999) has confirmed that higher educated women have their first child later than women with a lower level of education. However, this research also suggested that these differences may vary across countries, depending on the

structural opportunities for and cultural ideas about combining motherhood and a paid job. If so, it is extremely important that equivalent measures of educational attainment are available. If not, one could falsely attribute differences between countries to substantive causes, whereas in truth they might be caused by differences in the way the concept has been measured in different countries.

A second reason for paying serious attention to the cross-country equivalence of educational attainment is that the educational systems vary widely between countries. As a result, it is difficult to compare the curricula from different countries and to attach an educational attainment score to each school type in an unequivocal way. To overcome such problems the International Classification of Education (ISCED) has been created by the Unesco in 1976 (Eurostat, 1996). This classification consists of seven categories, coded from 0 to 6. The first two categories of the ISCED-classification represent people who only attained primary education or a part thereof. The third and fourth categories of the ISCED-classification represent the first and second rung of secondary education. Finally, the highest three ISCED-categories represent vocational and (post-) graduate education. However, the problem when using this classification is that every country has to decide for itself what ISCED-code has to be given to each type of education. This procedure can easily lead to differences between countries in the ISCED-code given to quite comparable educational curricula. For instance, Eurostat (1996, p. 91) warns that 'international comparisons are complicated by different national applications of ISCED and numerous variations in national education and training systems'.

Given this situation two questions can be posed:
1. *Are there any reasons to suspect that the ISCED-coding included in the FFS-dataset contains serious flaws as an indicator of educational attainment?*
2. *Are any alternative measures to estimate the educational attainment available that are better suited for comparative purposes?*

The first question can only be answered by examining empirical results on educational attainment. Two supplementary strategies seem promising. First, one can compare the distribution of people across educational levels in the FFS-countries. Our basic assumption is that differences in educational level between countries are to be expected, but that such differences will generally not be very large. After all, the expansion of the educational system has occurred in almost all Western European countries and in many Eastern European as well. In particular, we expect relatively small differences in educational level between countries within the same European region. If large and unexpected differences between European countries in the distribution of the levels of education of their population occur, this could point to flaws in the ways educational level has been measured and the validity of the indicator is questionable.

A second way to assess the validity of the ISCED-indicator is to examine its content-validity. Does educational level show the expected statistical relationships with other variables? In this study, the relationship between educational attainment and timing of first childbirth among women will be examined. Higher educated women are expected to postpone childbirth compared to lower educated women (Blossfeld, 1995). Do the data show this expected relationship or not? And is there much variation in the strength of this relationship between countries and is this variation plausible? Liefbroer and Corijn (1999) suggest that the impact of educational attainment on the timing of the birth of the first child will be strongest in countries where the combination of motherhood and labour force participation is problematic either for structural or cultural reasons. The impact of educational attainment is expected to be weaker in countries where good opportunities to combine motherhood and paid labour force participation exist.

Our second question concerns the availability of alternative measures for educational attainment. We propose a simple, alternative measure that is easily calculated for most countries and, in our opinion, offers better prospects for comparative research. This measure is based on the age at which people leave the educational system and can be calculated for all countries for which information on the age at leaving school is available. The usefulness of this alternative indicator can be assessed by comparing its univariate and multivariate properties with that of the ISCED-indicator. If our alternative shows better validity this suggests that our alternative is better suited as an indicator of educational attainment in cross-country comparisons than the ISCED-indicator.

The basic rationale for using age at leaving the educational system as an indicator for educational attainment is the assumption that people's educational attainment increases as they leave school at higher ages. In addition, it is assumed that people who leave school at the same age in different countries have attained approximately equal levels of education. Of course, many reasons exist why people who leave school at the same age can differ in their educational attainment. They could have repeated one of more classes, could have changed over to another type of education or could have studied part-time. However, although not all individuals who leave school at a certain age will have attained exactly the same level of education, it seems reasonable to assume that they have attained quite comparable levels of education and that these levels will generally be higher than those of people who left school at younger ages both in their own country and in other countries. To recall, the main issue of this study is not that using age at leaving school is the best indicator of educational attainment one can think of, but only that it is better than the ISCED-indicator in this particular dataset.

Data and Measures

The data used for this study come from the Fertility and Family Surveys conducted in 22 countries of the ECE Region. In five of these countries no or only incomplete information on leaving school is available. These countries were excluded from our analysis. Therefore, 17 countries will be used in this study. These are Austria, Belgium, the Czech Republic, Finland, France, the former East and West Germany (separately), Hungary, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Slovenia, Spain and Sweden. Women born between 1950 and 1970 are selected, because in most of these 17 countries this age-range is completely or almost completely filled.

In the FFS-questionnaires all participants were asked for the highest level of education they had completed. This has subsequently been classified according to the International Standard Classification of Education (ISCED) in each participating country by the responsible researcher(s). This classification consists of seven categories, coded from 0 to 6. Preliminary exploration of the educational distribution of women shows that in many countries various levels are not filled. In almost all countries no women can be found in the lowest category (coded zero), except in France where one fifth of all women reported not to have completed the first level. In another six countries, also category 1(=completed primary education only) is missing. Surprisingly, other categories were sometimes found to be empty as well. For example, in Hungary no women can be found in the two highest categories (5 and 6, being graduate and post-graduate education) and in Italy no women can be found in the ISCED-levels 4 and 5 (first two stages of tertiary education). Austria is a peculiar case, because only ISCED-level 2, 3 and 5 are present. Given these oddities, we decided to collapse the ISCED-codes into three levels, representing low, medium and high levels of education, respectively. Women in categories 0 to 2 of the ISCED-classification are considered as having attained a low level of education. These women have completed at most the first stage of secondary education. Women at level 3 of the ISCED-classification have completed the second stage of secondary education and will be considered as medium educated. Higher educated women in this study have completed any type of tertiary education and have ISCED-scores between 4 and 6.

In most of these 17 countries, participants were also asked questions on their educational career. In all countries the date at which they left school is known, whereas in most countries the beginning and ending dates of all educational spells completed after age 15 are known. Using this information, an alternative variable for measuring educational attainment has been constructed. The final age at which a woman leaves school is considered to indicate the amount of education she has attained. However, sometimes women have interrupted their educational careers. In countries where the complete educational career is known, these interruptions have been taken into account. The general rule is that we look at the age at which women completed their last education. We only deviate from this general rule if women have interrupted their educational career for more than eighteen months. In that case, her age when she ‘first’ left school is used as an indicator of her level of educational

attainment. In Belgium, East- and West-Germany and the Netherlands no information on the complete educational career is present. In these countries only the final date at which women left school is known and consequently used in this study. If women are still enrolled in education at the time of the interview their age at interview is taken as the indicator for their educational attainment[1]. To facilitate comparison with the ISCED-indicator, the information on the age at which women left school has been categorised into 3 levels. Women who left school before they turned 17 years old, were classified as having attained a low level of education. At this age women almost certainly have completed the first stage of secondary education. Women who left school between the age of 17 and 20 were classified as being medium educated. Finally, women with more than 5 years of education after age 15 are considered to be higher educated. These women are at least 20 years old when leaving school, and generally will have completed some type of tertiary education.[2]

Analysis strategy

The main purpose of this paper is to explore the quality of the ISCED-indicator of educational attainment and our alternative career-indicator. This will be done in two ways. First, we will compare the distribution of women across the three levels of education in all European countries. This will be done by calculating the percentages of women with a low, medium and high education according to both indicators. Next, the results will be compared and evaluated. No objective external criterion to judge the quality of both measures is available. However, given the fact that most of these countries have experienced a strong expansion of the educational system in the last decades, one would expect relatively small differences between countries, and in particular small differences between countries within the same European region. In addition, one would expect that younger cohorts have attained a higher mean level of education than older cohorts.

A second way to evaluate the quality of both measures is by examining their content-validity. We will estimate the impact of educational attainment on entry into first motherhood using a relatively simple hazard model. Entry into motherhood will be modelled to be dependent on age, birth-cohort and educational attainment for each country. The models have been estimated with the aML software package (Lillard & Panis, 1998; see Brien, Lillard & Waite 1999 for an example). An advantage of aML is that it offers the opportunity to model the age-dependency of the hazard with a so-called ‘spline’. The impact of age on the hazard of having a first child is piecewise linear. It is linear within predefined age-intervals, but its slope is allowed to vary between intervals. The quality of both indicators of educational attainment in predicting entry into motherhood will be assessed in several ways, for instance by examining the fit of both models, the standard errors of estimates and the between-country variation in the estimates.

Results

Distribution of educational attainment

First, we will examine the distribution of women born between 1953 and 1967 across educational levels in all 17 countries. In Table 1 the distribution according to the ISCED-indicator is presented. The percentage of lower educated women varies from a low of 7% in Lithuania and 9% in Latvia to a high of 65% in Spain. Also the Czech Republic, Italy, France, Hungary and Poland show relatively high levels of lower educated women. A wide variation in the percentage of highly educated women is also visible, running from less then 10% in the Czech Republic, West Germany and Italy to 53% in Norway. A closer look at the data not only reveals strong variation in the percentage of high and low educated women, but also that a clear regional pattern is absent. For instance, the percentage of highly educated women in the neighbouring countries of Belgium, West Germany and the Netherlands is 39, 10 and 16 respectively. Although some differences are likely, it seems highly unlikely that these differences reflect the actual differences in educational attainment between these countries. For instance, Eurostat (1996, p.96) reports that in 1994 the percentage of women born between 1960 and 1964 who had completed at least upper secondary education (= middle or high education) was lower in Belgium (65%) than in the Netherlands (82%) and Germany (87%). Although the Eurostat-data are also mainly based on survey-information and cannot be used as an objective criterion, it is remarkable that the discrepancies between the two data sources are so large.

To make sure that the differences between countries do not reflect differences in the age-distribution of women in the particular countries, we also present percentages of lower, medium and higher educated women for two successive birth-cohorts (1953-1959 and 1960-1966). The patterns within each cohort clearly reflect those in the total sample. To conclude, the ISCED-indicator of educational attainment suggests an extremely wide variation in the level of education attained in different European countries. In addition, no clear regional pattern emerges.

Next, we turn to the distribution of educational attainment based on the career-indicator. The results are presented in Table 2. Although wide discrepancies in the percentage of high and low educated women still exist, the differences between the 17 countries are much less striking than those found with the ISCED-indicator. This is true both with regard to the percentage of women who only attained a low level of education and for women with a high level of education. One can illustrate the difference between the distribution of the two indicators by comparing the association between country and educational level in both tables. *Cramer's V* is a useful measure of the degree of association between two nominal variables. The higher *Cramer's V*, the stronger the educational distribution varies between

countries. *Cramer's V* for the association between education and country when using the ISCED-indicator is 0.32, whereas *Cramer's V* is only 0.25 when using the career-indicator. This supports our observation that the differences in educational level are much smaller for the career-indicator than for the ISCED-indicator. In addition, the regional pattern of educational attainment is much more convincing for the career-indicator. The level of education seems to decline somewhat from North to South, at least within Western Europe. The differences between neighbouring countries are also smaller and more in line with expectations. Belgium, West Germany and the Netherlands show quite comparable levels of highly educated women if the career-indicator is used (40%, 42% and 37%, respectively).

Examination of the educational distributions within each of the two birth cohorts separately shows the same pattern as for the full sample. The differences in educational attainment between countries are smaller for the career-indicator than for the ISCED-indicator and the pattern of regional differentiation is much clearer as well. To conclude, the career-indicator shows more stability in achieved levels of education across Europe than the ISCED-indicator. According to the latter, huge differences in educational attainment exist across Europe and even between neighbouring countries sharing common economic and cultural features. In our opinion, the educational distributions generated by the career-indicator are generally far more realistic than those generated by the ISCED-indicator.

Impact of educational attainment on entry into motherhood

The quality of both indicators of educational attainment cannot be judged by comparing their respective distributions only. To arrive at more definite conclusions, their content-validity will be explored as well. Both indicators of educational attainment are used to estimate the timing of birth of a first child. In these hazard-models, educational attainment is treated as a time-constant variable to allow the inclusion of countries where no information on the complete educational career is present. Therefore, the results of this analysis should not be used to evaluate the exact impact of educational attainment on the timing of a first childbirth. The timing of birth of a first child will be estimated separately for each indicator of educational attainment, controlling for age and birth cohort.

Table 3 shows the results of the hazard analysis, if the ISCED-indicator of educational attainment is used. In all Western European countries with the exception of Austria medium educated women have a lower rate of giving birth to a first child than lower educated women, whereas higher educated women in their turn have a lower rate of first childbirth than medium educated women. Within Eastern Europe, the Czech Republic, Hungary, Poland and Slovenia show a similar pattern, whereas in Latvia this pattern is weak. In Lithuania and the former East Germany only higher educated women distinguish themselves from lower and medium educated women. To summarise, the ISCED-measure of educational attainment influences the timing of first birth in the expected direction, except in Austria.

Although our focus is on the impact of educational attainment on timing of a first childbirth, we briefly comment on the effect of cohort and age as well. Age is measured using a spline. By using a spline, one can easily model the changing rate of first childbirth across successive age groups. In all countries, the age-pattern of first childbirth follows the well-known bell-shaped curve (Blossfeld & Huinink, 1991). However, the curve is more extreme in Eastern European countries than in Western European countries. The peak is higher and earlier in Eastern European countries than in Western European countries. A clear cohort-effect is visible in all Western European countries. In these countries, younger women postpone childbearing compared to older women. In Eastern European countries with the exception of Hungary the pattern is different. In Latvia and Lithuania younger women have a higher rate of first childbirth than older women. In the other Eastern European countries (East Germany, Poland, the Czech Republic and Slovenia) no differences between cohorts in the rate of first childbirth are visible. However, one has to keep in mind that these results pertain to cohorts that started their reproductive careers before the fall of the Communist regimes in 1989. The FFS-data were collected too soon after this events to observe the likely postponement of first childbirth among cohorts that started their reproductive careers after the fall of Communism.

The next step is to repeat this analysis using the career-indicator of educational attainment. The results are presented in Table 4. At first glance, the effect of educational attainment is not much different from that in Table 3. Austria constitutes the most significant difference. In Austria the difference between lower and higher educated women in the rate to give birth to a first child is now comparable to other West-European countries. Obviously, for this country, using the career-measure is a better choice.

How can we evaluate the differences between the effects of the ISCED-indicator and the influence of the career-indicator, as at first glance these differences do not seem to be large? A closer look, however, reveals a number of significant differences. First, the model using the career-measure shows a better fit in ten countries and a slightly better fit in two countries (in Sweden and in the Czech Republic). In a further two countries (Hungary and Italy) the fit of both models is the same. Only in three countries (the Netherlands, France and Poland) does the model with the ISCED-indicator show a better fit than the model with the career-indicator. Although these models are not nested and therefore their fit cannot be compared straightaway, the results nonetheless suggest that the rate of first childbirth generally can be predicted better with the career-indicator than with the ISCED-indicator. Additional support for the superiority of the career-indicator is provided by the standard deviations coefficients for education. Generally, these are smaller for models in Table 4 than for models in Table 3. We calculated the mean of all country-specific standard deviations of the medium and high education coefficients.[3] These were larger for the ISCED-indicator than for the career-indicator. For instance, the mean standard deviation for medium educated women is .060 for the ISCED-indicator and .056 for the career-indicator, and that for the higher educated is

.085 for the ISCED-indicator and .076 for the career-indicator. Again, these differences show that the estimates of educational attainment using the career-indicator are more precise than those using the ISCED-indicator.

The models estimated with the career-indicator not only show a better fit than the models estimated with the ISCED-indicator, but the former also lead to slightly different substantive conclusions. Generally, the differences between highly educated women and women with low and medium levels of education are somewhat larger in models that use the career-indicator than in models that use the ISCED-indicator. The mean of all country-specific effects of high education is -.827 for models that use the ISCED-indicator and -.931 for models that use the career indicator.[4] In other words, the delaying effects of education on the timing of a first child is estimated to be stronger when the career-indicator is used than when the ISCED-indicator is used. In addition, the effect of educational attainment on the timing of first childbirth varies less between countries if the career-indicator is used. This can be illustrated by calculating the standard deviation of the effects of high education for all countries. This standard deviation is 0.18 if the career-indicator is used and 0.28 if the ISCED-indicator is used.[5] Therefore, models using the career-indicator suggest much smaller intra-European differences in the effect of educational attainment than models using the ISCED-indicator.

Conclusion and discussion

In cross-country comparisons of demographic behaviour, it is of utmost importance that the indicators used to explain demographic behaviour are comparable for all countries involved. If this is not the case, differences between countries can falsely be attributed to differences in the explaining variables. The main purpose of this study was to examine the validity of the standard classification for educational attainment (ISCED) as measured in the FFS surveys as an indicator of people's educational attainment.

The highest level of education that participants had completed was coded according to the International Classification of Education (ISCED) into seven categories. However, in many countries not all categories were used. Therefore, the number of categories was reduced to three: low, medium and high educational attainment. We also constructed an alternative indicator of educational attainment based on the number of years people have spent in the educational system. In most countries, educational histories were collected in the FFS. We used the age at which a woman left school as an alternative indicator of educational attainment. In constructing this indicator we took relatively short interruptions in the educational career into account. To facilitate comparison with the ISCED-indicator we categorised our career-indicator into three classes. Women who left school before age 17 were classified as lower educated, whereas women who stayed into school until the age of

20 were classified as medium educated. Women who left school after the age 20 were considered to have attained a high level of education.

The two indicators of educational attainment were compared in two ways. The first was by exploring the distribution of women across the three educational levels in each country. Differences between countries in this distribution were smaller and more in line with expectations for the career-indicator than for the ISCED-indicator. The second way in which both measures were compared was by examining the impact of educational attainment on the timing of a first childbirth. The career-indicator predicted the timing of a first child somewhat better than the ISCED-indicator. Generally, the fit of multivariate models using the career-indicator was better and the standard deviation of parameter estimates was smaller. In addition, the models that used the career-indicator suggested a somewhat stronger effect of educational attainment on first childbirth and less variation in the strength of this effect across Europe than models that used the ISCED-indicator.

These results have several implications. First of all, our results lead to serious doubts about the quality and usefulness of the ISCED-classification as an indicator of educational attainment in the FFS-project. The ISCED-distribution seems questionable for many countries. In our opinion, it is not advisable to use the ISCED-classification in the FFS if one is interested in studying differences between countries in the impact of educational attainment on family formation. This judgement is supported by the fact that others (e.g. Eurostat, 1996) have expressed serious doubts about the cross-country comparability of the ISCED-classification as well. Recently, this has led to a revision of the ISCED-classification (OECD, 1999) in order to take the major changes in the educational system during the last 25 years into account. However, it is still unknown whether this revised ISCED-classification will solve the problems that were faced by its predecessor.

Our career-indicator of educational attainment shows several properties that make it a very worthwhile alternative if one is interested in examining the impact of educational attainment on family formation. The educational distributions of the career-indicator vary relatively little between countries and the patterns found are in line with expectations. In addition, the effects of our career-indicator on the timing of first childbirth are clear and easy to interpret. Therefore, we recommend its inclusion in FFS-models that examine the impact of education on family formation. In addition, we would like to emphasise the importance of including the complete educational career in the next wave of the Fertility and Family Surveys.

Measuring educational attainment based on information from the educational careers of respondents has some additional advantages that were not discussed as yet. First, its measurement-level is interval rather than ordinal as in the case of the ISCED-classification. Second, students who have not yet completed an education will get a score that reflects the fact that they have accumulated some human capital during their enrolment even without

having completed the full level. For instance, if one has been enrolled in university for a couple of years, one's human capital is higher than if one has not been enrolled in university at all. The ISCED-classification does not take these subtleties into account whereas the career-indicator does. Third, if information on full-time and part-time enrolment is available, the career-indicator can take this information into account. Fourth, the career-indicator can easily be transformed into a time-varying covariate. If one really wants to study the impact of educational attainment on family formation processes the use of a time-varying educational attainment variable is essential (Hoem, 1996). Finally, the use of information on the age at leaving school facilitates the estimation of models that try to disentangle the impact of educational attainment and educational enrolment (Blossfeld & Huinink, 1991). Separating these effects is important because one wants to know why the higher educated start family formation later than women with a lower level of education. Is this because the former stay in the educational system for a prolonged period of time or because the former behave differently even after completing their education? Educational career information is essential in answering this important question.

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Notes

[1] In this paper, we focus on the time-constant measurement of educational attainment. Using a time-constant measure to predict the timing of demographically relevant events can lead to serious bias (Hoem, 1996). However, an important advantage of our measure is that it can also very easily be applied if one wants to measure educational attainment in a time-varying fashion. We will briefly return to this issue in the discussion.

[2] An added advantage of our indicator compared to the ISCED-classification is that ours is measured at interval-level whereas the ISCED-indicator is only ordinal. Therefore, by categorising our career-indicator we do not make use of its full potential.

[3] In this calculation we excluded Austria, as the ISCED-indicator for this country clearly is flawed.

[4] Again, Austria was excluded from this calculation.

[5] See note 4.

Table 1: Educational attainment based on the ISCED-indicator for women in 17 European countries

	Lower educated			Middle educated			Higher educated		
	1953-1959	1960-1966	all[a]	1953-1959	1960-1966	all	1953-1959	1960-1966	all
Norway	14.8	9.6	10.9	40.8	28.3	31.0	44.4	62.1	58.1
Sweden	13.9	10.2*	12.1	46.4	55.8	53.9	39.6	34.0	34.0
Finland	18.2	9.6	15.2	60.9	77.2	68.3	20.9	13.2	16.5
W-Germany	48.2	37.7	40.1	37.0	51.9	48.7	14.8	10.5	11.2
Netherlands	42.9	35.7	39.9	37.4	44.8	41.7	19.8	19.5	18.5
Belgium	34.1	21.6	27.0	34.0	39.2	37.9	31.9	39.2	35.1
Austria	26.7	27.8	27.3	55.2	55.5	54.5	18.0	16.7	18.2
France	48.2	37.3	40.6	34.9	42.3	39.9	16.9	20.5	19.5
Italy	50.8	42.3	47.1	35.5	46.2	41.1	13.7	11.5	11.8
Spain	74.0	62.6	67.4	12.0	17.0	15.6	13.9	20.5	17.0
Latvia	6.5*	4.4*	6.6	68.2	73.3	69.4	25.3	22.3	24.0
Lithuania	4.1*	2.4*	3.4*	54.8	53.6	54.9	41.1	43.9	41.8
E-Germany	15.8	11.4	13.3	51.4	57.3	57.4	32.8	31.3	29.3
Poland	46.2	45.1	46.3	36.4	37.3	37.2	17.3	17.6	16.5
Hungary	47.9	46.5	47.7	38.0	36.9	37.7	14.1	16.5	14.6
Czech Rep.	55.2	45.2	48.6	35.2	41.1	39.4	9.6*	13.7*	12.0
Slovenia	32.9	19.2	26.7	28.8	30.0	28.2	38.4	50.9	45.1

* N<75

a. all = all women born between 1950 and 1969.

Table 2: Educational attainment based on the career-indicator for women in 17 European countries

	Lower educated			Middle educated			Higher educated		
	1953-1959	1960-1966	all[a]	1953-1959	1960-1966	all	1953-1959	1960-1966	all
Norway	18.7	9.5	11.1	38.4	40.7	42.2	43.0	49.8	46.7
Sweden	14.5	9.0	11.4	38.7	52.2	47.8	46.8	38.8	40.7
Finland	20.5	10.6	16.9	28.7	38.6	33.8	50.8	50.9	49.4
W-Germany	25.5	19.4	20.4	41.6	38.0	38.3	32.9	42.7	41.3
Netherlands	34.6	20.7	28.7	31.4	40.6	34.9	34.0	38.7	36.4
Belgium	28.9	18.3	22.5	37.8	39.7	39.0	33.3	42.0	38.5
Austria	35.2	28.1	31.8	49.0	55.1	51.8	15.8	16.8	16.5
France	46.1	32.3	37.9	36.2	42.7	40.6	17.7	25.0	21.5
Italy	45.8	39.1	43.3	22.3	28.7	25.6	31.9	32.2	31.1
Spain	64.5	51.2	56.7	14.5	17.5	16.9	21.0	31.2	26.3
Latvia	7.2*	5.2	7.0	53.0	58.8	54.8	39.8	36.0	38.2
Lithuania	7.9*	5.3	6.8	40.9	42.8	42.5	51.2	51.9	50.7
E-Germany	11.6	9.6	10.6	55.5	59.4	57.5	33.0	31.0	31.9
Poland	19.9	12.3	19.1	49.2	57.8	51.9	30.9	29.9	29.0
Hungary	35.7	30.7	32.8	43.7	47.9	46.7	20.6	21.5	20.4
Czech Rep.	20,2	11.4	15.0	60.8	68.3	65.8	19.0	20.3	19.2
Slovenia	34.4	23.4	29.4	38.5	49.0	43.5	27.1	27.6	27.2

* N<75

a. all = all women born between 1950 and 1969.

Table 3: Hazard of first childbirth in 17 European countries, using the ISCED-indicator of educational attainment

	Norway	Sweden	Finland	West-Germany	Netherlands	Belgium	Austria	France	Italy
Intercept	-4.4905 ***	-4.9424 ***	-4.5193 ***	-4.3996 ***	-5.6790 ***	-5.1680 ***	-4.2316 ***	-4.6993 ***	-4.7201 ***
	(.1612)	(.1660)	(.1499)	(.1440)	(.1826)	(.1591)	(.1128)	(.1580)	(.1382)
Age 15-19	.6094 ***	.5653 ***	.4560 ***	.3904 ***	.5449 ***	.5683 ***	.4054 ***	.5280 ***	.4781 ***
	(.0382)	(.0386)	(.0358)	(.0347)	(.0417)	(.0370)	(.0266)	(.0374)	(.0328)
Age 20-24	.0389 *	.1063 ***	.1160 ***	.1204 ***	.2078 ***	.2381 ***	.0654 ***	.1124 ***	.1340 ***
	(.0205)	(.0181)	(.0178)	(.0185)	(.0166)	(.0164)	(.0154)	(.0179)	(.0153)
Age 25-29	.0722 **	.0379 *	-.0231	.0017	.0673 ***	-.1487 ***	-.0837 ***	-.0533 **	.0066
	(.0321)	(.0229)	(.0240)	(.0243)	(.0165)	(.0238)	(.0226)	(.0245)	(.0185)
Age 30-34	-.2197 **	-.1434 ***	-.1981 ***	-.2525 ***	-.2122 ***	-.2860 ***	-.1143 ***	-.1632 ***	-.1284 ***
	(.1107)	(.0461)	(.0579)	(.0559)	(.0323)	(.0665)	(.0435)	(.0553)	(.0347)
Age 35+	-.2104	.0429	-.4090	-.7447 *	-.2373 **	-.4785	-.3769 ***	-.3110 *	-.3667 ***
	(.0000)	(.1780)	(.3865)	(.4427)	(.0960)	(.3835)	(.1097)	(.1867)	(.0926)
Birth-cohort	-.0189 ***	-.0215 ***	-.0341 ***	-.0200 ***	-.0398 ***	-.0436 ***	-.0258 ***	-.0325 ***	-.0373 ***
	(.0069)	(.0052)	(.0056)	(.0057)	(.0042)	(.0049)	(.0039)	(.0047)	(.0038)
Education:									
Middle	-.6226 ***	-.3349 ***	-.4914 ***	-.4033 ***	-.4379 ***	-.4593 ***	.0656	-.3664 ***	-.6584 ***
	(.0651)	(.0580)	(.0554)	(.0541)	(.0454)	(.0475)	(.0495)	(.0538)	(.0452)
High	-1.3394 ***	-.8238 ***	-.7670 ***	-.7859 ***	-1.1128 ***	-.8530 ***	-.0151	-.9829 ***	-1.1547 ***
	(.0703)	(.0700)	(.0873)	(.1033)	(.0700)	(.0634)	(.0648)	(.0858)	(.0937)
ln-L	-6470.84	-7992.82	-7943.89	-7661.24	-11158.19	-9212.48	-10291.73	-7358.91	-11109.04

Table 3: Hazard of first childbirth in 17 European countries, using the ISCED-indicator of educational attainment (cont.)

	Spain	Latvia	Lithuania	East-Germany	Poland	Hungary	Czech Republic	Slovenia
Intercept	-4.8762 ***	-5.4615 ***	-5.9391 ***	-4.5976 ***	-5.1608 ***	-3.9621 ***	-4.5612 ***	-4.2678 ***
	(.1522)	(.2018)	(.2155)	(.1178)	(.1457)	(.0964)	(.1851)	(.1278)
Age 15-19	.4814 ***	.8324 ***	.7969 ***	.6597 ***	.7480 ***	.5399 ***	.7113 ***	.6484 ***
	(.0359)	(.0440)	(.0463)	(.0268)	(.0335)	(.0237)	(.0440)	(.0303)
Age 20-24	.1787 ***	.0388 **	.1550 ***	-.0068	.0901 ***	.0115	-.0594 **	.0196
	(.0164)	(.0181)	(.0176)	(.0160)	(.0151)	(.0146)	(.0247)	(.0164)
Age 25-29	-.0013	-.1327 ***	-.2396 ***	-.1962 ***	-.1744 ***	-.1383 ***	-.0869 *	-.1151 ***
	(.0200)	(.0301)	(.0313)	(.0364)	(.0267)	(.0285)	(.0476)	(.0312)
Age 30-34	-.1888 ***	-.0971	-.1999 **	-.1809	-.1549 **	-.1728 **	-.2111 *	-.1564 **
	(.0435)	(.0644)	(.0812)	(.1153)	(.0614)	(.0700)	(.1149)	(.0673)
Age 35+	-.2761 **	-.3433 **	-.3156	-3.6108	.0228	-.1854	-.2254	.0618
	(.1137)	(.1695)	(.2422)	(8.1418)	(.1584)	(.2207)	(.2172)	(.0972)
Birth-cohort	-.0164 ***	.0110 **	.0178 ***	-.0024	.0028	-.0096 **	.0078	-.0002
	(.0041)	(.0044)	(.0046)	(.0045)	(.0040)	(.0038)	(.0064)	(.0041)
Education:								
Middle	-.6492 ***	-.1683 **	.1379	.0158	-.5470 ***	-.4779 ***	-.3127 ***	-.2981 ***
	(.0693)	(.0811)	(.1088)	(.0573)	(.0457)	(.0437)	(.0722)	(.0532)
High	-.9116 ***	-.7136 ***	-.3115 ***	-.2343 ***	-.9277 ***	-.8763 ***	-.7667 ***	-.6677 ***
	(.0816)	(.1012)	(.1121)	(.0688)	(.0751)	(.0801)	(.1358)	(.0559)
ln-L	-9234.00	-6672.89	-6703.23	-8875.41	-9615.43	-10563.21	-3875.35	-8010.13

Table 4: Hazard of first childbirth in 17 European countries, using the career-indicator of educational attainment

	Norway	Sweden	Finland	West-Germany	Netherlands	Belgium	Austria	France	Italy
Intercept	-4.6484 ***	-4.8958 ***	-4.5065 ***	-4.2257 ***	-5.6109 ***	-5.1037 ***	-3.8840 ***	.5245 ***	.4795 ***
	(.1610)	(.1661)	(.1497)	(.1436)	(.1831)	(.1592)	(.1083)	(.0378)	(.0329)
Age 15-19	.6132 ***	.5697 ***	.4645 ***	.3987 ***	.5463 ***	.5689 ***	.4149 ***	.1120 ***	.1335 ***
	(.0387)	(.0394)	(.0363)	(.0355)	(.0418)	(.0371)	(.0271)	(.0178)	(.0154)
Age 20-24	.0503 **	.1007 ***	.1208 ***	.1233 ***	.2060 ***	.2419 ***	.0794 ***	-.0545 **	.0091
	(.0209)	(.0180)	(.0181)	(.0186)	(.0166)	(.0164)	(.0155)	(.0247)	(.0184)
Age 25-29	.0635 **	.0437 *	-.0202	.0048	.0651 ***	-.1490 ***	-.0787 ***	-.1621 ***	-.1273 ***
	(.0319)	(.0230)	(.0239)	(.0242)	(.0165)	(.0237)	(.0226)	(.0554)	(.0347)
Age 30-34	-.2495 **	-.1399 ***	-.1983 ***	-.2510 ***	-.2189 ***	-.2926 ***	-.1222 ***	-.3130 *	-.3666 ***
	(.1101)	(.0460)	(.0579)	(.0557)	(.0323)	(.0665)	(.0435)	(.1868)	(.0925)
Age 35+	-.2104	.0345	-.4072	-.7509 *	-.2416 **	-.4920	-.3948 ***	-4.7054 ***	-4.7156 ***
	(.0000)	(.1787)	(.3853)	(.4425)	(.0964)	(.3836)	(.1091)	(.1584)	(.1385)
Birth-cohort	-.0273 ***	-.0197 ***	-.0296 ***	-.0106 *	-.0330 ***	-.0395 ***	-.0215 ***	-.0333 ***	-.0409 ***
	(.0069)	(.0052)	(.0055)	(.0056)	(.0042)	(.0049)	(.0038)	(.0047)	(.0037)
Education:									
Middle	-.4412 ***	-.4083 ***	-.2828 ***	-.3114 ***	-.3484 ***	-.4605 ***	-.3979 ***	-.3048 ***	-.4569 ***
	(.0589)	(.0593)	(.0562)	(.0544)	(.0465)	(.0464)	(.0440)	(.0536)	(.0486)
High	-1.4419 ***	-.8660 ***	-.8979 ***	-1.0279 ***	-.9031 ***	-.9848 ***	-.9930 ***	-.9011 ***	-.9928 ***
	(.0785)	(.0683)	(.0650)	(.0722)	(.0548)	(.0648)	(.0809)	(.0817)	(.0580)
ln-L	-6413.49	-7989.14	-7878.19	-7590.25	-11187.74	-9188.64	-10177.56	-7374.52	-11099.46

Table 4: Hazard of first childbirth in 17 European countries, using the career-indicator of educational attainment (cont.)

	Spain	Latvia	Lithuania	East-Germany	Poland	Hungary	Czech Republic	Slovenia
Intercept	-4.8178 ***	-5.4700 ***	-5.7106 ***	-4.4714 ***	-5.1143 ***	-3.9114 ***	-4.3548 ***	-4.3216 ***
	(.1526)	(.1977)	(.2077)	(.1148)	(.1459)	(.0967)	(.1878)	(.1275)
Age 15-19	.4831 ***	.8439 ***	.8086 ***	.6802 ***	.7451 ***	.5411 ***	.7169 ***	.6595 ***
	(.0360)	(.0448)	(.0476)	(.0278)	(.0338)	(.0240)	(.0446)	(.0305)
Age 20-24	.1828 ***	.0355 *	.1509 ***	-.0013	.0851 ***	.0082	-.0627 **	.0376 **
	(.0165)	(.0182)	(.0177)	(.0161)	(.0152)	(.0147)	(.0248)	(.0166)
Age 25-29	.0055	-.1352 ***	-.2498 ***	-.2077 ***	-.1734 ***	-.1421 ***	-.0899 *	-.1205 ***
	(.0201)	(.0302)	(.0312)	(.0361)	(.0269)	(.0285)	(.0477)	(.0310)
Age 30-34	-.1969 ***	-.0953	-.1968 **	-.1564	-.1556 **	-.1588 **	-.2001 *	-.1548 **
	(.0435)	(.0645)	(.0806)	(.1149)	(.0614)	(.0702)	(.1141)	(.0665)
Age 35+	-.2730 **	-.3395 **	-.3365	-3.3274	.0202	-.1575	-.2100	.0669
	(.1142)	(.1697)	(.2424)	(8.0495)	(.1591)	(.2202)	(.2164)	(.0972)
Birth-cohort	-.0145 ***	.0114 ***	.0173 ***	-.0007	.0077 **	-.0069 *	.0046	-.0022
	(.0041)	(.0044)	(.0045)	(.0045)	(.0039)	(.0039)	(.0063)	(.0040)
Education:								
Middle	-.4838 ***	-.1317 *	-.0854	-.0950 *	-.2484 ***	-.3922 ***	-.4029 ***	-.2882 ***
	(.0588)	(.0740)	(.0797)	(.0543)	(.0469)	(.0415)	(.0716)	(.0454)
High	-.9842 ***	-.6993 ***	-.5750 ***	-.7837 ***	-.8907 ***	-.9411 ***	-.9607 ***	-1.0508 ***
	(.0695)	(.0898)	(.0860)	(.0789)	(.0663)	(.0751)	(.1287)	(.0763)
ln-L	-9205.08	-6659.21	-6690.98	-8784.23	-9634.50	-10562.69	-3870.28	-7925.82