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Study achievement for students with kids

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Study achievement for students with kids[+]

by

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Abstract

In this paper we explore the composition of students, the study length towards diploma, and examine the likelihood of diploma, all with respect to parenthood. Few get children while enrolled in higher education, nevertheless one fourth of female university students in Sweden has children. In Sweden as in many other countries enrollment periods have been prolonged and allocated to later parts of life. Using a large longitudinal register micro data set containing educational achievement we find that students with children seem to be somewhat more efficient in their studies among those who have graduated. Becoming parent speeds up ongoing studies but not studies that are initiated after entry into parenthood. We also find an indication that students with children have a lower dropout rate since their probability to register a diploma is higher, compared to students without children.

Keywords: Students, parenthood, education, study interruption
JEL-codes: J13, J31, I21

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1 Introduction

It is often presumed that there is a normal order of entering into the 'adult life'. First you are expected to complete studies, second become established in the working life, and only after that form a family. Not least is this the expected order implicitly built into the Swedish social security and education systems. Today, however, a greater share of young Swedes is enrolled in higher education for longer periods and studies continue into fertile ages, where it is common to start family formation. One may therefore ask if not the traditional order of entering adult life has become less frequent. For instance for female students, especially, we see a dramatic increase in the average age of enrolled students, which has increased from 25 in 1993 and reached a top of 27.5 in 2004. Over the same period the average age of male students rose from 24.5 to 26.5.[1] During the time period the education sector in Sweden expanded considerably, and the share of students increased in practically all age groups, see Figure 1.

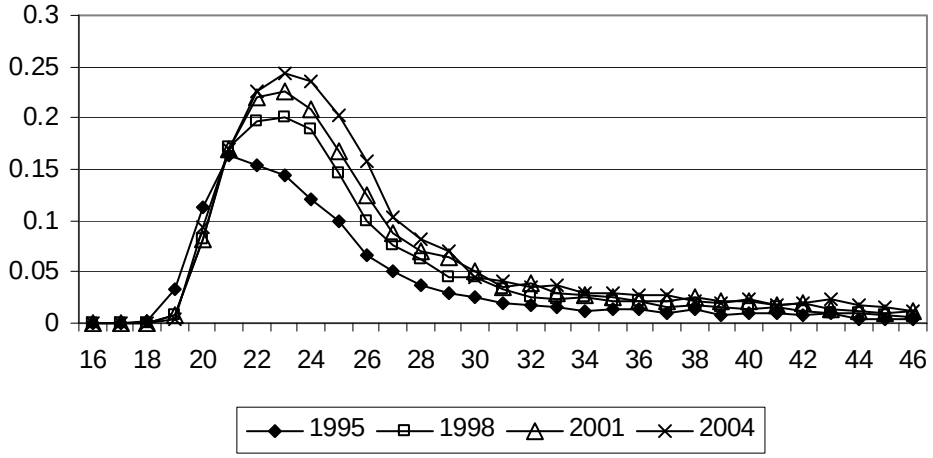

Figure 1 Share of university students, by age and year

We see that the peak frequency in the age distribution of students is delayed over time; while the peak of the age distribution is 21 in 1995, it is 23 in 2004. It is also clear that an important fraction is committed to studies well into their 30s and 40s. The general increase in students over time is mainly due to more women pursuing university

[1] The data used in this part are described below. Student status is defined as finishing at least 20 university points/credits during a calendar year. Full-time students usually register for 40 points per academic year.

studies (females almost doubled their share of enrolled students between 1994 and 2004). These trends are partly explained by prolonged study periods, by delay in time of entry, and by older individuals being committed to studies, sometimes re-entering university after a period of work. [2]

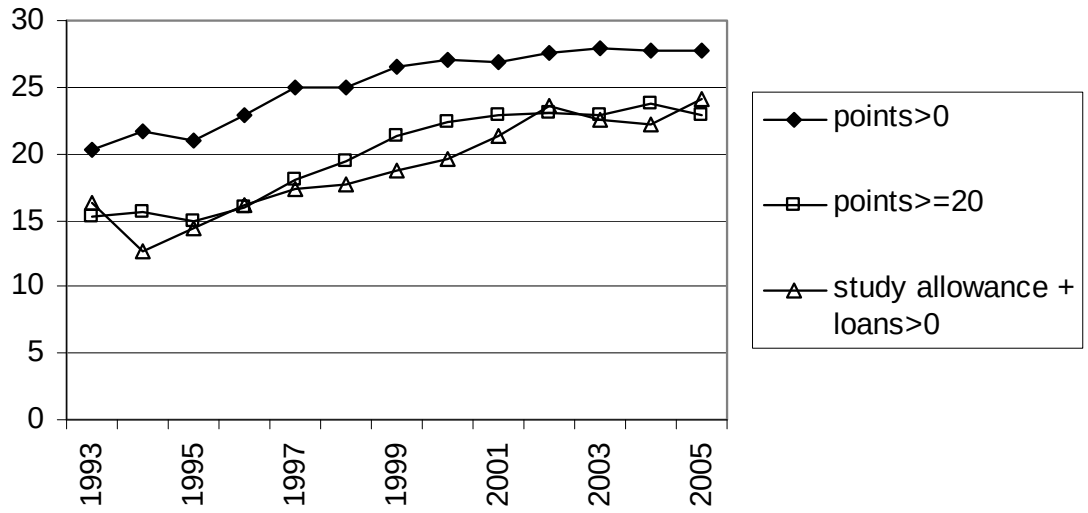

Figure 2 Share of female students with children, by year, percentages

The increase in the share of students and the increase in students' average age lead to the question whether the normal order of entering adult life has changed, i.e., do individuals wait to have children until after university? The fact is that in the last ten to fifteen years Sweden has had a quite dramatic increase in the share of students, predominantly women, with children during higher studies. According to Figure 2, about one quarter of female students had children in 2004.[3] In an international comparison this is an exceptionally high rate. There is plenty of evidence that being in education is a factor that reduces the likelihood of having first birth (e.g. Blossfeld and Huinink, 1991; Kravdal, 1994; Blossfeld, 1995; Hoem, 2000; Santow and Bracher

[2] This is confirmed by expansion of study length – as measured by the difference between first university registration and diploma year – has increased from on average 4.6 years to almost 6.5 years. We see no sharp gender differences, but men start university studies earlier and obtain their diploma at a younger age relative to women.

[3] The figure presents shares of mothers for three different student populations: the first two refer to accomplished university points during a calendar year (at least 1 point or at least 20 points, respectively), while the third refers to having student allowance and/or student loans. We restrict these populations to age-group 19 or older. The corresponding shares for men are much lower. Similar levels are documented also by other authors, see, e.g., Thalberg (2009) and SOU (2003).

2001; Thalberg, 2009) so one possibility is that these mothers return to education after childbearing, possibly entering a new educational program, even as first-time students.

Obviously something has changed that from an economic viewpoint seems hard to explain. Study allowances and loans are given at levels that hardly suffice to support single individuals, much less a family. There are, however, reasons to expect that other countries may follow the Swedish example due to expected increases in longevity. With increasing longevity it is rational to rescale the economic life-cycle and to expand the human capital investment period (Lee and Goldstein 2003) in the expectation of later retirement and a longer payback period. If the prime fertility age does not expand in the same manner this implies that an increasing share will be students during their prime fertility period between 20 and 30 years old. Postponing childbirth to after education will increase the medical cost when less fecund older individuals desire to have children (see Wetzels, 2001, for medical and biological review).

It is well documented that the traditional timing of having children, after education, has negative effects on female earnings (e.g. Anderson et al., 2002; Budig, Michelle and England, 2001; Crittenden, 2001; Datta Gupta and Smith, 2002; Heckman and Walker, 1990; Mincer and Ofek 1982). But it is less well studied what the effects of having children during or before higher education are.

Most studies that investigate the effects of motherhood on education deal with basic or secondary education, i.e. teenage pregnancies. The conclusion from these studies is that there is a negative effect of motherhood on education (e.g., Klepinger et al., 1999; Marini, 1984). Today teen age mothers are rather rare in Sweden and comprised only one percent of all births in 2006. So the question remains if the same negative outcome is to be found for university mothers. To our knowledge this is an issue that has been overlooked in the literature.

Raising children is a time-consuming activity, especially small children, and thus it becomes important to consider how easy (or difficult) it is to combine studies and small children compared to work and small children. Gustafsson (2001) suggested that the government should consider political measures to facilitate the combination of either being a student and a mother or being a worker and a mother. Giving birth unavoidably requires time off at least for the women during a period and it is clear from, e.g.,

Holmlund et al. (2008) that there is a severe and long-lasting wage penalty involved with the loss of work experience in early adulthood. Besides the motherhood wage penalty argument it is also important to assess the effects of motherhood on the efficiency of education since increased education length also shrinks the fecundity window after education.

The phenomenon of having children while studying in university is under investigated. In this descriptive study, we investigate the differences in student composition and student achievement, all with respect to parenthood during higher studies. The scope for increasing our knowledge concerning some of these issues is greatly facilitated by the rich data at our disposal in the present paper. We use a large longitudinal micro data set spanning 1993-2005, containing very detailed register information on background characteristics, incomes, and educational achievement. We have in this paper focused on the following research questions: Do students who have children during or before their studies also spend more time in education, take longer time to graduate, and is the dropout rate higher?[4]

Our empirical findings suggest that students with children, who have taken a diploma, are more efficient in their studies as they take shorter time to reach diploma counting the number of semesters as active students. One explanation for this might be selection into certain programs. Students with children are overrepresented in certain programs, e.g., pedagogic and teacher training, and health sector professions and social care. Students with children produce less credits during a given time period in their studies, which suggest that they study fewer extra curricular subjects that are outside the scope of their diploma. But the raw dropout rate (without any controls) for student parents is higher than non-parents, if they became parents before first enrolment. This difference appears to be driven by failure in the initial period of higher studies. Note, however, that the individuals that get children during education have a higher probability to register a diploma than non-parents.

[4] We should also mention that the analysis is limited to those that actually study since we are not able to observe applications to different programs and therefore cannot identify those who want to study but are prevented by entry restrictions.

The rest of the paper is organized as follows. Next in Section 2 we give a summary of some earlier literature, related mainly to fertility and education. The evidence concerning our research focus here is both mixed and scant. Section 3 presents the data. The empirical model for analyzing study length is described in Section 4, empirical results are presented in Section 5, and Section 6 concludes the paper.

2 Earlier literature on fertility and education

There is a large literature on the effects of education on fertility. As noted above many studies find that being in education is a factor that significantly reduces the probability of having first birth. One explanation for this is the delayed transition to economic independence. Students often lack sufficient income and housing to form a family, and their future living conditions and careers are uncertain (Kohler, Billari, and Ortega, 2002). There is also the argument that social norms about education and childbearing may influence the behavior of students because "there exist normative expectations in society that young people who attend school are 'not at risk' of entering marriage and parenthood" (Blossfeld and Huinink, 1991, pp.147). The current Swedish observations may be reflecting both dissolution of such norms and that it is economically feasible to care for children during education.

From a methodological point of view one can discuss whether education can be taken as a pre-determined factor in fertility behavior, or whether there is a reversed causality, e.g. that an earlier childbirth may prevent a woman from finishing or delay her planned education (Gustafsson and Kalwij, 2006). Bratti (2006) analyzed the potential endogeneity of education in female labor force participation and marital fertility in Italy and did not find residual evidence of endogeneity of education in these two decisions. This finding may suggest that women first decide on an educational plan and from their educational plan follows labor force participation and fertility, hence the order we observe in Sweden with many instances of education after child birth may suggest that the reverse causality is stronger here. Marini's (1984) study did find that early entry into parenthood had a negative effect on the educational attainment of women in the United States. However, most of the studies on the impact of motherhood on education focus

on teenage childbirth in the United States and Britain that, as noted in the introduction, are rather irrelevant for Sweden.

Billari and Philipov (2004) consider education and the transition to motherhood as parallel and interdependent processes from a life-course perspective. They analyse the mutual impacts of educational enrolment and attainment on the timing of motherhood and of maternity on education results for eleven Western European countries including Sweden. The results confirm that finishing schooling significantly speeds up the transition to first birth in all the countries, while only in Austria and France the level of education shows significant impacts. Moreover, the impact of education on first birth is stronger in the continental countries than in the Northern and Southern European countries. The reason given by the authors is mainly that in the former countries the educational system provides less support to combine studying and childbearing and have less flexibility in postponing the end of education, while in the other two groups of countries, the mother students may receive more support either from the public sector or from family members.

The study also confirmed that being a mother has significant impacts on schooling in all the countries except for Greece, but the direction of the impacts varies across the countries. In Nordic and Southern European countries, being a mother reduces the risk of leaving education or prolongs the finishing of education. In the continental countries, however, being a mother increases the risk of dropping out from education or speeds up the end of education. In addition, having started work accelerates the coming of first birth in the Nordic countries but postpones the first birth in the other countries.

3 Data and variable construction

The database from which we draw our sample is created by Statistics Sweden in collaboration with the Institute for Labour Market Policy Evaluation (IFAU). It contains linked information from several national registers including individuals' income, demographic status, and educational achievement.[5]

[5] Unfortunately the data does not contain housing allowance benefits which could be quite important for single mothers.

The database covers the whole population in ages 16 and above. For the main analysis (on study length towards a diploma and the probability of registering a diploma) we will use the population, i.e., not take a random sample. However, in some parts of the analysis, we will, for practical reasons, use a 3 percent longitudinal random sample, representative of the population in ages 16 and above.

In this study we are particularly interested in enrollment and achievement at university or college. These data comes from the National Board of Education that collects information from all institutions supplying tertiary education in Sweden. It should be noted that in Sweden this includes nursing education as well as other professional educations, for example police training.

These data are available from autumn 1993 until spring 2005. In the data we can, for most periods, measure both the number of enrollment points/credits (EP) and the number of taken points/credits (TP), down to the semester.[6] For everyone (also those that started before autumn 1993) there is information about when (in which semester) they registered as students for the first time. A full-time student normally registers for 1 credit per week[7] and 40 credits each academic year (usually but not always at two times with 20 credits each semester). It is allowed to register for much more, however. [8]

The main outcome that we analyze is the length of study towards a diploma. Using the data on university credits taken we define the study length (in semesters) for individual *i* who registers a diploma in period *t* as the number of semesters with nonzero production of university credits accumulated until period *t*, i.e.,

$$L_{it} = \sum_{k=t_{0i}}^{t} I\left(TP_{ik} > 0\right),$$

[6] For the first years in data (1993, 1994, and 1995), the TP is recorded on the basis of the academic year (i.e., normally autumn to spring the following year) and not on the semester level. However, EP is recorded on semester level for all years. In the first three years of data we allocate TP into semester in proportion to the semester distribution of the EP:s. Thus, for the first three years, there is some measurement error in the timing of TP.

[7] Since July 1st 2007 when Sweden adopted to the so-called Bologna-process, one week of full-time studies means 1.5 points/credits (*högskolepoäng*). We will throughout this paper refer to credits in the old system.

[8] In order to be eligible for continuation of study loans, a full-time student is required to accomplish 75 percent of enrolled credits, but there are exemptions to this rule. During the first year of study the required accomplishment rate is usually lower (today the requirement rate is 62.5 percent of enrolled credits).

where $I(.)$ is the indicator function, TP_{ik} is credits taken by individual i in period k, and t_{0i} is the first semester with credits taken by individual i. In TP_{ik} we sum credits from both educational programs and separate courses that are not part of an educational program (fristående kurser). Note, however, that it is possible to obtain a diploma based on separate courses without belonging to an educational program.

Importantly, semesters with no credits taken (due to, e.g., intermediate gaps in studies or failure in taking exams) will not count in L_{it}. That means that semesters with parental leave will not count for the length of studies (but only, of course, if no credits are taken that semester). L_{it} is thus a measure of the effective time engaged in tertiary education. Note that it is not a duration measure in the usual sense. To account for left-censoring of an individual's study history, we will only consider individuals who had their first registration in or after the start period of our data (i.e., in the second semester of 1993).

In addition to the points/credits data the data from the National Board of Education also include information on whether someone, in a given semester, registered a diploma. This information is very rich. The data contain very detailed codes, on educational level, field, and number of credits included in the diploma that was registered. The level and field of education is categorized according to SUN, which follows ISCED 97.[9] Henceforth we denote this information EXSUN to distinguish it from the annual SUN-code that is available from other parts of the data, henceforth denoted HISUN.[10]

A diploma only contains the credits and courses needed for that diploma. Individuals may, however, have a much richer study history outside the diploma. There is no limit as to the number of diplomas an individual may have, but a person cannot register the same type of diploma twice. However, a person can register a diploma at a higher

[9] SUN is short for Swedish Educational Nomenclature and classifies education into educational level and field of study (for details, visit www.scb.se) and ISCED 97 is International Standard Classification of Education - 1997 version.

[10] HISUN is register information on the latest (highest) level and field of education (also classified according to the SUN classification) that a person has achieved. This is unrelated to the event of registering of a diploma and is updated (mechanically, but sometimes with a lag) when a person attains more education. However, this information is far from ideal given that we want to know the theoretical content of an unfinished educational program. This code does not always take into account the level of a particular university course. For instance, taking two university courses at basic level in separate fields will often count as the same thing as taking first a basic course and then an advanced course in the same field, which normally would imply a 'greater' educational content. Hence, the best information on the theoretical content in an education is given by the EXSUN (and the diploma codes), but this is, by definition, conditional on graduation.

education level (e.g., a master's degree) which includes courses that were included in a diploma at a lower degree (e.g., a bachelor's degree) registered earlier by the individual. These data have a bi-annual frequency, while the linked income and background data are annual.

A limitation of the avaliable data is the definition of 'parent'. A parent, in our data, is defined as a person cohabiting (married or unmarried) or a person living alone with a child living at home and less than 18 years of age. According to this definition a person may hence switch from being a parent to a non-parent although the person in reality still is parent. Either this happened because the youngest child turned 18, or the parent and child separated to different households. This data is annual.[11]

There are also some problems in measuring couple status with these kinds of administrative data. We have no track of unmarried couples unless they have a common child. A person living alone with children may hence be in a couple-relation without *common* children although we cannot identify it.

4 Empirical model of study performance and parenthood

To examine the correlation between parenthood and study achivement we will evaluate different measures and use different strategies. First, we will estimate study length until graduation (diploma), *L*, in the regression model where the type of diploma individual *i* registers at period *t* is held constant, of the following type:

$$L_{it} = \alpha + \gamma_1 PAR_{it} + \boldsymbol{\pi}\mathbf{EXSUN}_{it} + \boldsymbol{\beta}\mathbf{X}_{it} + \varepsilon_{it}\,. \qquad (1)$$

L was defined above, PAR_{it} is a dummy for being a parent, $\mathbf{EXSUN}_{it}$ is a vector of dummies indicating the diploma type (in terms of education level and field, i.e. EXSUN, and the number of credits included in the diploma) of *i* at *t*, and $\mathbf{X}_{it}$ is a vector

[11] This definition is in one sense problematic as parenthood does not end because kids move out. We will underestimate parenthood for parents who lose custody of the child or older parents who are more likely to have kids that are 18+. An age-limit on the child nevertheless serves the purpose of avoiding differences in home-leaving age to affect the definition of parent – very few leave home before age 18.

of controls (age, period, etc.). In this model, γ_1 is the average difference in study length between students with children at *t* compared to other students, given that educational attainment (in terms of diploma) is held constant in $\mathbf{EXSUN}_{it}$.

Second, we will evaluate a measure of study speed. We examine accumulated points/credits in a given semester, TP_{it}, starting from the semester of first enrolment in the following type of regression:

$$\ln(TP_{it}) = \alpha + \gamma_2 PAR_{it} + \theta_i + \boldsymbol{\pi}\mathbf{HISUN}_{it} + \boldsymbol{\beta}\mathbf{X}_{it} + \varepsilon_{it}\,. \qquad (2)$$

In this model we follow individuals over time and estimate the difference with respect to parenthood, controlling for individual fixed effects, and HISUN, i.e., the annual SUN-code of the latest educational classification (in terms of education level and field). In this model γ_2 measures the percentage difference between parent-students and other students in the number of credits taken during a semester (given nonzero credits), conditional on the latest educational achievement (as far as we can measure in HISUN), and unobserved time-invariant confounders (θ_i). There might be unobserved individual effects –such as 'taste for studying' or ability – that biases the relationship if not accounted for, so we use individual fixed effects regression specification. The relationship does not account for the possibility that parenthood timing and study choices may be simultaneously determined (or by unaccounted time-varying factors). In model (1), we have little possibilities to make use of repeated observations on the same individual since there are only very few that has registered several diplomas. In addition these may be a selected group.

It might be that parents intensify studies and choose a higher study rate ($\gamma_2>0$) than others and therefore are faster to a given diploma ($\gamma_1<0$). It may also be that parents choose a lower study rate ($\gamma_2<0$) but in the end move faster in reaching a given diploma in terms of effective study length ($\gamma_1<0$). One interpretation is that parents take fewer courses that are outside their diploma requirement.

The parent/non-parent difference might depend on parenthood timing. Thus we will also estimate specifications of (1) which allow for separate coefficients for a) students

who were parents already at the time of first enrolment in higher studies and b) students who became parents later, i.e., after their first registration but before obtaining the diploma. The first group is labeled ‘before’ and the second group ‘during’. Specification (2) with fixed individual effects estimates the parent/non-parent difference for those that change status, i.e., effectively for the group ‘during’.

The sample for (1) uses all individual-semester-year observations in which we observe a diploma being registered (conditional that first enrolment is equal to or later than the second semester of 1993). The sample for (2) is an individual-level panel independently of diploma (for practical reasons we use a 3-percent random sample). Thus, these two samples have their own advantages but also disadvantages. One may argue that the difference with respect to parenthood might depend on parents deliberately choosing courses or programs that demand less effort and therefore are easier to complete. In the ‘diploma sample’, we focus only on those that take out diploma. Here we compare the time (in semesters) individuals used in university to reach the exact same diploma, in terms of having the same SUN-code. Data is very detailed and contains all diplomas during the period. The real benefit of the model (1) is that we hold constant for the educational content in a very strict sense. A significant difference between parents and non-parents in study length to reach a certain diploma is therefore likely to reflect efficiency differences and not differences in educational content, given that a diploma is reached.

It should be observed, however, that absence of a diploma does not imply that education has not been finished. Nor is the reverse true, since a given education can give the right to diploma at different levels.

However, the ‘diploma sample’ is likely to be selective for a number of reasons, since it conditions on diploma. A substantial fraction never registers a diploma although they have accumulated enough credits, and if they do, diplomas may be registered with substantial delay. This may bias our results if parents, for some reason, are faster or slower in registering their diploma than non-parents, and if non-parents’ intention is continued active studies. It might be that one group is more prone to register several

diplomas on their way the final exam. This would mean that the rate of registering a diploma would differ.[12]

To further check whether selection problems due to the choice of registering diploma matter we also analyze the probability of registering a diploma given that studies have ended. The event of not registering a diploma will henceforth be denoted as dropping out; although the absence of a diploma need not reflect study failure. Study success is a quite vague concept, in particular in our case, when we have no measure of the education goals of the individual to relate to.

We set up the following ex-post rule for when studies are regarded as having ended, *independently of when or if any diploma was registered*: if a student has not registered for a university course for a period of 5 years, then the studies are regarded as finished.[13]

5 Results

5.1 Descriptive evidence of students with children

In this part we focus at a concept implying active students, which we define as someone finishing at least 20 university credits during a calendar year.[14] The active student status on a calendar-year basis thus corresponds to one full semester of completed courses (again we sum credits from both educational programs and separate courses that are not part of educational programs).[15] Table 1 shows estimated mean values over a range of

[12] In some fields of study more than others it might be more common to register a diploma since, e.g., it is required in certain jobs (however, unfortunately, we cannot control for occupation). Individuals may also register more than one diploma (and with little space in between) since there is no limit as to how many program students enroll for simultaneously. As pointed out above it may furthermore, in some educational paths, be common to register several diplomas on the way to a final diploma. The time point when a diploma is registered is therefore only an uncertain measure of when studies are finalized.

[13] This will limit the analysis to diplomas registered before spring 2000. Further in this analysis the group 'during' will mean those that became parents after their first registration but before studies were ended.

[14] The status of being a student and (actively) studying at university is not always clear-cut. Student status in the registers does not exclude other activities, in particular over the course of a year. For instance an individual may combine several different activities, e.g., employment, education, and unemployment, during the same period of time. A person may also be enrolled in education and (temporarily) produce little or nothing in terms of university points but still be regarded (or regard herself) as a student. This data problem severely limits the accuracy in pin-pointing whether a certain event comes before or after student status has actually changed.

[15] While the academic year spans two calendar years (starts in the autumn and lasts until summer vacation the following year), the income and background data are annual and allocated by calendar year. To make the active student status definition (arising from EP and TP data) and the income data consistent with respect to timing, we use EP and TP aggregated by calendar year in the definition of active student. In this part of the analysis the data is thus

characteristics from four different samples of students using this student definition, by parenthood and age-group. It turns out that most results are invariant to using a looser definition of student in terms of taken credits.

As noted previously the results indicate that it is mainly females that study with children. It can also be noted that students with children are older. We also find that students with children to a lesser extent are singles. However, one should be a bit cautious with the single status indicator since, as noted above, there are some problems in measuring couple status with these data.

Generally persons that already have a diploma are less likely to be committed to studies since a diploma often marks the end of studies. Still, in our sample of active students (with at least 20 credits taken per year) 14 percent already have a diploma. The estimates in Table 1 suggest that students with children below 30 are more likely to return to studies and continue producing credits after diploma than students below 30 without children. However, above the age of 30 the students with children are less likely to have an earlier diploma compared to students of that age-group without children.

The level of the highest education achieved so far (as expessed by HISUN) in the student population does not differ much depending on parenthood. Below age 30 parent-students have achieved a slightly higher education level compared to students without children. However, we find some dissimilarity between parent-students and other students with respect to their field of education. Students with children are overrepresented in pedagogic and teacher training, and health sector professions and social care. In some educational fields, e.g., in the pedagogical and teacher training, and health professions, it is common with complementary studies at university or college in combination with the normal occupation. We would hence expect these dissimilarities to be shorter courses taken on part time.

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on calendar year basis. The definition may introduce some underreporting of student status in instances when only half of the calendar year is dedicated to studies, as is normally the case at the start or the end of an educational program. Also, since the data on EP and TP start in the autumn 1993 and end in spring 2005, student status (as defined on a calendar year basis) is clearly underreported for these two years.

Table 1 Descriptive statistics (means) for the students taking at least 20 credits per year, 2nd semester 1993- 1st semester 2005, by parenthood (PAR) and age-group

	Non-parents		Parents		Total
	age<30	age>=30	age<30	age>=30	
Female	0.56	0.54	0.69	0.77	0.59
Age	23.66	35.19	26.78	37.36	26.69
Single	0.71	0.78	0.18	0.19	0.64
If earlier diploma	0.11	0.22	0.17	0.19	0.14
Level of education (HISUN):					
Primary and lower secondary <9 yrs	0.00	0.00	0.00	0.00	0.00
Primary and lower secondary 9 (10) yrs	0.00	0.00	0.01	0.01	0.00
Upper secondary	0.11	0.06	0.10	0.07	0.10
Post-secondary <2 yrs	0.56	0.40	0.52	0.39	0.52
Post-secondary 2 yrs or more	0.33	0.53	0.37	0.53	0.37
Licentiate/Doctoral programme	0.00	0.01	0.00	0.00	0.00
Unknown	0.00	0.00	0.00	0.00	0.00
Field of education (HISUN):					
General	0.07	0.02	0.05	0.03	0.06
Pedagogic and teacher training	0.08	0.12	0.15	0.23	0.10
Humanities and art	0.14	0.13	0.14	0.09	0.13
Social science, law, business, administration	0.28	0.25	0.25	0.18	0.27
Natural science, mathematics, and computer science	0.12	0.11	0.08	0.07	0.11
Engineering and manufacturing	0.19	0.15	0.10	0.09	0.17
Agronomist and veterinary	0.00	0.01	0.00	0.00	0.00
Health sector professions and social care	0.10	0.18	0.21	0.28	0.13
Services	0.01	0.02	0.02	0.02	0.01
Unkown	0.01	0.01	0.01	0.01	0.01
Other household income (thousands SEK)	547	196	405	666	525
Qualifying income, SGI (estimated) (thousands SEK)	77	173	118	170	100
If income related UI previously	0.13	0.49	0.40	0.48	0.22
If basic level UI previously	0.09	0.06	0.10	0.04	0.08
Main source of income:					
Unemployment benefits	0.01	0.06	0.03	0.04	0.02
Allowance support	0.00	0.00	0.00	0.00	0.00
Parental leave benefits	0.00	0.00	0.07	0.02	0.01
Parental allowance for taking care of sick child	0.00	0.00	0.00	0.00	0.00
Market income (including active entrepreneur income)	0.32	0.48	0.27	0.45	0.35
Passive entrepreneur income	0.00	0.00	0.00	0.00	0.00
Sickness benefits	0.00	0.01	0.01	0.01	0.00
Social assistance	0.00	0.00	0.00	0.00	0.00
Study allowance (including study loan)	0.66	0.44	0.61	0.45	0.60
Special allowance for PHD students (*utbildningsbidrag*)	0.00	0.01	0.00	0.01	0.00
Care benefits (*vårdnadsbidrag*)	0.00	0.00	0.00	0.01	0.00
Daily allowance for military service	0.00	0.00	0.00	0.00	0.00
Total income is zero	0.01	0.01	0.00	0.01	0.01

Note. Estimates are from a 3 percent random sample of individuals aged 16+.

The income of other household members seems to differ between the groups in more or less the expected direction: older students with children presumably have a supporting spouse with substantial incomes, while the household income for younger students to a large extent depends on your own parents' income. Older students above 30 without children have the lowest income of other household members.

Qualification income (SGI) is an important concept in the Swedish social insurance system. It determines the level of various benefits including parental leave benefits, and may thus be important to explain parental status among students. There are also indications that the qualification to income related benefits (via their SGI) differs among students with children and other students, especially for students below 30. Having no SGI presumably renders a negative association with the probability of being a parent. Not unexpectedly, if this is the case, this would indicate that the design of the parental leave insurance is important. As the SGI variable is constructed and serves only as a crude proxy for the true value one should be a bit cautious about the interpretation. High values on SGI should imply however that the individual has substantial labor earnings history.[16]

For the students below 30 there is also descriptive evidence that previous unemployment is associated with parenthood among students.[17] It is more common that students below 30 who have children also have had income-related unemployment benefit previously, compared to students without children. This indicates that students with children, as opposed to other students, have more labor market experience than the qualification time for income-related benefits.

Several of the income types are much closer linked to students with children than childless students for obvious reasons, as these are linked to having children: allowance support, parental leave benefits, benefits for taking care of sick child, and to some extent care allowance. Besides those, however, we find that unemployment benefits are

[16] SGI is contructed in the following way. We assume that the qualification income is never reduced in the case of subsequent lowered income. Further we "back-track" the original earnings in case of, e.g., unemployment or parental leave. Qualifying income, SGI, in a given year t, is estimated as $\max(Q_t,Q_{t-1})$, where Q_t=min(I(inc_t >=.24**BA*)**inc*$_t$,7.5**BA*), I(.) is the indicator function, *BA* is the price-basic amount, inc_t is the sum of (a) wage income, and (b) any income that relates to income compensation via the national social security systems (sickness, unemployment, parental leave, or care of sick child benefits), divided by corresponding replacement rate.

[17] The database includes measures on previous unemployment spells and information whether an unemployed person was compensated with an income-related or a basic compensation.

more important for students with children compared to those without children, while study allowance (including study loans) is less important.

5.2 Study length and study speed

First we focus on the measure *L*, which we defined above, i.e., the number of semesters an individual has spent actively in university to reach a diploma, given that the student registers a diploma.

Table 2 Average study length (L), by level of diploma (from EXSUN), diploma sample

	Parents			Non-parent		
	Mean	St.err	Obs.	Mean	St.err	Obs.
Higher ed. <2 yrs, vocational	2.71	0.04	1,147	2.77	0.03	1,403
Tertiary ed. 2 yrs, general	5.96	0.09	815	6.19	0.06	3,026
Tertiary ed. 2 yrs, vocational	3.56	0.05	2,109	4.14	0.03	6,350
Higher ed., 120 credits - not a degree	6.53	0.28	154	6.15	0.15	654
Tertiary ed. 3 yrs, general	7.64	0.03	6,567	8.14	0.01	32,901
Tertiary ed. 3 yrs, vocational	6.23	0.01	25,172	6.51	0.01	68,590
Tertiary ed. 4 yrs, general	8.92	0.05	3,400	9.32	0.01	32,549
Tertiary ed. 4 yrs, vocational	9.10	0.04	6,821	10.12	0.01	37,769
Tertiary ed. >=5 yrs, vocational	11.45	0.11	853	11.28	0.03	6,323
Total	6.92	0.01	47,038	8.04	0.01	189,565

Before presenting regression results, we show, in Table 2, the raw estimates (without controls) in study length at the time of diploma, separately for parents and non-parents.[18] Judging from these averages (and standard errors) there is in general a significant difference depending on parenthood in study length towards diploma as measured by the number of effective semesters devoted to studies. One can note, for instance, that in obtaining a diploma at a two-year vocational program, parents take on average 3.6 semesters, while other students take 4.1 semesters (the difference is statistically significant).[19] For a diploma in a four-year vocational program the difference is about one semester less for those students that are parents at diploma registration compared to non-parents (again the difference is highly statistically

[18] As a sensitivity analysis we examined some variations on this measure; the number of semesters with a production of at least 5 university credits accumulated until period *t*, and the number of semesters with a production of at least 10 university credits accumulated until period *t*. Both measures gave similar results in terms of the parent-non-parent difference.

[19] There are obviously some programs in this category that can be completed before two years.

significant). We also note that parents have a higher propensity to choose vocational programs, particularly the three-year long programs.

Clearly, these raw comparisions indicate that parents in general are faster. However there may be several confounding factors such as gender, age, in which field of education the diploma is taken, the number of credits included in the diploma, the period when the diploma is registered, time of first registration, and timing of parenthood, that might explain these patterns.

In Table 3, Panel A, ordinary least square (OLS) estimates of the parent dummy are presented without controls. This corresponds to the difference between parents and non-parents in the previous table. Again we note that parents seem to take fewer active semesters to reach a diploma. For instance for a general diploma in tertiary education of 3 years formal length we estimate that parents take on average one half of a semester less to reach such diplomas compared to non-parents.

When including a wide range of controls, see Panel B, the size of the parent dummy is reduced but it is still strongly significant for all diplomas that are 3 years or longer. [20]

[20] Right-censoring of data will cause the end-period of the data to be unrepresentative in terms of which diplomas that are being registered (more short programs) and which students in the end-period of data that manage to finalize their diploma (bias towards faster students). Since we condition on type of diploma (as measured by EXSUN and credits) we are mainly worried about the second type of bias. We ran regressions on alternative data where we condition that the starting period has to be at least five years before the data window ended (i.e., first registration on 2000:2 or earlier) to assess the importance of fast students in the end of the data period. These regressions, presented in appendix, gave however very similar results to those already presented. We thus conclude that right-censoring of data seems unimportant.

Table 3 Study length towards diploma, regression estimates, by education level in diploma (full sample)

A:No controls	(1) Higher education <2 yrs, vocational	(2) Tertiary Education 2 yrs, General	(3) Tertiary Education 2 yrs, Vocational	(4) Higher education, 120 credits - not a degree	(5) Tertiary education 3 yrs, General	(6) Tertiary education 3 yrs, vocational	(7) Tertiary Education 4 yrs, General	(8) Tertiary Education 4 yrs, vocational	(9) Tertiary education >=5 yrs, vocational
Parent	-0.06	-0.23*	-0.57***	0.37	-0.50***	-0.28***	-0.40***	-1.02***	0.17
Obs.	2,550	3,841	8,459	808	39,468	93,762	35,949	44,590	7,176
B:Many controls	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Parent	0.03	-0.15	-0.09	0.32	-0.23***	-0.12***	-0.19***	-0.27***	-0.14**
Obs.	2,548	3,835	8,455	808	39,466	93,736	35,948	44,586	7,176
C:Gender interaction	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Parent	0.04	-0.22	-0.10	-0.25	-0.27***	-0.10*	-0.14*	-0.07	-0.00
Female *Parent	-0.02	0.14	0.02	0.96*	0.08	-0.03	-0.08	-0.34***	-0.24
Obs.	2,548	3,835	8,455	808	39,466	93,736	35,948	44,586	7,176
D:Birth timing	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
Before	0.01	0.19	-0.02	0.20	0.02	-0.01	0.22***	0.12	-0.01
During	0.03	-0.70**	-0.36**	0.50	-0.52***	-0.34***	-0.36***	-0.40***	-0.13*
Obs.	2,548	3,835	8,455	808	39,467	93,736	35,949	44,586	7,176

Note. Robust standard errors; coefficient significant at the ***) 0.1 percent, **) 1 percent, and *) 5 percent level. Panel A) no controls. Panel B) Controls include dummies for field of education (from EXSUN), number of credits included in the diploma, age, period, and time of first registration. Panel C) Control for female, otherwise same controls as in Panel B. Panel D) same controls as in Panel C. *Before*: has entered parenthood before first registration, *During*: has entered parenthood after first registration but before the registration of the diploma.

When extending the model with control for gender and interacting the parent dummy with female, see Panel C, we still find that parents are faster in reaching diploma but that this depend on gender for some educational programs. Female students with children use fewer active semesters in four years vocational education at the tertiary level, while men with children do not, compared to other students. In the category 'higher education, 120 credits' female students with children take about 1 semester longer time than other students, but this is only significant at the 5 percent level. This diploma category is not a formal university program but consists of a rather heterogenous group of diplomas where the student puts together 120 credits in separate university courses (fristående kurser) of which 60 credits have to be in one subject into a diploma. Compared to program students, diploma registration is presumably rarer among those that register for courses without (formally) being part of a program. One might interpret this group as having more uncertainty about study plans than program students. It might also be the case that a regular program did not fit their study intentions and they have therefore decided to assemble their own diploma.

However, as shown in Panel D, the parent/non-parent difference seems to depend on parenthood timing. These estimates investigate whether it matters if the student was a parent already at the time of first enrolment in higher studies as compared to if the kid(s) came later. While those that had entered parenthood already before they enrolled for the first time ('before') have in general the same or sometimes somewhat longer lengths compared to non-parents, we note that those that entered parenthood after their first registration but before obtaining the diploma ('during') have significantly shorter study lengths compared to non-parents. One can note this is a quite small group; in our diploma data about 5.3 percent of all diplomas are registered by the group 'during' while 16.2 percent of all diplomas come from the group 'before'. As mentioned above very few have a new child while in active studies.

As can be expected, these groups are, moreover, very different with respect to background characteristics, e.g., in our data the group 'before' is on average 38 years of age when registering diploma, while the group 'during' is on average 30 years old, and non-parents have a mean age of 26 at the time of diploma. One can also note that the group 'before' stands out in terms of education level in the diploma they take (more

concentrated to three-year vocational programs) compared to 'during' and non-parents. These are much more similar in terms of the educational content in their diploma.

The estimates in Panel D control for such differences, so one interpretation is that becoming parent speeds up ongoing studies but not studies that are initiated after entering into parenthood, all else equal. It may be that the economic uncertainty of not having finished studies motivates a new parent in the middle of higher studies to finish the diploma. Someone who enters studies with children already 'in the luggage' presumably does not have the same incentive structure. Our estimates indicate that these parents are about as fast as non-parent students, given the education type in the diploma etc. One can furthermore note that the point estimates for some education types for 'during' are quite large.

The regression results for accumulation of credits during a calendar year, i.e., model (2), are given in Table 4. We provide a set of estimates where we to a varying degree control for background characteristics. Let us first focus on the OLS estimates. These suggest that parents (as a group) take about 6 percent more credits per semester compared to non-parents, see col. 1. Females produce about 5 percent more credits per semester compared to males, but according to the OLS estimates there is no significant interaction estimate of parent and female. Single status seems to be unimportant as a parent (usually mothers) without a partner produce equally the number of credits as a parent living with a partner. However, as mentioned we have some problems in measuring couple status with these data.

However it is likely that these results are driven by sorting on unobservables, such as 'taste for studying', ability, study intention, and children preferences during studies. The specifications with individual fixed effects give quite different results. These results suggest that female students who get children while enrolled in education produce about 14 percent *less* credits in a given period compared to other students, depending on specification and other controls. (Recall that this specification estimates the parent/non-parent difference for those that change status.) We find, in general, no significant effect for male students if they study with children. Only in the specification without any controls, see col. 8, there is an indication that male students with children produce fewer

credits than male students without children. Comparing with col. 6 this obviously depends on single status.

Table 4 Study speed estimates of studying with children, regressing production of credits per academic year (TP) in logarithms, OLS and individual fixed effects (FE)

Variable	OLS	FE	OLS	FE	OLS	FE	OLS	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parent	0.059**	-0.036	0.050*	0.002	-0.042*	-0.051	-0.127***	-0.189***
Parent*female	-0.018	-0.137**	-0.024	-0.154**	-0.021	-0.156**	-0.019	-0.145**
Single*parent	-0.009	0.026	-0.034	0.046	-0.076***	-0.041		
Female	0.057***		0.086***		0.079***		0.086***	
Dummy for single	X	X	X	X	X	X		
Dummies for year and age	X	X	X	X				
Dummies for level and field of education (HISUN)	X	X						
Obs.	75,596	75,596	75,611	75,611	75,611	75,611	75,611	75,611
# individuals		17,795		17,795		17,795		17,795
R2	0.220	0.238	0.070	0.087	0.012	0.012	0.006	0.003

Note. A 3 percent random longitudinal sample. R2 is R2 within in case of FE. Robust standard errors; coefficient significant at the ***) 0.1 percent, **) 1 percent, and *) 5 percent level. Sample restriction is study start (first registration) on 1993 second semester or later, age less than 45, and non-immigrant.

To sum, it seems that parents take shorter time to reach a given diploma, at least if they get kids after their first university enrolment. The estimates suggest that someone who studies with children need less time to reach the same diploma conditional on field of education, education level, and the number of credits included in the diploma, compared to students without children. Note that these estimates exclude (full) semesters that are dedicated to other activities than studies (e.g., parental leave). Further, in a given study period they complete fewer courses, at least mothers. One interpretation is that those extra courses do not contribute to their diploma.

5.3 Dropout rates

Below we will focus on the probability of registration of a diploma (the inverse of dropping out), although, as previously mentioned, this need not reflect study success. In the following graphs, Figure 3 and Figure 4, we show the unadjusted probability of registering a diploma (without controls) and focus on the two years before and after studies ended (defined in section 4). Note that this definition is independent of diploma registration. However, importantly, we restrict the sample for Figure 3 to individuals

who have accumulated at least 40 university credits (about one year of full-time studies). On the x-axis is the number of semesters since studies were finished; period 0 is thus last period of studies as we define study ending.

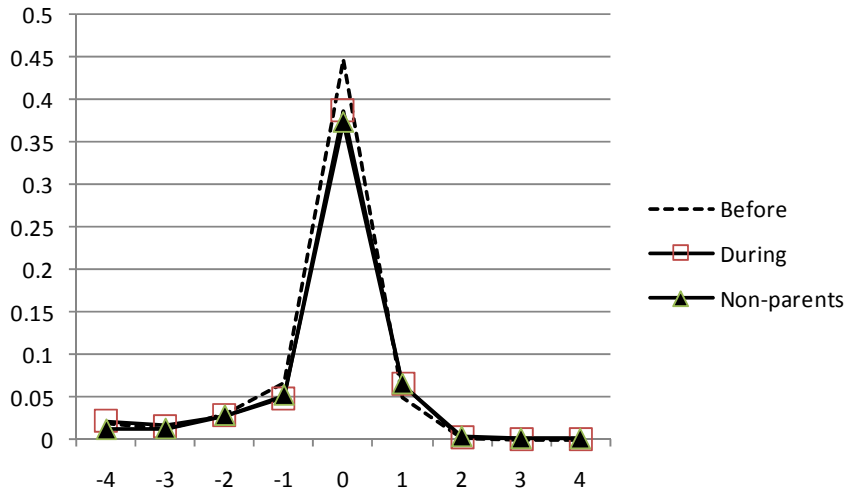

Figure 3 Probability of registering a diploma by semesters since studies were ended and group, given accumulated at least 40 credits

First, one can note that the vast majority of diplomas are registered in the semester that studies ended (period 0 in figure). According to these raw data far from all students register diplomas. If the university studies resulted in at least accumulating 40 credits or more (Figure 3), then there is a likelihood of about 40 percent that a diploma is registered in period 0, while there is a likelihood of about 5 percent in either period -1 or period +1. Second, there is, interestingly, in this case somewhat higher diploma likelihood for the group 'before' compared to the two other groups.[21] However if we remove the restriction on having accumulated credits, see Figure 4, the probability of diploma drops for all groups – however it drops more for those that have entered parenthood before first registration ('before') than for the other two groups. In this case the diploma likelihood is higher for those that became parents after first enrolment but before ending studies ('during').

[21] 'Non-parent' consists of those that have not entered parenthood in the period when the studies were finalized.

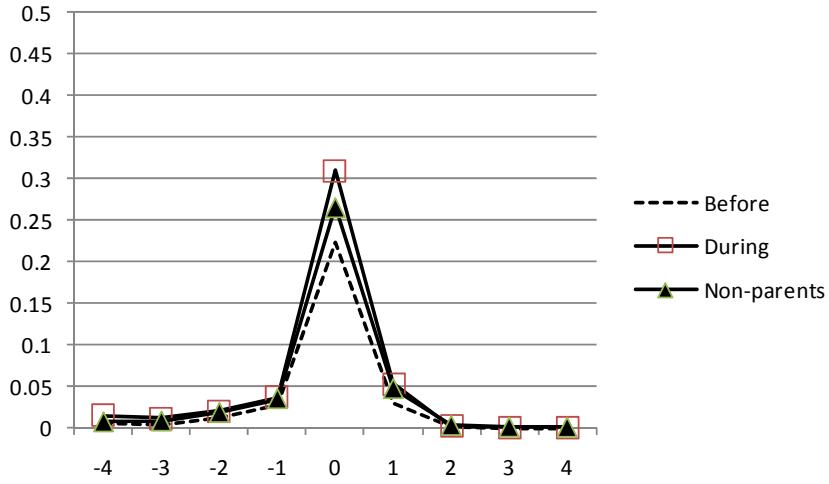

Figure 4 Probability of registering a diploma by semesters since studies were ended and group, unconditional on the number of accumulated credits

Table 5 shows the estimated probabilities of registering a diploma, taken from a set of linear probability models where we to a varying extent adjust for background characteristics.[22] First, the general impression is that parents are somewhat less likely to drop out (more likely to register diploma) compared to non-parents. As previous figures showed, however, the accumulated number of credits is important for the differences between groups. When the accumulated credits are accounted for (col. 2) the group 'before' is more likely to register diploma compared to 'during', which, in turn, is more probable to register diploma compared to non-parents. When removing this control (see col. 5), we find that those that where parents already at first registration ('before') are less likely to finish compared to non-parents. The students that became parents later in the study period are always more likely to finalize studies than non-parents.

Second, there are important gender differences with respect to parenthood. In most models we detect a higher likelihood for diploma for females than males. However this is in most specifications wiped out by the lower likelihood we find for female students that has children. One interpretation is that interruptions due to childbearing fall mainly on female students and not on male students. According to col. (1), where we control for the full sets of controls, fathers seem in general more probable to register a diploma

[22] The sample is period 0, i.e., the semester when studies ended. Since diplomas sometimes lead and lag study end, we count diplomas registered in periods -1, 0, and +1 as a positive outcome in the dependent variable.

than mothers, at least in the group 'before'. In the group 'during' mothers and father are equally likely to finalize studies and register a diploma. However, interestingly, in both 'before' and 'during', fathers' and mothers' probabilities of finalizing studies (by obtaining diploma) are higher than non-parents.[23]

Table 5 Probability of diploma conditional on study end

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Before	0.052***	0.088***	0.088***	0.01	-0.052***	-0.067***
During	0.036***	0.044***	0.045***	0.100***	0.098***	0.054***
Female*Before	-0.032***	-0.042***	-0.076***	-0.056***	-0.061***	
Female*During	-0.020	-0.043***	-0.101***	-0.116***	-0.099***	
Female	0.003	0.008***	0.109***	0.126***	0.119***	
Obs.	136,886	136,886	136,886	136,886	136,886	139,696
Controls:						
Age	X		X	X		
Period	X		X			
Start period	X		X			
Accum. Credits	X	X				
Accum. Credits*Female	X	X				

Note. Full sample. Outcome is 1 if a diploma is registered in the previous, the current, or the next semester, and 0 otherwise. Sample conditional on no study registration in next five years. *Before*: has entered parenthood before first registration, *During*: has entered parenthood after first registration but before the studies ended. *Age* is included as 5-year dummies. *Period* and *Start period* are period dummies on semester level of current period and period of first registration, respectively. *Accumulared credits* is included as five dummies, as I(accum.credits>=X), where X=40, 80, 120, and 160. Robust standard errors; coefficient significant at the ***) 0.1 percent, **) 1 percent, and *) 5 percent level. Linear probability model.

In sum, it thus seems important to have accomplished the first year of courses at university before parenthood for the chance of finally reaching diploma. Once this threshold is passed we actually observe a positive effect for students with children compared to others in the likelihood to register a diploma. One interpretation is that there are some parents registering as students who either do not have the necessary aptitude or lack real motivation to study.

[23] One may attribute some of these differences between 'before' and 'during' to higher order births which would be more frequent in the 'before' group. But, given that we define study ending rather restrictive (no enrolment for a period of five years), it should be case that what we observe are actual dropouts and not shorter interruptions due to parental leave.

6 Concluding discussion

In Sweden today the education period overlaps with the prime fertility period. Having children leads in most cases to interruption of other activities and provides restrictions on future activities. Starting from the observation that a rapidly increasing share of Swedish female students, now around one fourth, have children during education we have tried to assess the difference in outcomes for those that have children relative to students without children. This observation suggests that study performance and dropout rates from higher education, may be different for parent students compared to others, issues which we focus at in this study.

When it comes to study performance during active studies we see a somewhat surprising result. One would perhaps have expected that children imply prolonged education also when active. However our results show on the contrary that students with children actually obtain a diploma a little faster (counting active study time) than students without. We also find that students with children take fewer credits in a given semester. It could be that students with more “own” leisure time (i.e. with no children) choose to study extra curricular subjects that are outside the scope of their diploma. But, obviously, such course credits do not contribute when it comes to completing a diploma. If study performance is measured as the time it takes to reach a diploma, then being a parent during education does not have a general negative effect on study performance compared to non-parents. For those who become parents during higher education it rather seems to make study performance more efficient. One explanation may however be that individuals self-select into educational programs that fit better their life situation.

However, using the event of registering a diploma as an indication of study completion the raw evidence suggests that students with children before their first registration drop out to a greater extent than other students. This seems to be driven by failures in the initial semesters rather than dropping out of university at later stages. This lends itself to the following conjecture, namely that we may be observing two types of students with children; one group is serious students aiming to complete an education and another group that enters higher education without much ambition or ability, perhaps as an alternative to unemployment or for some other reason without

caring to remain in education. Note that individuals that get children during higher education have a higher probability to register a diploma than non-parents.

To summarize what we see from these descriptive evidence is that being parent during higher education is associated with a somewhat higher drop-out rate the first semesters, but conditional on completing education, and having passed the initial courses, parents seem to be more efficient. Selection effects in the initial sorting of students with children may drive the result of a possible speed benefit towards diploma but also the indication that fewer register diploma.

Future research need to look into the issue of why there has been such an increase in the share of female students with children and whether it has any connection to the general female biased expansion of tertiary education in Sweden since the early 1990s. In general the institutional setting of public support to parents could be one important reason why there is such a high share of students with children in Sweden. Given that individuals have preferences for having children competing with their preferences for uninterrupted education the parental leave system gives high economic incentives to qualify for income-related benefits before entering education or during education and thus delaying finishing education. Future research needs also to explore the labor market outcomes and occupational choices after studies have ended. It might very well be that occupational choice depends on the expectation of parental leave, i.e., individuals may choose an occupation (and thus wage path) that is more “parental-leave friendly”.

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Appendix

Sample conditional on first registration <=2000:2.

	Higher education <2 yrs, vocational	Tertiary education 2 yrs, general	Tertiary education 2 yrs, vocational	Higher education, 120 credits - not a degree	Tertiary education 3 yrs, General	Tertiary education 3 yrs, vocational	Tertiary Education 4 yrs, general	Tertiary Education 4 yrs, vocational	Tertiary education >=5 yrs, vocational
Parent	0.03	-0.18	-0.11*	0.40*	-0.24***	-0.14***	-0.20***	-0.27***	-0.14*
St.err	*0.03*	*0.11*	*0.05*	*0.19*	*0.03*	*0.02*	*0.05*	*0.05*	*0.04*
Obs.	2,267	3,320	7,524	769	36,361	81,275	34,368	44,065	7,145
Share excluded due to sample restriction	11.0%	13.4%	11.0%	4.8%	7.9%	13.3%	4.4%	1.2%	0.4%

Note: Same controls as Panel B, Table 3. Robust standard errors; coefficient significant at the ***) 0.1 percent, **) 1 percent, and *) 5 percent level. Sample restricted to first registration being 2000:2 or earlier.

Unconditional (estimates in Table 3, Panel B repeated).

	Higher education <2 yrs, Vocational	Tertiary education 2 yrs, general	Tertiary education 2 yrs, vocational	Higher education, 120 credits - not a degree	Tertiary education 3 yrs, General	Tertiary education 3 yrs, vocational	Tertiary Education 4 yrs, general	Tertiary Education 4 yrs, vocational	Tertiary education >=5 yrs, vocational
Parent	0.03	-0.15	-0.09	0.32	-0.23***	-0.12***	-0.19***	-0.27***	-0.14**
St.err	*0.03*	*0.09*	*0.05*	*0.18*	*0.02*	*0.02*	*0.04*	*0.05*	*0.04*
Obs.	2,548	3,835	8,455	808	39,466	93,736	35,948	44,586	7,176

Note: Same controls as Panel B, Table 3. Robust standard errors; coefficient significant at the ***) 0.1 percent, **) 1 percent, and *) 5 percent level.

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