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Progress in the Educational System**

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ABSTRACT

Dropping out of School? A Competing Risks Analysis of Young Immigrants' Progress in the Educational System

This paper analyses the drop-out and graduation behaviour of young 1st generation immigrants enrolled in a qualifying education in the period 1984-1999. The descriptive analyses show that the low educational achievements among young immigrants compared to young ethnic Danes found in other studies are a combination of low enrolment rates and high drop-out rates among the immigrants. Especially, male immigrants have much higher drop-out rates and lower completion rates than ethnic Danes. A competing risk duration model is used to analyse the time patterns of drop-out rates and completion rates for immigrants, as well as the effects of variables such as age at migration, marital status, the presence of young children, parental education, and ethnic origin. The results show that marriage reduces the probability of educational enrolment for female immigrants as well as for male immigrants, but also that being (or becoming) married leads to a decline in the female immigrants' drop-out rate. Age at migration exerts a negative influence on the probability of enrolling in an education, and for women age at migration also affects the dropout rate. Parental capital shows no effect on the immigrants drop-out and completion rates.

JEL Classification: J61, J24

Keywords: educational achievement, drop-out, competing risks, duration model, sample selection

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1. Introduction

In this paper, we analyse the process according to which a sample of 1st generation immigrants, who came to Denmark as children and – upon leaving secondary school – commenced a qualifying education, drop-out from or complete this qualifying education. We are particularly interested in the time patterns of drop-out rates and completion rates, as well as in the effects of variables such as the age at migration, marital status, the presence of young children, parental education, and ethnic origin. The immigrants analysed in this study come from Ex-Yugoslavia, Turkey and Pakistan. We estimate a competing risks duration model with two different causes for leaving the educational system; dropping out or completing. The analysis is conducted separately for men and women.

The primary motivation for looking at this issue is the observation that not only 1st generation immigrants but also 2nd generation immigrants have very high drop-out rates from qualifying education. The Danish Ministry of Education (2001b) have shown that the proportion of 1st and 2nd generation immigrants enrolled at a vocational or high school education has nearly converged to the similar proportion of the ethnic Danes during the last ten years, and that the transition rates from one educational level to the next, conditional on completion, is nearly as high for immigrants as the corresponding transitions rates for young ethnic Danes. This does suggest that the educational level of the young immigrants will approach the level of ethnic Danes. However, the Ministry of Education also finds that both the 1st and 2nd generation of immigrants drop out from the educational system to a much higher extent than young ethnic Danes.

Immigrants who came to Denmark as children share some of the characteristics of 2nd generation immigrants in the sense that some of them have been through the Danish basic school system. Variations in age at migration allow us to identify the effect of going through the Danish school system separately from the differences that there may otherwise be between immigrants and natives. The ability to identify the effect of age at migration on educational achievement allows us to infer the likely reasons for high drop-out rates among 2nd generation immigrants (who are characterised by being born in Denmark). This is important because very large cohorts of 2nd generation immigrants are on their way into the educational system right now, and the entry of 2nd generation immigrants into the educational system will increase dramatically in the future. However, most 2nd generation immigrants are still quite young, and hence, few of them have completed their education. This implies that inferences based on statistical analyses of these cohorts may not be valid. On the contrary, the immigrants analysed in this paper were 28-36 years old in 1999, and thus, most of them had already left the educational system before 1999.

We propose to use a duration model for analysing this issue, because this framework naturally allows us to investigate the dynamic process of human capital acquisition, and the impact of e.g. time-varying variables such as marriage and the presence of young children. The use of duration models also allows taking into account that there are potentially two different causes for leaving the

educational system, drop-out versus completion, through a specification of a competing risks model.

The process of completion versus dropping out of the educational system has been analysed by van Ophem and Jonker (1999), who investigate US data on college students. They use a continuous time competing risks duration model. They find – naturally – that the completion rate is very low initially, but the drop-out rate is high already in the beginning of the educational spell. They find similar hazard rates of men and women, and they find ability (as measured by AFQT scores) to be quite important.

Other duration studies of drop-out are Arulampalam *et al.* (2001), who analyse drop-out from medical schools in the UK, and DesJardins *et al.* (2002), who analyse drop-outs among college students in the US. They both use duration models to examine the probability that an individual will drop out prior to successful completion of their studies. Arulampalam *et al.* (2001) find that academic preparedness (measured by pre-university secondary school grades/scores) is an important factor determining drop-out and that men are more likely to drop out than women, but they find no effect of parental social class. DesJardins *et al.* (2002) analyse how different packages of financial aid to college students affect their decisions concerning departure from college, a discussion which is less relevant in the Danish context, because grants and loans financed by the state are available for all students in Denmark and because there are no tuition fees in the Danish educational system (see section 3).

The use of a duration framework finds some support in a paper by Cameron and Heckman (1998). The widely used ‘schooling transition model’ - where the probability of schooling attainment is generated of a sequence of transition probabilities - is severely criticized. Using US data, they show that the schooling transition model implies ‘dynamic selection bias’ in the empirical estimates when omitted individual variables that affect the estimates of the transition model are ignored.

A particularly intriguing problem is posed by the presence of sample selection; in our simplest models, we find that the higher is the age at migration, the higher is the completion rate of qualifying education, and the lower is the drop-out rate. This highly counterintuitive finding has something to do with sample selection bias; suppose a smaller fraction of those arriving to Denmark at higher ages commence a qualifying education than among those who arrived as young children. Then it is likely that the selection process determining enrolment into qualifying education is much tougher among the ‘late arrivers’ than among those who arrive at very young ages. Those with high age at migration (say, 11-16) who enrol into the educational system will on average have much better unobserved abilities, and it may be that this fact seriously biases our (first round) estimation results. In order to deal with this phenomenon, we propose the use of a sample selection model, that is, a selection equation estimated jointly with our duration model. In order to identify such an equation system nonparametrically, we need exclusion restrictions. We have access to the number

of qualifying educational institutions in the municipality. This is likely to affect the probability that an individual enrolls into a qualifying education, but is not very likely to affect the probability of dropping out versus completing the education. Therefore, we use it as our identifying variable.

Earlier Danish studies regarding the educational attainment of young first and second generation immigrants have primarily focused on the level of education the young immigrants achieve and the factors which influence the level of education (e.g. Hummelgaard *et al.* (1998, 2002) and Jakobsen and Smith (2003)). Jakobsen and Smith (2003) include an analysis of drop-out rates among immigrants from Turkey, Pakistan and the Ex-Yugoslavia using a probit specification based on survey data from 1999, and find that proficiency in the Danish language is an important factor in explaining the individual drop-out risk. Other findings are that the length of mother's education reduces the drop-out risk and early marriage increases the drop-out risk. However, the analysis of drop-out in Jakobsen and Smith (2003) does not take sample selection into account, which can explain the finding that age at migration has a negative effect on the drop-out risk among female immigrants. Besides Jakobsen and Smith, Danish studies concerning drop-out from the educational system among immigrants do not – to our best knowledge – exist.¹

The paper is organised as follows; in the next section, we discuss the theoretical foundations of the paper, while section 3 describes the main features of the Danish educational system. The data set used in this study is presented in section 4, and in section 5 the econometric model used for the analysis is laid out. Section 6 contains a presentation of the main results, along with a discussion of their economic interpretation. Finally, conclusions and policy issues are discussed in section 7.

2. Theoretical considerations and hypotheses

It is often assumed, based on human capital theory, that the choices of investment in education are based on maximisation of expected discounted lifetime income. That is, an individual will enrol at an educational institution if the expected gains from spending time on a particular education are larger than at any other educational institution, and outweigh the expected costs, given the available information. The potential gains are increased wage levels and improved chances of obtaining permanent employment.

Two theories describe the relation between education and income/earnings: the human capital theory and the screening/signalling hypothesis. According to the screening hypothesis (Arrow (1973), Spence (1973, 1974)) the main *raison d'être* for the educational system is to give those with better abilities a possibility to send a signal of these abilities; undertaking an education is costly, but the costs are lower for the more able individuals. An education only raises wages if the individual

¹ The international literature is discussed in the next section.

graduates, and students will quit immediately if new information arrival reveals that the costs are larger than was originally perceived.

According to human capital theory (Becker (1962, 1975) Schultz (1971)), education is an investment that will increase productivity and therefore increase the future earnings potential. Thus, a student will quit the educational system when the optimal amount of education is reached, irrespective of whether she has graduated or not.

The decision to drop out is thus, according to those theories, a consequence of either having reached the optimal level of educational investment before graduation, or due to the arrival of new information, rendering the original decision (to graduate) inoptimal. In Denmark (as in other European countries), it is in most professional occupations a requirement to have graduated in order to obtain employment. Thus, it could be argued that the Danish educational system contains strong elements of signalling and that the decision to drop out as a consequence of having reached the optimal level of education is not very likely. This implies that drop-out is a large problem, because it implies that not only the individual, but also the society as a whole, wastes valuable resources. Our aim in this paper, however, is not to test these competing theories. But in order to test our main hypotheses we need a formal framework in which to interpret our results. It is for this purpose that the theories on human capital and signalling/screening are discussed.

As discussed above, people may (choose to) graduate, either because it sends a signal of ability, or because they have reached the optimal level of investment in education. In any event, completion rates are likely to depend on ability, so any variables that may proxy for (unobserved) ability would be likely candidates to include in the estimating equations below. Of course, many other factors may play a role in completion rates, such as motivation, academic preparedness, tradition, social integration, marital status etc., see e.g. Arulampalam *et al.* (2001).

With regard to drop-out rates, the information that can render the original decision to graduate inoptimal could be events in the family (birth of a child, marriage), or it could be the recognition of rigidities in the educational system, i.e. the inability to find a trainee placement, due to e.g. discrimination or to a general shortage of suitable placement opportunities². It might also be caused by realisation of the fact that the original decision was wrong, because of a bad match quality. This may again be caused by lack of knowledge about the requirements of the Danish educational system and overestimation of own abilities and skills.

Here, we have chosen to concentrate on the effects of a few factors that are perceived to be particularly important for young immigrants (and some of them for the 2nd generation as well).

² The Ministry of Education runs an internet matching site, where students seeking trainee placement and match up with firms offering such placements. On any given day, the number of students seeking placements is approximately 10 to twenty times larger than the number of firms offering placement opportunities. See <http://www.praktikpladsen.dk/>.

Below, we discuss theories, existing evidence, and the hypothesized effects of these variables on completion and drop-out rates in view of the theoretical considerations outlined above.

The effect of age at migration

It is a general finding that age at immigration is very important for the educational attainment and earnings of immigrants. Schaafsma and Sweetman (2001) find that both the level of education as well as the subsequent earnings decrease with age at migration for immigrants, who immigrated to Canada before the age of 20. A similar relation between the educational level and age at immigration is found for young immigrants in Denmark, see Hummelgaard *et al.* (1998) and Jakobsen and Smith (2003). Both studies find that age at migration influences the probability of attaining an education in Denmark for the 1st generation immigrants; the higher the age at migration, the lower is the educational level. Moreover, the study by Hummelgaard *et al.* (1998) also shows that 2nd generation immigrants are more likely to obtain a qualifying education than the immigrants who came to Denmark as children.

It is a well known fact that immigrants arriving late in their childhood will have more difficulties learning the destination country language, see e.g. Schmidt and Jakobsen (2000). Cahan *et al.* (2001) indicates that language acquisition plays a central role in the negative relationship between scholastic achievement and age at migration. This role of language acquisition is also indicated in Jakobsen and Smith (2003), who base their study on data from a survey collected among a sub sample of the immigrants analysed in this paper. One of the findings in that study is that age at migration has a negative effect on the probability of being enrolled in or having completed a qualifying education. But the effect of age at migration weakens considerably when controlling for proficiency in the Danish language.

In addition, immigrants arriving late in childhood have not been exposed to the Danish school system for very long before leaving the compulsory schooling system (after nine or ten years). They have a shorter period for acquiring information about the Danish society, including information about the educational system, and for adapting to norms in the educational system. This implies that immigrants who arrive in their late childhood may be more reluctant to enrol in the educational system. Moreover, among those who enrol in the Danish educational system, the lack of information possibly leads to fewer good matches between the students and the educational institutions, and therefore potentially to higher drop-out rates and lower completion rates among the 'older' immigrants.

In the present study we therefore hypothesize that age at migration exerts a negative influence on the immigrants' ability to complete the education they have been enrolled at: the higher the age at migration, the larger will be the drop-out rate and the smaller will be the completion rate.

Intergenerational effects

Parental background is also expected to influence the completion and drop-out rates. Several international as well as Danish studies have focused on intergenerational mobility in general and among immigrants in particular. For a survey of the general literature on intergenerational mobility, see e.g. Solon (1999), and for analyses and particular concepts in analyses of 2nd generation immigrants, see e.g. Borjas (1992, 1995). Many studies have found important effects of parental background on the level of education, see e.g. Solon (1999), Ginther *et al.* (2000), and Borjas (1992, 1995). Van Ophem and Jonker (1999) find a negative relation between the fathers level of education and the graduation rate, while their results show no effect of fathers' education on the drop-out rate. Van Ophem and Jonker had expected a positive relationship between the fathers education and the completion rate, because a father with a higher education may have a positive and stimulating effect. Their explanation on the opposite result is that students who have fathers with higher educations receive more financial support and therefore experience lower costs of education.

Hummelgaard *et al.* (2002) and Rosholm *et al.* (2002) analyse the intergenerational mobility of 2nd generation immigrants using ordered probit specifications to analyse the educational level achieved, and they find that the marginal effect of parental capital³ is smaller for second generation immigrants than for ethnic Danes, but the marginal effect of ethnic capital⁴ eliminates this difference, so the compound effect of the parent generation on its children is nearly the same for 2nd generation immigrants and ethnic Danes. Jakobsen and Smith (2003) find a significant, positive marginal effect of the parents length of education on the probability of attaining a qualifying education among immigrants who came to Denmark as children. The conclusion in these studies is that the low level of parental and ethnic capital is an important explanation of the low level of education among young second and first generation immigrants.

In this paper, we choose to focus only on parental capital, because we only analyse three ethnic groups, which would lead to insufficient variation in the ethnic capital variables. We do, however, include dummies for ethnicity in the estimated relations. Our hypothesis is that parental capital should work so as to increase the completion rate, while the effect on the drop-out rate is less certain (because dropping out may be caused by many factors other than ability). Nevertheless, we would expect a negative influence on the drop-out rate, due to arguments presented above concerning match quality, which is likely to improve with the general level of human capital in the family.

The effect of marriage and children

The studies by Hummelgaard *et al.* (2002), and Rosholm *et al.* (2002) also show that early marriage is negatively related to the educational achievements of young immigrants as well as ethnic Danes.

³ Parental capital here covers parents' education, income, and working experience, as well as the cumulative time they have spent in Denmark; years since migration.

⁴ By ethnic capital, we refer to the average of the characteristics used for parental capital, measured in the adult population of the same ethnicity.

The difference is that young immigrants on average get married at a much earlier age than young ethnic Danes, Hummelgaard *et al.* (2002), Rosholm *et al.* (2002) and Jakobsen and Smith (2003). For female immigrants the effect of marriage seems to be related to other variables reflecting attitudes and norms in the family concerning marriage behaviour and religion, while this is not the case for male immigrants, see Jakobsen and Smith (2003). Thus, marriage may exert a stronger influence on women who marry early than on men, due to norms and traditions in the involved ethnic groups. On the other hand, other papers (Nielsen *et al.* (forthcoming)) have documented that some of the young women in the second generation perform very well in the educational system, perhaps because they see an opportunity to break free from the patriarchal traditions in their families.

As concerns the effect of children, Jakobsen and Smith (2003) find that the number of children has a negative effect on the educational achievement of the immigrants, especially on the educational success of women.

On the whole, we hypothesize that marriage and children may affect men and women differently as regards their completion and drop-out rates, and we would expect women to be affected negatively by marriage as well as the presence of young children. On the other hand, we expect women to have higher completion rates and lower drop-out rates than men, *ceteris paribus*, due to the possibility that they are driven by a motivation to become independent of the family and its norms and traditions.

The effects of ethnicity

We know from other studies that immigrants from Turkey are mainly from rural areas, the parent generation has a low educational level, a large fraction of them is illiterate, and they have been used to living in a highly male dominated society, see e.g. Schmidt and Jakobsen (2000). On the other hand, the immigrants from Ex-Yugoslavia are better educated, come from a more modern society, and lived to a larger extent already in the cities in their origin country.

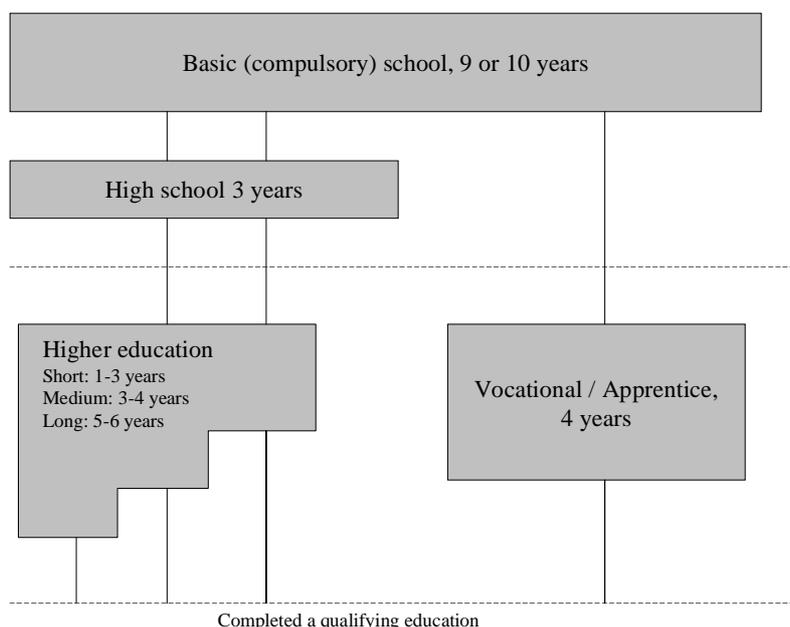
We therefore conjecture that the immigrants from Turkey would be least likely to complete and most likely to drop out of an education, while the opposite is the case as concerns the immigrants from Ex-Yugoslavia.

3. The educational system in Denmark; an overview

Compulsory school in Denmark starts when the child is 6-7 years old. Most of the children receive this education in the Municipal School (Folkeskolen), which offers nine years of schooling, combined with a supplementary optional tenth year and an optional pre-school class. After finishing compulsory schooling, a young person can choose to start in upper secondary school, start a

vocational education or leave the educational system without a qualifying education. Upper secondary school does not provide the young person with any formal qualifications of use in the labour market, but it qualifies the young individual for entry into the higher educational system. Indeed, enrolment at most of the higher educational institutions demands a diploma from upper secondary school (Ministry of Education (1994)). A qualifying education is defined as a completed vocational education or a completed higher education. The higher education can be short (1-3 years, e.g. dental hygienist, laboratory technicians, medium (3-4 years, e.g. teachers, nurses and bachelors) or long (5-6 years, university). The educational system is illustrated graphically in Figure 1 below.

Figure 1. Main features of the Danish School and educational system



Note: Not all higher educations demand a completed high school exam. The length of higher educations and vocational training varies, the figures shown are approximate.

There are no tuition fees at Danish educational institutions. Student support, which is available from the students' 18th birthday, is today granted by the state in the form of state education grants and loans. The first Act on the State Grant was passed in the parliament in 1970 and the idea behind it was that no individual should refrain from studying as a result of poor economic circumstances. The present education grant and loan scheme was introduced in 1988. Until students enrolled in a youth education programme (general upper secondary and vocational education) are 20 years of age, their grants depend upon their parents' income. When that income exceeds a certain amount the grants are reduced on a sliding scale, ending in a minimum grant. All students aged 18 or more enrolled in higher education courses are entitled to a number of monthly grants corresponding to the prescribed duration of the chosen study, plus 12 months. Students can as a general rule change from one course to another within a maximum of 70 monthly grants. The Ministry of Education can raise this maximum, for instance if the prescribed duration of a education exceeds 58 months. The students

who take up support in a year in which their private earnings exceed a given maximum amount have to repay some of the grants and loans received that year. Alternatively they have the option not to take up support for a period of time, and reserve the grants and loans for use in a later period, see Anthony and Molander (1997). The student support, which is available to all students, is of a magnitude, which enables young individuals to be enrolled at a qualifying education without having to rely on financial support from the parents.

4. Background, Data, and Descriptives

4.1 Young immigrants from Ex-Yugoslavia, Turkey, and Pakistan

Immigrants from Ex-Yugoslavia, Turkey and Pakistan came to Denmark because of the high economic growth in the fifties and sixties. The high growth rates eventually led to a shortage of labour, despite the simultaneous increase in the female participation rate. Therefore, in the late sixties and early seventies, Denmark - as well as other Western-European countries - recruited foreign labour, mainly from Ex-Yugoslavia, Turkey and Pakistan, to perform largely unskilled jobs in the manufacturing industry. These foreign workers were mostly men aged between 20 and 40. They were initially considered guest workers, that is, temporary labour immigrants, but many of them decided to stay in Denmark and brought their wives and children to Denmark in the seventies. Most of these guest workers brought very little education from the origin country, have predominantly been employed in low paid unskilled jobs and have experienced excessive unemployment. It is the educational achievements of the sons and daughters of these guest workers, which we study in this paper.

4.2 Data

The empirical analysis is based on an event history data set covering the period 1984 to 1999. This data set originates from administrative registers in Statistics Denmark. The sample used in this study contains information about the entire population of immigrants from Turkey, Pakistan and Ex-Yugoslavia, who were 28-36 years old in 1999 and arrived to Denmark before their sixteenth birthday.⁵ This gives us a total of about 3,000 immigrants.⁶

We have information about ongoing and completed education for the period 1984-1999, which enables us to construct the duration of education measured in months, and a variable that describes whether a person completes the education or drops out before graduation. The information about

⁵ Jakobsen (2003) includes a more detailed description of data, including a description of the characteristics of the concerned group of immigrants.

⁶ Moreover, for descriptive and comparative purposes, we have access to a 10 per cent sample of the population of ethnic Danes, who were 28-36 years old in 1999. This produces a sample of almost 80,000 ethnic Danes. Unfortunately, at the time of the writing of this paper, we were not able to use this sample for estimation purposes. In future research, we will have full access to the sample of ethnic Danes.

ongoing and highest completed education is from October 1 each year in the period 1984-1999. Moreover, if an individual is enrolled in an education, we have information about the month and year that the individual got enrolled. As regards the highest completed education, we have information about the month and year of graduation. If a person leaves the educational system without graduation we have no information of the month they drop out, only that they were observed to be enrolled in October of one year and not in the next year. Hence, the information on the timing of drop-out is grouped into annual intervals, while the completion information leads to exact information (at least up to monthly precision). This has to be addressed in the formulation of the likelihood function.

Persons may take breaks during an educational spell, and this should not be counted as drop-outs. However, in some cases a break may be so long that it does not seem fair to call it a break. We have defined a break as a period of no more than two years, where the individual is not enrolled at a given educational institution. If an educational spell contains a break, which is shorter than two years, the break interval is removed from the educational spell.

It may be the case that some forms of switching between studies are characterized as dropping out. We have decided that switching within natural sciences, within social sciences, etc., is not considered a drop-out, but changes from e.g. social to natural sciences will be counted here as a drop-out, as will a switch from one level to another (if the first level has not been completed), e.g. from long academic to short academic education. The Danish Ministry of Education operates with seven definitions of drop-out, ranging from the strictest one, where even switches between closely related studies (for example within social sciences) count as drop-outs, to the loosest one, where a drop-out is defined as not completing any education once you have begun. According to the last definition, a person commencing a long academic education, dropping out, switching to a vocational education and eventually completing that education will not count as a drop-out.⁷ The definitions employed by the Ministry thus do not address the issue of breaks, presumably because they allow for arbitrarily long breaks.

Besides the (dependent) educational variables, we have information, which is used to construct explanatory variables in the estimations: time of immigration, gender, and country of origin. This information is time invariant. Furthermore, for each year we have information about the individuals' age, marital status, number of children in different age groups, and finally we also have annual information about the education, the working experience, and the gross annual income of the mothers and fathers of the young immigrants studied. Hence, these variables are considered to be time varying.

The time of immigration is used to calculate age at immigration. The time of immigration changes if an individual immigrates to Denmark more than once. We therefore use the first information that

⁷ See Ministry of Education (2001a).

exists in the registers. A few of the immigrants have missing information in the registers about time of immigration. These are mostly persons, who have immigrated to Denmark before 1973. Because the age at immigration is necessary to define the group of persons of interest in this paper, individuals with missing information are not included in the analysis. This particularly reduces the number of immigrants from the Ex-Yugoslavia – the immigrants from Ex-Yugoslavia started to bring their family to Denmark earlier than the other groups of immigrants.

The variables regarding the parents' educational level are based on information from the administrative registers and a survey carried out by Statistics Denmark. Until recently, the registers of Statistics Denmark included only information about the education obtained *in* Denmark. To supplement the registers Statistics Denmark carried out a survey in 1999, where all immigrants between 18 and 59 years old, who had not taken an education in Denmark, received a questionnaire concerning their educational background. About 50 percent responded and values of the educational level were imputed for the remaining 50 per cent, see Mørkeberg (2000). However, some of the immigrants have single parents, some of the parents have died, some may have emigrated, etc. Therefore, we have chosen as our parental variables the maximum of the value for the father and the mother. The parents' educational level is grouped into three levels; vocational education, academic education, and a residual category. In addition, we have constructed an indicator for completely missing parental information. In this case, the values of the missing variables are set to zero.

In addition to the parents' educational level, we have also used the maximum of their working experience in Denmark and their gross income. Working experience is calculated as number of years as wage earner in Denmark since 1964 and the number of years as self-employed in Denmark since 1984, since this information is not available before 1964 and 1984, respectively.

All variables are measured on January 1st of the year in question, and they are thus lagged in relation to the dependent variable. For the annual gross income of the parents, the measure is lagged one year.

The sample means of the explanatory variables in 1986 are shown in Table A1 (men) and A2 (women) in the appendix. Immigrant children were on average 8 years old when they came to Denmark. Above 60 percent of the immigrants in the sample are from Turkey. 14 percent of the male immigrants and 17 per cent of the female immigrants are from Ex-Yugoslavia, while the same figures for the immigrants from Pakistan are 25 and 21 per cent. The immigrants from Turkey were in general older at immigration than the immigrants from Pakistan and Ex-Yugoslavia, see Schmidt and Jakobsen (2000). Despite their young age in 1986 (the mean age was 19), a high proportion of the immigrants were already married and had children – these figures are slightly higher for the women than men.

4.3 Completion and drop-out among immigrants and ethnic Danes

There are large differences between the immigrants and the ethnic Danes regarding enrolment as well as completion and drop-out rates. Table 1 shows the proportion of young immigrants and ethnic Danes who were enrolled in a qualifying education in the period 1984-1999, as well as their completion and drop-out rates. 66 percent and 69 percent of the ethnic Danish men and women, respectively, have been enrolled in a qualifying education, while enrolment rates among the young immigrants are 41 percent (men) and 36 percent (women). 59 percent of the male and 41 percent of the female immigrants who have been enrolled have dropped out from the *first* qualifying education they were enrolled at, while these figures are much lower for ethnic Danes, namely 30 percent for men and 32 percent for women. Hence, the drop-out rates are much larger for the young male immigrants, but they are also quite large for the young female immigrants, and even quite high for the sample of young ethnic Danes.⁸ The numbers in Table 1 show that the problem of low educational achievements among young immigrants is a serious one, which is caused by a combination of low enrolment rates *and* very high drop-out rates. The enrolment process is treated in detail by Jakobsen and Smith (2003), so the description of it here will be somewhat rudimentary.

Table 1. Educational enrolment of immigrants and ethnic Danes in the period 1984-1999.⁹

	Immigrants		Ethnic Danes	
	N	Pct	N	Pct
Men				
Never been enrolled	960	59	13,320	34
Enrolled:	680	41	26,356	66
Completed	255	16	17,694	45
Dropped out	401	24	7,984	20
Still enrolled	24	1	678	2
Total	1,640	100	39,676	101
Women				
Never been enrolled	860	64	11,520	31
Enrolled:	476	36	26,081	69
Completed	232	17	17,045	45
Dropped out	198	15	8,102	22
Still enrolled	46	3	934	2
Total	1,336	99	37,601	100

For the empirical analyses below, we would like to avoid the problems associated with individuals who were already enrolled at an educational institution at the beginning of the observation period in 1984. Therefore, we drop 176 immigrants who were already enrolled at an education at the beginning of 1984. The reason for dropping these individuals is that their inclusion would lead to a combined stock and flow sample, the treatment of which is much more complex than that of a pure

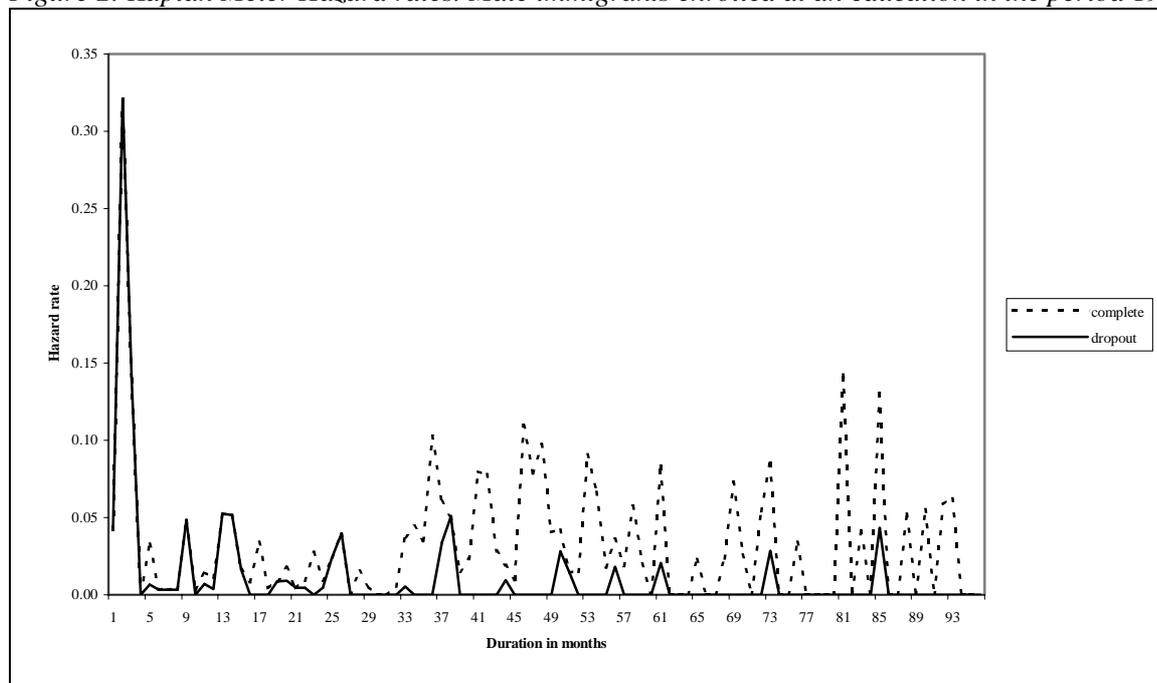
⁸ This is in part caused by our fairly broad definition of a drop-out. If we apply the strictest possible definition, namely, if we calculate the fraction which completed *any* formal education among those who were enrolled during the period 1984-1999, the completion rates change to 52 (men) and 58 (women) percent for the immigrants and 82 (men) and 83 (women) percent for the ethnic Danes.

⁹ The figures in Table 1 differ slightly from the figures in Jakobsen and Smith (2003). The differences can however be explained by differences in data sources. The analyses in Jakobsen and Smith (2003) are based on survey data.

flow sample, particularly in the presence of unobserved heterogeneity, see e.g. D’Addio and Rosholm (2002) for a discussion of this problem.

Kaplan Meier estimates of the hazard rates for drop-out and completion for immigrants are shown in Figures 2 and 3, for men and women respectively.¹⁰ The solid lines depict the drop-out hazard rates, and the dotted lines represent the completion hazard rate. Not surprisingly, the drop-out hazard rate is large during the early phases of an educational spell, and then it drops off to a much lower level.¹¹ For the completion hazard rate, it is evident that it is very low initially (naturally), and then it starts increasing after approximately three years. It then drops again around five years to increase again after six years. It is quite clear that these hazard rates may differ for different types of education, but there are not enough observations to conduct the analysis separately for those different types. In the appendix, we show the Kaplan-Meier hazards for vocational education, which is by far the most frequent education that young immigrants are enrolled at (see Table 2 below).

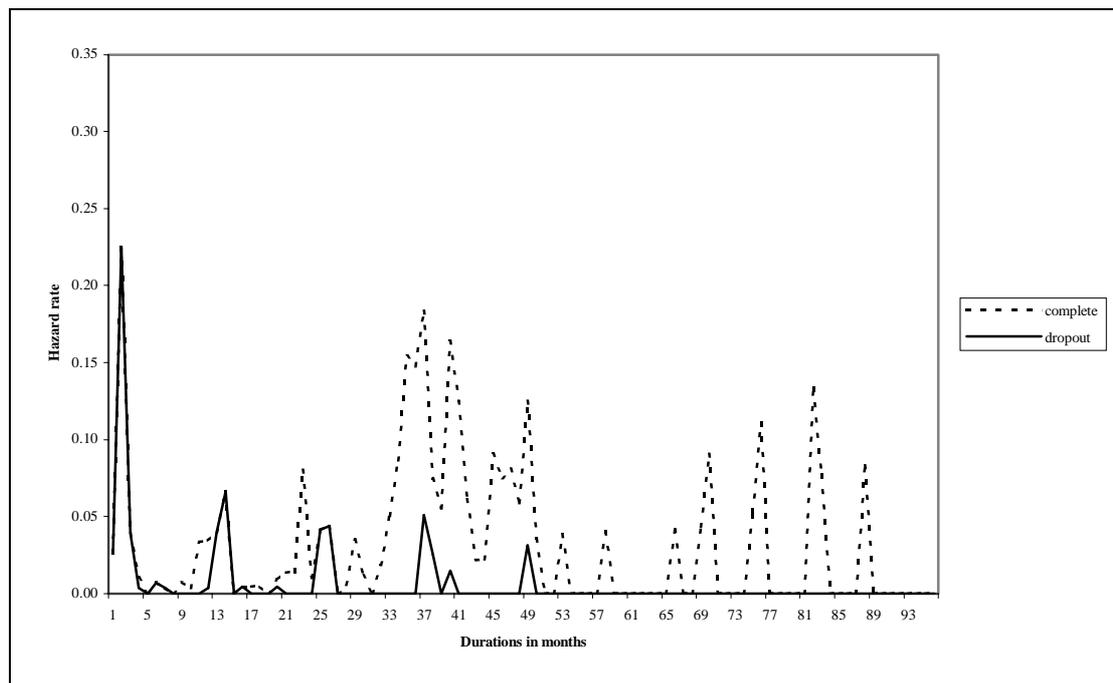
Figure 2. Kaplan Meier Hazard rates. Male immigrants enrolled at an education in the period 1984-1999



¹⁰ The drop-out durations are not observed precisely, but only in intervals of 12 months. In order to avoid that problem, we have here made the simplifying assumption that a drop-out always occurs in the first month of that interval. This implies that drop-out durations are biased downwards in these figures.

¹¹ This is also found in international studies of drop-outs (see e.g. Arulampalam *et al.*, 2001 and Montmarquette *et al.*, 2001).

Figure 3. Kaplan Meier Hazard rates. Female immigrants enrolled at an education in the period 1984-1999



The duration until completion or drop-out may vary for many reasons, as was discussed in section 2. Table 2 shows the drop-out and completion percentages for each of the four types of education. Vocational and long academic educations have the highest drop-out rates among immigrants as well as ethnic Danes but there are a few remarkable differences between the two groups; the first interesting observation is the percentage of drop-out from vocational educations, which is much higher among immigrants. Immigrants’ drop-out rates from vocational education are 50-100 percent higher than those of the ethnic Danes. This could be due to problems of finding an employer for the trainee period associated with a vocational education, something that is discussed more by Jakobsen and Smith (2003) and the Board of Ethnic Equality (1996). If this is the case, it would be an example of discrimination already at the educational level.

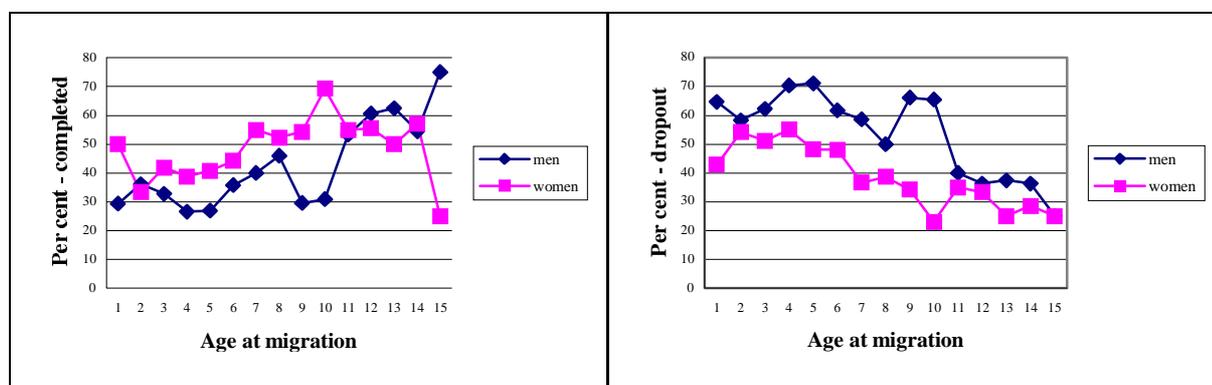
The second observation is that male immigrants drop-out to a much larger extent than female immigrants. This holds across all educational levels but is most pronounced at the vocational level. For young natives, there are no systematic differences between male and female drop-out rates.

Table 2. Drop-out and completion percentages by type of education. Immigrants and ethnic Danes enrolled at an education in the period 1984-1999.

	Men					Women				
	Completed	Dropped out	Still enrolled	Total	N	Completed	Dropped out	Still enrolled	Total	N
Immigrants:										
Vocational	34	65	1	100	500	47	45	8	100	347
Short higher	71	29	0	100	24	75	25	0	100	24
Medium higher	66	30	5	101	61	65	13	23	101	48
Long higher	32	53	16	101	95	33	52	14	99	57
Total	38	59	4	101	680	49	42	10	101	476
Ethnic Danes:										
Vocational	70	29	1	100	18,797	65	33	2	100	15,632
Short higher	74	23	2	99	990	78	20	2	100	1,406
Medium higher	72	23	6	101	2,058	77	17	6	100	4,711
Long higher	50	43	8	101	4,511	49	43	8	100	4,332
Total	67	30	3	100	26,356	65	31	4	100	26,081

Age at migration is a central variable in this paper, and we expect a positive relation between the drop-out rate and age at migration (see section 2). But Figures 4 and 5, which illustrate the relation between completion rate and age at migration, and between drop-out rate and age at migration, respectively, indicate on the contrary a negative relation; the probability of dropping out falls as age at migration increases. Conversely, the probability of completing an education increases with age at migration.

Figure 4. Completion rates by age at migration. Figure 5. Drop-out rates by age at migration.



This rather unexpected and counterintuitive finding, and the fact that enrolment is strongly negatively related to age at migration (see Jakobsen and Smith (2003)), leads us to suspect a severe sample selection problem leading to omitted variables bias; those who enrol at a qualifying education despite arriving late must be very able in other (unobserved) dimensions, in order to compensate them for their lack of knowledge about the language etc. Hence, it may be the case that the unobserved characteristics possessed by these individuals enable them to complete at a higher rate than would a broader selected group of late arrives. In order to test these hypotheses, we need

to explicitly model the process of sample selection (enrolment) in our econometric model. For that, we need an exclusion restriction, that is, a variable that explains enrolment, but does not explain completion or drop-out rates. One such candidate is a measure of the accessibility of educational institutions. In the administrative data, there is a variable measuring the number of different institutions supplying qualifying educations in the municipality of residence. In the econometric results shown in section 5, this variable is used for identification.

5. Methodology

The duration of qualifying education is modelled by a continuous time competing risks duration model. Let $T_1 \in R_+$ denote the time until completion of higher education, and let $T_2 \in R_+$ denote the time until drop-out. Both durations are measured in months. The observed duration is thus $T = \min\{T_1, T_2\}$. Further, let $C = I\{T_1 = t, T_2 > t\}$ indicate the event that the individuals completes the education, and let $D = I\{T_2 = t, T_1 > t\}$ indicate a drop-out in period t .

Let X_{1t}, X_{2t} denote the set of time-varying explanatory variables measured at time t , for each destination (completion versus drop-out). The destination specific hazard rates, that is, the rate at which an individual leaves education for a given destination, given that he or she has not already left, is specified as a mixed proportional hazard

$$h_i(t|x_i, v_i) = \lambda_i(t) \cdot \exp(x_{it}\beta_i + v_i), \quad i = 1, 2$$

The destination specific hazard rate is the product of three terms; a baseline hazard, capturing the time dependence of the hazard rate, a function of observed variables x , and an unobserved component, v , which is included for several reasons: First of all, neglect of unobserved heterogeneity leads to a bias towards negative duration dependence in the baseline hazard, and a bias towards zero in the coefficient vector β . Secondly, the presence of the unobserved component allows us to capture dependencies between the two destination specific hazard rates over and above those dependencies induced by the observed variables. Thirdly, it allows us to address the problem of non-random selection into education.

It is obvious that time until completion will differ between different types of education, but it may also be the case that the drop-out process differs between different types of education. Given that the vast majority of education spells are of the type vocational education, we decided to capture the differences in the durations between different types of education by a set of dummy variables

allowing the level of the baseline hazard to shift between education types.¹² Of course, one might also imagine that the explanatory variables will have different effects across different types of education, but we felt a need to restrict the number of parameters to be estimated from this rather small data set.

For education spells that are completed, the likelihood function is straightforward, while it is slightly more complicated for drop-outs, due to the grouped nature of this information. The probability of observing a drop-out between time t and $t+12$ is

$$\Pr(t \leq T_2 < t+12, T_1 > T_2 | x_{1t}, x_{2t}) = \int_t^{t+12} h_2(s | x_{2s}, v_2) \cdot \exp\left[-\int_0^s (h_1(u | x_{1u}, v_1) + h_2(u | x_{2u}, v_2)) du\right] ds$$

The contribution to the likelihood function of a single educational spell is thus

$$\begin{aligned} L_{dur}(v_1, v_2) = & \left\{ \int_t^{t+12} h_2(s | x_{2s}, v_2) \cdot \exp\left[-\int_0^s (h_1(u | x_{1u}, v_1) + h_2(u | x_{2u}, v_2)) du\right] ds \right\}^d \cdot \\ & \left\{ h_1(t | x_{1t}, v_1) \cdot \exp\left[-\int_0^t (h_1(u | x_{1u}, v_1) + h_2(u | x_{2u}, v_2)) du\right] \right\}^c \cdot \\ & \left\{ \exp\left[-\int_0^t (h_1(u | x_{1u}, v_1) + h_2(u | x_{2u}, v_2)) du\right] \right\}^{1-c-d} \end{aligned}$$

where c (d) takes the value 1 if the individual completes the education (drop-out) and otherwise the value 0.

In order to address the problem of non-random selection into education, let the expected utility of becoming enrolled at a given education be described by the index function

$$z^* = x_0 \beta_0 + v_0 + \varepsilon$$

where v_0 denotes unobserved heterogeneity, introduced in order to correlate the enrolment equation with the duration model, and ε is an idiosyncratic error term. This utility is obviously not observed by the econometrician, who only observes whether a certain individual is enrolled in an education, that is, we observe

$$z = \mathbf{I}\{z^* \geq 0\}$$

¹² In alternative estimations, we experimented with having separate baseline hazards for different educations, but there were problems of identification, due to the limited number of observations and due to the grouped nature of the drop-out information.

Assuming that ε is standard normally distributed, we can describe the selection process by a probit equation

$$\begin{aligned}\Pr(z = 1 | x_0, v_0) &= \Pr(x_0\beta_0 + v_0 > -\varepsilon) \\ &= 1 - \Phi(-x_0\beta_0 - v_0) \\ &= \Phi(x_0\beta_0 + v_0)\end{aligned}$$

where $\Phi(\cdot)$ is the standard normal CDF. The likelihood of a single observation drawn at random from the sample of young immigrants is thus

$$L(v_0, v_1, v_2) = \int \{\Phi(x_0\beta_0 + v_0) \cdot L_{dur}(v_1, v_2)\}^{1\{z=1\}} \cdot \{1 - \Phi(x_0\beta_0 + v_0)\}^{1-1\{z=1\}} dG(v_0, v_1, v_2)$$

(v_0, v_1, v_2) is assumed to follow a trivariate discrete distribution, with M points of support for each of the variables, that is, $\Pr[v_0 = v_{0a}, v_1 = v_{1b}, v_2 = v_{2c}] = P_{abc}; a, b, c = 1, \dots, M$. ε is a mentioned standard normal and we apply an exclusive restriction (see section 4.3), which leads to identification of the marginal distribution of v_0 and is correlated with v_1 and v_2 .

6. Results

We have estimated three different specifications; Model 1 estimates the competing risks model without taking into account unobserved heterogeneity or sample selection. Model 2 estimates the competing risks duration model, taking into account unobserved heterogeneity but still ignoring sample selection. Model 3 corresponds to the full model outlined in the previous section, allowing for both unobserved heterogeneity and non-random sample selection.¹³ The baseline hazards are assumed to be piecewise constant in intervals of 12 months length. The distribution of unobserved variables is assumed to be discrete and trivariate, taking at most two distinct values in each of the marginal distributions, that is, $M=2$. In all the estimations shown below, it turned out that we were unable to detect significant unobserved heterogeneity in the completion hazards, therefore it was difficult to estimate the correlation between v_1 and v_2 . In the estimation, the correlation converged towards one; hence we fixed the appropriate probabilities of zero, leaving us with a bivariate distribution of unobservables in Model 3 and a univariate distribution in Model 2.

Table 3 contains the results from the estimation of the sample selection equation of Model 3. The variable measuring the number of different institutions supplying qualifying educations in the municipality of residence and the variable measuring whether the number of institutions in the

¹³ The explanatory variables for the selection equation are taken from 1986.

municipality is missing in the data is used as exclusion restrictions. The variables describe the accessibility of educational institutions. A least one of the two variables are significantly affecting the enrolment rates for men and women.

The results in Table 3 basically confirm that age at migration exerts a negative influence of the probability of enrolling at an education in the first place, and that marriage also reduces the probability of educational enrolment. Immigrants with Pakistani origin have a higher probability of being enrolled at an education. Parental capital has no effect on the probability of enrolling.

Table 3. Selection equations. Male and female immigrants. Applied in Model 3.

	Men		Women	
	Coeff.	Std.err.	Coeff.	Std.err.
V01	-0.5419*	0.2775	-1.8531***	0.5157
V02	3.4321	5.7742	1.8796*	1.0349
Turkish origin	0.0040	0.1246	-0.0120	0.1816
Pakistani origin	0.5690***	0.1338	0.6679***	0.1831
Married	-0.6638**	0.2701	-1.2148*	0.7300
Age at migration	-1.6737***	0.2599	-2.2116***	0.4326
Age at migration squared	-1.0095**	0.4321	-1.6380**	0.7275
Youngest child is 0-6	-0.2259	0.1468	-0.2275	0.1934
Parents vocational education	0.0104	0.1642	0.0969	0.2038
Parents academic education	0.0261	0.1894	0.0039	0.2925
Parents working experience	0.2868	0.5022	1.1688	0.9305
Parents working experience squared	0.0739	0.2577	-0.5284	0.4662
Parents income	-0.1285	0.1347	0.2784	0.2233
Missing information on parents	0.0567	0.2487	0.6913	0.4583
Number of educational institutions	-0.0181	0.0317	0.1000**	0.0468
Missing information on number of educational institutions	-0.6432**	0.2500	-0.6341	0.4513
P1	3.2169***	0.9985	1.4481***	0.1816
P2	-12.2935	.	-1.4130***	0.4658
P3	2.6473**	1.1206	0.9229**	0.3865
Ln L				

NOTE: ***significant at a 1 % level; **significant at a 5 % level; *significant at a 10 percent level. The reported 'probabilities' are

transformed, i.e. $\Pr(v_{01}, v_{11}, v_{21}) = \frac{e^{P_1}}{1 + e^{P_1} + e^{P_2} + e^{P_3}}$, and so on.

Tables 4 and 5 present results from the estimation of the drop-out hazard for men and women, respectively. Please note that the baseline hazard levels are not comparable between models, because they have to be multiplied with the average function of covariates in order to be so.

Table 4. Drop-out hazard estimations. Male immigrants enrolled at an education in the period 1984-1999. Model 1: Competing risk. Model 2: Competing risks with unobserved heterogeneity. Model 3: Competing risk with unobserved heterogeneity and sample selection.

	Model 1:		Model 2:		Model 3:	
	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.
Base 1 (0-12 months)	-1.6004***	0.3302	-0.6262	0.6506	-0.5157	0.6776
Base 2 (13-24 months)	-3.0345***	0.3727	-0.1495	0.6943	0.0060	0.7198
Base 3 (25-36 months)	-3.7849***	0.4323	-0.4669	0.7805	-0.3430	0.8051
Base 4 (37-48 months)	-3.2830***	0.4593	0.3520	0.8307	0.4935	0.8589
Base 5 (49-60 months)	-3.5707***	0.6305	0.3934	0.9365	0.5663	0.9628
Base 6 (61-72 months)	-3.6955***	0.5819	0.5726	0.8882	0.7533	0.9171
Turkish origin	-0.3193**	0.1678	-0.1973	0.2746	-0.1828	0.2712
Pakistani origin	0.0589	0.1698	0.1004	0.2956	0.0904	0.2950
Married	-0.3560	0.2225	-0.0860	0.3293	-0.0262	0.3213
Age at migration	0.0573	0.7517	-0.9124	1.3444	-1.3376	1.4483
Age at migration squared	-0.3774	0.5414	0.2986	0.9135	0.6783	1.0288
Short academic education	-1.3731***	0.3924	-2.3813***	0.4631	-2.4216***	0.4568
Medium academic education	-1.6919***	0.2792	-3.3951***	0.3546	-3.4151***	0.3613
Long academic education	-1.1161***	0.1818	-1.6048***	0.2464	-1.6354***	0.2466
Youngest child is 0-6	0.0456	0.1746	0.0286	0.3037	0.0066	0.3014
Parents vocational education	-0.1370	0.1823	-0.0435	0.3475	-0.0350	0.3522
Parents academic education	-0.4641**	0.2151	-0.2000	0.3748	-0.1833	0.3651
Parents working experience	-0.5712	0.3738	0.1676	0.6180	0.1400	0.6393
Parents working experience squared	0.1839	0.1737	-0.1148	0.2625	-0.1129	0.2716
V22			-4.2209***	0.3409	-4.2798***	0.3479

NOTE: ***significant at a 1 % level; **significant at a 5 % level; *significant at a 10 % level. The support point v21 is normalized to zero (that is, it equals the baseline hazard).

Table 5. Drop-out hazard estimations. Female immigrants enrolled at an education in the period 1984-1999. Model 1: Competing risk. Model 2: Competing risks with unobserved heterogeneity. Model 3: Competing risk with unobserved heterogeneity and sample selection.

	Model 1		Model 2		Model 3	
	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.
Base 1 (0-12 months)	-3.7703***	0.5669	-2.1861**	0.7188	-0.9403	0.7431
Base 2 (13-24 months)	-4.8100***	0.6053	-1.5710*	0.7321	-0.4816	0.7770
Base 3 (25-36 months)	-4.9565***	0.6101	-0.3330	0.7608	0.6593	0.7819
Base 4 (37-48 months)	-4.3993***	0.6669	0.9745	0.8321	2.0246**	0.8832
Base 5 (49-60 months)	-5.6027***	1.1629	1.3680	2.1818	1.7912	1.2807
Base 6 (61-72 months)
Turkish origin	0.5393**	0.2530	0.5266	0.2799	0.3480	0.2819
Pakistani origin	0.3116	0.2448	0.0029	0.2542	-0.4675*	0.2537
Married	-0.9226***	0.2797	-1.3645***	0.3640	-1.1563***	0.4368
Age at migration	-0.4309	1.0419	0.6780	1.2637	-2.5058	1.5581
Age at migration squared	-0.1671	0.7577	-0.9773	0.8979	2.3322**	1.2213
Short academic education	-0.6598	0.4873	-1.1843**	0.5951	-0.6096	0.5924
Medium academic education	-1.4560***	0.4331	-3.5115***	0.4652	-4.2821***	0.4935
Long academic education	-0.3443	0.2424	-1.9724	0.2874	-1.5416***	0.2810
Youngest child is 0-6	0.3153	0.2040	0.0611	0.2658	0.3736	0.2975
Parents vocational education.	0.0657	0.2396	0.1905	0.2827	0.2650	0.3072
Parents academic education	-0.2519	0.3753	0.0806	0.4226	0.0787	0.4576
Parents working experience	1.5997***	0.7125	1.1392	0.8621	0.1280	0.8205
Parents working experience squared	-0.8157	0.3061	-0.5997*	0.3559	-0.2192	0.3316
V22			-10.0000	.	-10.0000	.

NOTE: ***significant at a 1 % level; **significant at a 5 % level; *significant at a 10 % level. The support point v21 is normalized to zero (that is, it equals the baseline hazard).

Results from Model 1 detect apparently strong negative duration dependence in the drop-out hazard rate, at least during the first two to three years of enrolment, as was also present in the empirical hazards shown in Figures 2 and 3. Acknowledging the presence of unobserved heterogeneity (in Model 2) leads to a complete revision of this picture, as there is now positive duration dependence (with minor exceptions), particularly among women. Moving to the full model specification reinforces this impression. One would thus be tempted to conclude that the presence of negative duration dependence in the empirical hazards is caused solely by an extreme sorting effect, which makes perfect sense, into ‘able’ and ‘not so able’ (that is, drop-outs) individuals. Alternatively, the sorting could also be in terms of good and bad matches. The quality of the school-student match may be revealed shortly after enrolment, resulting in dissolution of the ‘bad’ matches.

Thus, the result concerning duration dependence is consistent with a story of mismatching; those dropping out are those whose skills do not match those required at the given educational institution. This could be caused by lack of information regarding educational institutions and requirements among the parent generation and the immigrant children themselves. Poor match may be more frequent among immigrants than ethnic Danes, because the immigrants have less knowledge about the educational system in Denmark than ethnic Danes, other things being equal. This might be one explanation behind the higher drop-out rates of immigrants reported in Table 2.

One might also ask if the not-so-able individuals drop out voluntarily, or if individuals enrolled at a vocational education are screened out during the attempt to obtain a (mandatory) trainee placement (the trainee period normally starts in the first year after enrollment at a vocational school). If employers discriminate against immigrants in the hiring of trainees, i.e. if some employers refuse to accept immigrants as trainees, those employers who are willing to accept them will naturally want ‘the best’.¹⁴ Other studies show that immigrants at vocational schools have greater difficulties finding trainee placements than ethnic Danes (see for instance Board for Ethnic Equality, 1996). The existence of discrimination in the hiring of trainees may also contribute to explaining why we find higher drop-out rates for vocational educations than for any of the other educational types. Academic education does typically not include a mandatory trainee period. Still, the evidence is consistent with several explanations for dropping out, so no firm conclusions emerge from our study in this regard.

Turning to the effects of the explanatory variables, we find for the male immigrants that those with Turkish origin drop out of the educational system to a lesser extent than men from Ex-Yugoslavia and Pakistan. The differences are not statistically significant except in Model 1 though. This is quite a surprising result given that young Turks generally do worse in the educational system than the two other groups, especially the male Turks, see Jakobsen and Smith (2003). The reason behind the effect of Turkish origin is probably found in the fact that we have controlled for parental human

¹⁴ If the screening process were completely random, it would lead to negative duration dependence in all 3 specified models.

capital, and the young male Turks compensate for low levels of parental capital by trying more, hence the positive sign. On the other hand, women with Turkish origin drop out to a higher extent than the other two groups. The differences are only significant in model 1 and 2. The effect of Pakistani origin changes from model 1 to model 3 for the female immigrants. Women with Pakistani origin drop out to a higher extent than women of Yugoslavian origin according to model 1, but to a lesser extent than the two other groups according to model 3, which takes selection and unobserved heterogeneity into account.

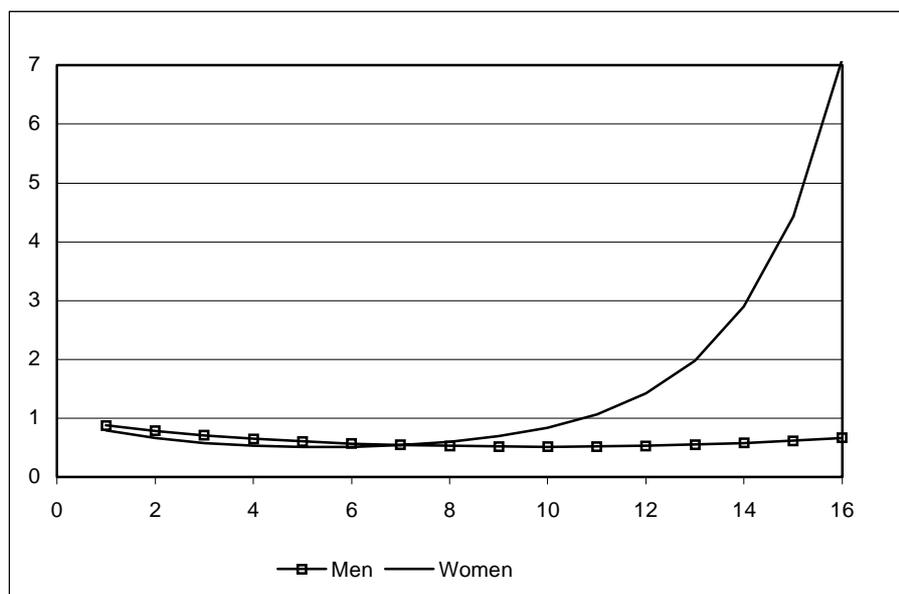
Being (or becoming) married surprisingly leads to a large decline in the drop-out rates for female immigrants, a result that is in stark contrast to our *a priori* expectations. For men the effect of marriage is also negative, but not significant. Children have no effects on the drop-out rates. The indicators of marriage and children are lagged, as described above. Hence, the evidence shows that women who are (some of whom have recently become) married drop out less frequently, *ceteris paribus*, than unmarried women. However, this result could easily be due to endogeneity; perhaps drop-out occurs just prior to marriage, such that those who continue ‘despite’ their marriage are the most motivated and hence, least likely to drop-out.¹⁵

Age at migration does not have a statistically significant effect on the drop-out rate of men, but for women the effect changes through the different specifications; in Model 1, the drop-out rate decreases with age at migration, but is statistically insignificant, while the effect is statistically significant in the preferred specification, and increasing from the age of five. For someone immigrating at the age of 16, the drop-out rate is 14 times higher, *ceteris paribus*, than that of someone who arrives at the age of 5. This is illustrated in Figure 6, which plots the development in the drop-out rates with age at migration.¹⁶

¹⁵ It can also be argued that ‘children’ is an endogenous variable, but we have deliberately chosen not to account for these endogeneities, since our model is already quite complex, and the introduction of a marriage and fertility equation is beyond the scope of this paper. Moreover, we are not convinced that the modest sample size of the data we use would yield any meaningful results from the estimation of such complex models.

¹⁶ The results concerning age at migration are not very robust, unfortunately. The results are sensitive to the specification of age at migration in the model. We have estimated two alternative models to model 3. In the first alternative model age at migration is recoded into three dummy variables (0-6 years, 7-9 years, 10-15 years) in the estimation of the drop out and completions hazards as well as in the selection equation, and according to this model women who immigrated at the age of 7-11 drop out to a lesser extent than women who immigrated at the age of 0-6. These results are contrary to the results shown in figure 6 and our expectations of the effect of age at migration. In the second alternative model age at migration is coded as dummy variables in the estimations of the drop out and completions hazards only, and as a second order polynomial in the selection equation, and in this model we obtain once again the expected effect: women who immigrated at the age of 7-11 drop out to a higher extent than women who immigrated at the age of 0-6. To choose between the models we have used a Vuong test. However, the test was inconclusive. The test did favour the model reported here, but not significantly so. We thus feel a need to stress that our results may actually be a consequence of the specification chosen. We would like to investigate this issue further in the future.

Figur 6. The estimated development of the drop-out rate with age at migration



Somewhat surprisingly, parental human capital, in terms of education and working experience, does not appear to affect the drop-out rates significantly.

Turning next to the completion hazard rate, the results are reported in Tables 6 and 7 for men and women, respectively. The completion hazards are increasing with the time spent in education, which is not surprising. Moreover, this does not change between the three different models. This is because the introduction of unobserved heterogeneity leads to the conclusion that there are no unobserved factors, which significantly affect the completion rate directly.¹⁷

Short academic educations are the shortest among the educations considered, and therefore their completion hazard rate is the highest. The second highest is that of vocational educations, followed by medium length academic educations, with long academic educations naturally having the longest duration and hence the lowest hazard rate.¹⁸

¹⁷ There are obviously indirect effects from unobserved variables; those who drop out because they are 'not-so-able' never complete.

¹⁸ It would be natural to estimate the model separately for different educational categories, but due to the low number of observations, we have chosen to pool the data.

Table 6. Completion hazard estimation. Male immigrants enrolled at an education in the period 1984-1999. Model 1: Competing risk. Model 2: Competing risks with unobserved heterogeneity. Model 3: Competing risk with unobserved heterogeneity and sample selection.

	Model 1		Model 2		Model 3	
	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.
Base 1 (0-12 months)	-5.8722***	0.6328	-5.7645***	1.0385	-5.7059***	1.0924
Base 2 (13-24 months)	-4.7886***	0.6163	-4.6419***	1.2084	-4.5793***	1.2472
Base 3 (25-36 months)	-3.5434***	0.5934	-3.3876***	1.1980	-3.3222***	1.2211
Base 4 (37-48 months)	-2.3942***	0.5759	-2.2355*	1.2101	-2.1705*	1.2367
Base 5 (49-60 months)	-2.2181***	0.6108	-2.0537	1.3045	-1.9821	1.3287
Base 6 (61-72 months)	-1.7533***	0.6138	-1.5786	1.3996	-1.5038	1.4071
Turkish origin	-0.5889**	0.2776	-0.5845*	0.3113	-0.5829*	0.3123
Pakistani origin	-0.5867**	0.2913	-0.5821	0.3603	-0.5804	0.3627
Married	-0.1200	0.2503	-0.1184	0.3091	-0.1252	0.3139
Age at migration	0.6424	1.0070	0.6798	1.2676	0.5594	1.2687
Age at migration squared	-0.0540	0.6576	-0.0761	0.8619	0.0070	0.8674
Short academic education	2.3624***	0.4265	2.3063***	0.6224	2.2893***	0.6396
Medium academic education	-0.4763**	0.2132	-0.5446	0.4483	-0.5574	0.4212
Long academic education	-2.3356***	0.3067	-2.3474***	0.3983	-2.3606***	0.3984
Youngest child is 0-6	0.5312**	0.2554	0.5272*	0.2937	0.5316*	0.2952
Parents vocational education	0.1654	0.2977	0.1734	0.3656	0.1686	0.3618
Parents academic education	0.1320	0.2834	0.1301	0.3423	0.1259	0.3433
Parents working experience	-0.1349	0.6553	-0.1246	0.8998	-0.1125	0.9157
Parents working experience squared	-0.0013	0.2798	-0.0050	0.3643	-0.0125	0.3709
V12			-0.1837	1.0503	-0.2130	1.0083

NOTE: ***significant at a 1 % level; **significant at a 5 % level; *significant at a 10 % level. The support point v11 is normalized to zero (that is, it equals the baseline hazard).

Table 7. Completion hazard estimations. Female immigrants enrolled at an education in the period 1984-1999. Model 1: Competing risk. Model 2: Competing risks with unobserved heterogeneity. Model 3: Competing risk with unobserved heterogeneity and sample selection.

	Model 1		Model 2		Model 3	
	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.
Base 1 (0-12 months)	-4.1787***	0.5353	-3.8553	0.9245	-4.6069***	1.2812
Base 2 (13-24 months)	-3.5640***	0.5519	-3.1461	1.1240	-4.0547***	1.3883
Base 3 (25-36 months)	-2.2522***	0.5040	-1.7974	1.1318	-2.7599**	1.3797
Base 4 (37-48 months)	-0.9805**	0.5264	-0.5106	1.2030	-1.4832	1.3607
Base 5 (49-60 months)	-1.3983**	0.6991	-0.8776	1.3927	-1.8732	1.4635
Base 6 (61-72 months)	-0.7175	0.6720	-0.1637	1.4414	-1.1930	1.5085
Turkish origin	-0.3244	0.2362	-0.3173	0.2748	-0.3309	0.2765
Pakistani origin	-0.2093	0.2445	-0.2088	0.2559	-0.1938	0.2922
Married	0.3189*	0.1936	0.2996	0.2201	0.3214	0.2150
Age at migration	-0.8580	1.1589	-0.7769	1.4581	-0.8821	1.4711
Age at migration squared	0.5990	0.8064	0.5227	1.0057	0.6003	1.0230
Short academic education	1.0360***	0.3272	0.9992	0.3929	1.0539***	0.3667
Medium academic education	-0.9216***	0.2406	-1.0575	0.4166	-0.7540	0.5328
Long academic education	-2.8054***	0.3727	-2.8874	0.4628	-2.8226***	0.4407
Youngest child is 0-6	0.0328	0.2150	0.0249	0.2158	0.0335	0.2180
Parents vocational education.	-0.2621	0.2476	-0.2538	0.2816	-0.2512	0.2826
Parents academic education	0.3040	0.3079	0.3341	0.3836	0.3446	0.4014
Parents working experience	-0.8357*	0.4581	-0.8197	0.5469	-0.8429	0.5492
Parents working experience squared	0.3521*	0.1963	0.3418	0.2341	0.3537	0.2357
V12			-0.4732	0.9512	0.5233	1.2617

NOTE: ***significant at a 1 % level; **significant at a 5 % level; *significant at a 10 % level. The support point v11 is normalized to zero (that is, it equals the baseline hazard).

Young immigrants of Yugoslavian origin complete their educations faster than any of the other groups, but this effect is only statistically significant for men. Being (or becoming) married leads to an almost significant increase in the completion rates of women, but has no effect on the completion rates of the men. Age at migration has an utterly insignificant effect on the completion hazard rate. Young men with young children complete their education faster than others (which could be due to planning the arrival of the child at the approximate time when they complete the education – in which case this variable is also endogenous), while the presence of young children does not affect the completion rates of young women. Once again, parental human capital does not appear to have any effect.

7. Conclusion

In this paper we investigate the drop-out and graduation behaviour of young first generation immigrants from Turkey, Pakistan and Ex-Yugoslavia enrolled in a qualifying education in Denmark during the period 1984-1999. Drop-out and completion are analysed for the first qualifying education in which the young immigrants have been enrolled during the period. In Denmark it is a requirement to have graduated in order to obtain employment in most professional occupations, especially in the public sector. We therefore argue that the educational system contains strong elements of signalling and that the decision to drop out is a consequence of the arrival of new information, rendering the original decision (to graduate) inoptimal. This implies that high drop-out rates are waste of resources for the individual as well as for the society as a whole.

The descriptive analyses in section 4 show that the low educational achievements among young immigrants compared to young ethnic Danes found in other studies are a combination of low enrolment rates and high drop-out rates among the immigrants. Nearly 60 percent of the male immigrants and 42 percent of the female immigrants drop out of the first qualifying education they have been enrolled at compared to 30 percent of the male and female ethnic Danes. The higher drop-out rates among immigrants are mainly driven by a higher drop-out rates from vocational educations, and to a lesser extent by higher drop-out rates from long academic educations.

We estimate three different competing risks duration models of the drop-out and completion processes of immigrants; the first model is estimated without controlling for unobserved heterogeneity and sample selection; the second model accounts for unobserved heterogeneity; the third model takes into account unobserved heterogeneity as well as non-random enrolment (sample selection). The models are estimated separately for men and women.

The empirical (Kaplan-Meier) hazard rates show strong negative duration dependence in the drop-out hazard. However, duration dependence becomes positive once we control for unobserved heterogeneity. This indicates that most of the negative duration dependence in the empirical hazard

rates are due to a sorting effect into 'able' and 'not so able' individuals, where the 'not so able' drop out early and the 'able' complete their studies. For vocational education, the result is consistent with a story of discrimination in the trainee assignment process; if there is an extraordinary scarcity of trainee places (due to discrimination), the most able immigrants are likely to get the few trainee places that there are. However, the result is also consistent with a story of mismatching; those dropping out are those whose skills do not match those required at the given educational institution. This could be caused by lack of information regarding educational institutions and requirements among the parent generation and the immigrant children themselves. Poor matches are probably more frequent among immigrants than ethnic Danes, because the immigrants have less knowledge about the educational system in Denmark than ethnic Danes, other things being equal. This might also explain the differences in drop-out rates between immigrants and natives observed in Table 2. The duration dependence in the completion hazard is positive as expected.

The analysis of the effect of various characteristics on enrolment, drop-out and completion rates show no effect of parental capital. It is surprising that we do not find any effect on parental capital, at least on the enrolment rates, given the positive effect of parental capital found in other empirical studies. This may be due to the fact that parental capital is strongly correlated with the ethnic group, and since the ethnic group is controlled for in the estimations, this may cause the effect of parental capital to disappear. Moreover, the sample studied here is quite small and probably more homogeneous than the entire stock of young immigrants, as we only investigate immigrants from three countries.

Immigrants with Pakistani origin have a higher probability of being enrolled at an education than immigrants from Turkey and Ex-Yugoslavia. The Pakistani women also drop out to a lesser extent than women of Yugoslavian and Turkish origin. The fact that the Pakistani immigrants are doing better in the educational system when controlling for other factors is also found in Jakobsen and Smith (2003).

We expected marriage to exert a stronger negative influence on women than on men with respect to educational achievements, due to norms and traditions in the involved ethnic groups. Marriage does reduce the probability of educational enrolment for the immigrants (both men and women) as expected. However, the estimations show that being (or becoming) married leads to a large decline in the drop-out rates for female immigrants. For men the effect of marriage is also negative, but not significant. Marriage has no significant influence on the completion rates. Thus, the net effect of marriage is not entirely clear; on the one hand, being married at an early age lowers the enrolment rate into the educational system. On the other hand, begin or becoming married lowers the drop-out rate, at least for women. Both effects could easily be caused by marriage being an endogenous variable, which is not controlled for in this study.

Age at migration exerts as expected a negative influence on the probability of enrolling at an education. In accordance with the hypothesis that increased age at migration leads to fewer good matches between the students and the educational institutions, the estimation results for women show a significant effect of age at migration on the drop-out rate, which is increasing from the age of five. We find no statistically significant effects of age at migration on the drop-out rate for men. Thus the observed negative relation between age at immigration and the drop-out rate (shown in figure 5) may at least for the male immigrants be explained by selection. However, the results concerning the effects of age at migration are sensitive to the specification of age at migration in the selection equation.

Very large cohorts of second generation immigrants are on their way into the educational system. These individuals share some of the characteristics of the first generation immigrants studied in this paper. We would expect the second generation immigrants to experience higher enrolment rates and lower drop-out rates than the young first generation immigrants, who came to Denmark as children, while the effect of marriage, children, parental capital and ethnicity is expected to be similar for the two groups.

It is important that the enrolment rates increase and that the drop-out rates decrease for young immigrants. In this paper, we have mostly been concerned with looking at the drop-out rates. However, it is obvious that much can be gained by also improving enrolment. When it comes to reducing the drop-out rates, policy recommendations are hampered by the fact that we do not have estimation results for young Danes with which to compare our results for immigrants.

The policy recommendation to be derived from the study will thus be based on the inter-immigrant comparisons that we have performed. One result that springs to mind is that drop-out does not seem to be a function of any of the usually suspected variables, such as different measures of parental capital. If that result holds in a comparison to native Danes (but that remains to be seen), a possible recommendation would be to disseminate the information on educational requirements and/or barriers in the educational system more appropriately to the immigrant students, for example by intensified counselling to students *and parents* already in basic school, that is, before the young immigrants make their educational choices.

If the explanation for the large drop-out rates among immigrants is discrimination in trainee placement assignment, the obvious solution would be to get rid of the discrimination. One way to do that would be to change the trainee assignment process itself, such that the entire responsibility of obtaining trainee placement belonged to the school and the assignment itself was carried out solely by the school rather than through an individual matching process.

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Appendix

Table A.1. Sample means. Male immigrants 1986

	N	Mean	Std Dev
Age	1,586	18.7	2.6
Age at migration	1,640	8.5	3.6
Origination from Pakistan (1=from Pakistan, else=0)	1,640	0.25	0.43
Origination from Turkey (1=from Turkey, else=0)	1,640	0.61	0.49
Married (1=married, else=0)	1,640	0.23	0.42
Child aged 0-6 (1=a child in the age group, else=0)	1,640	0.28	0.45
Child aged 7-17 (1=a child in the age group, else=0)	1,640	0.41	0.49
Income – father (kroner)	1,466	117,026	48,983
Income – mother (kroner)	1,348	77,026	48,713
Working experience – father (years)	1,466	9.5	4.0
Working experience – mother (years)	1,348	4.1	4.0
Years since migration – father	389	13.4	3.7
Years since migration – mother	1,228	11.4	2.6

Table A.2. Sample means. Female immigrants 1986

	N	Mean	Std Dev
Age	1,297	18.5	2.6
Age at migration	1,336	8.2	3.6
Origination from Pakistan (1=from Pakistan, else=0)	1,336	0.21	0.41
Origination from Turkey (1=from Turkey, else=0)	1,336	0.62	0.49
Married (1=married, else=0)	1,336	0.28	0.45
Child aged 0-6 (1=a child in the age group, else=0)	1,336	0.36	0.48
Child aged 7-17 (1=a child in the age group, else=0)	1,336	0.39	0.49
Income – father (kroner)	1,184	120,607	49,461
Income – mother (kroner)	1,098	85,139	46,576
Working experience – father (years)	1,184	9.6	3.9
Working experience – mother (years)	1,098	4.5	3.9
Years since migration – father	301	14.0	4.5
Years since migration – mother	1,028	11.7	2.5

Figure A.1. Kaplan Meier Hazard rates. Male immigrants enrolled at a vocational education in the period 1984-1999

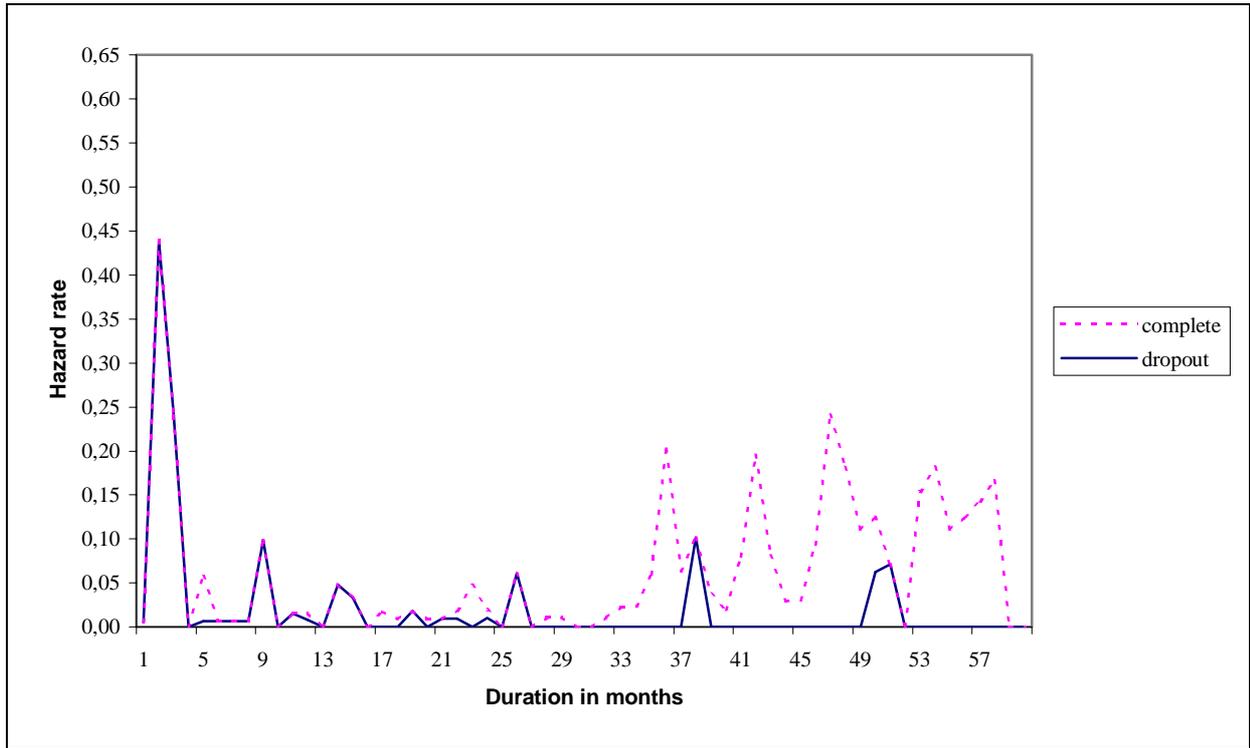
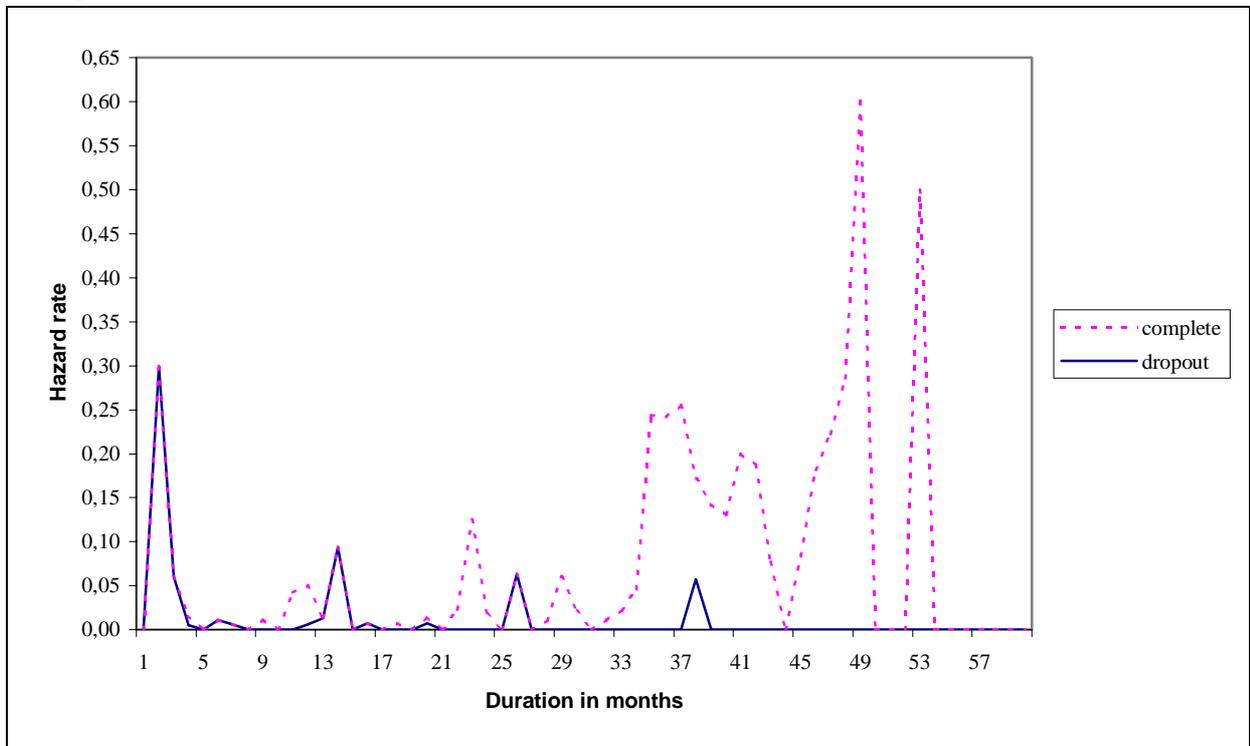


Figure A.2. Kaplan Meier Hazard rates. Female immigrants enrolled at a vocational education in the period 1984-1999



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