Trends in differentiation of student achievement and learning conditions in the Czech compulsory education. Findings from TIMSS.

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Abstract

Many studies show that one of the most important factors related to delivering equity in education is the design of education system, its differentiation, and the age at the time of the first selection. In a system in which early self-selection is constrained by the choice structure there is less educational inequality than in a system where consequential decisions about the educational career are taken at a very young age. On that account, grouping according to student performance has been one of the most controversial issues in education for more than 80 years. Its effects, particularly on student achievement, have been extensively studied over that time period, mainly in United States and Great Britain. In the Czech Republic tracking is very extensive and starts from very young age. In all international comparative studies of student achievement the Czech Republic exhibits a relatively strong relationship between student achievement and family background. National analyses show high differences between achievement and social composition of students in individual tracks. In last decade the differentiation of Czech education system at the primary and lower secondary level has been escalating. The data from the IEA TIMSS study show that the growing differentiation of educational pathways leads to the growing differentiation of student achievement and learning experience of students in various schools and tracks. The analysis, using the hierarchical linear modeling approach, is carried out on data from TIMSS 1995, TIMSS 1999 and TIMSS 2007.

Keywords: *educational inequalities, student achievement, socio-economic background, tracking, learning conditions*

Impact of the differentiation of educational careers on learning inequalities

Besides academic abilities and direct family influence (e.g. genetic influences, difference in study conditions, nutrition, and health condition), studies on the relationship between educational achievement and family background most often focus on the factors connected to educational careers. These are significantly influenced by the structure of education system, the degree of its differentiation (that is, the amount in which differing educational opportunities exist), and the age, at which the pupils are first sorted into different tracks.

The topic of educational trajectory differentiation at the level of lower and upper secondary education was studied by researchers from US and UK. They primarily studied the impact of student separation into selective and non-selective classes on their educational results and socialization; they mapped the differences in teaching, and separation mechanisms.

In the American survey High school and beyond (Gamoran, Mare, 1989) and National Education Longitudinal Study, thousands of students within the differentiated system were observed long-term with the aim to study *the impact of tracking on the students' educational results.* The survey confirmed that students in the highest track learn more that students in other tracks (controlling for other variables, such as socioeconomic status and initial knowledge) and that the placement in the highest track increases the likelihood of secondary education completion. These studies have also shown that track selection mechanisms slightly prefer minority students and girls (these are represented in higher tracks to a higher degree than their results would suggest). However, higher representation in lower tracks is maintained in relation to social classes. The representation of children from poor families in lower tracks is higher than their results would suggest. Research has shown that tracking increases inequalities in results and in likelihood of secondary school completion among students from families with higher and lower socioeconomic status.

Similar findings were also made in Britain. Kerckhoff (1986) monitored more than 9000 children in differentiated and non-differentiated conditions (i.e. in schools separating students based on results and schools where all students studied together). He did not find any differences in the average results in both groups. However in the differentiated environment, the highest group achieved better than in the case of heterogeneous setting, students in the so-called remedial classrooms, however, achieved much worse that students with the same background and initial knowledge who were educated in higher tracks or in a heterogeneous study group.

Gamoran, Nystrand (1990) studied *the impact of teaching methods and attitudes on achievement differences between students in higher and lower tracks*, they focused on differences in learning experiences of students in individual tracks. They carried out the research in 58 eighth grade classrooms with approximately equal representation of classes where students were studying together and classes belonging to the highest, middle and lowest performance level. The research was carried out during one school year: in autumn, the students took a reading literacy test and an essay test and completed a questionnaire about their family background and study experiences. The questionnaire was also completed by teachers. At the end of the school year, students took a test serving as a final test in English for the entire year. Researchers also carried out observations in class, focusing on the types of questions asked, the extent, to which teachers work with students' answers. They also observed students' participation in class work: student attention and completion of the tasks required. Based on observation and questionnaires, two indicators were construed: the first characterized the level of in-class discussion, the other student participation. Data analysis using multilevel modelling showed there were no overall differences in average results between heterogeneous and homogeneous classes, big differences were found in the results of advanced, common and lowest tracks. Analysis showed that a third of the differences are caused by different study experiences in different tracks. It confirmed that students in the lowest tracks suffer from the separation, while the students in the highest tracks benefit from it. Oakes supported these findings (2005), showing different quality of teaching in different tracks: higher tracks have more academic subjects, more enthusiastic and knowledgeable teachers, better learning climate.

Ireson et al (2002) studied *the mechanisms of student separation* at British secondary schools (division into groups within class, division into tracks within a year for some or for all study subjects). They found that students are in many cases wrongly placed in groups or tracks (students are not in the groups corresponding to their performance) and that division into groups is influenced by factors such as ethnic origin, race, or family background. The lowest groups feature higher representation of students from poor families and minorities. Another problem is that students often do not change a group even when their performance changes. It has been found that if a child is moved to a higher group, its results improve, while, on the contrary, the results of a child with the same performance deteriorate in the lowest group. The above studies in Britain also showed that at schools dividing children according to performance, their socioeconomic status is the main predictor of results, even with controlling for initial knowledge. This is not the case in heterogeneous groups. Wrong placement then directly impacts student results.

In the US, studies of the effects of student division impacted directly the organisation of teaching. Half way through the 20th century, it was still common for American high school students (11 to 18 years) to be divided into three tracks based on IQ tests: 1. the highest, preparing students for university studies, 2. average (for averagely endowed students), 3. the lowest (with prevalently vocational training). Whereas the highest track graduates left for universities, students of the middle track continued to colleges or left for the labour market and the lowest track students often left the school early. In the second half of the 20th century, many American schools eliminated the division of students into permanent tracks in response to the studies published and began to offer main subjects (math, English, science) in more levels of difficulty. The advantage of this organization was the more flexible division of students into individual subjects (the possibility of different placement for different subjects, easier transfer to a more advanced course for an improving student).

Lucas (1999) studied the extent to which the new manner of differentiation really removes the disadvantages of permanent tracks. His main research question was, to what extent the different

student socialisation in individual tracks was eliminated. Therefore, he studied whether students really are placed differently for different subjects, the extent to which their placement is based on their results and whether students move between courses of different difficulty. He found that the placement of students still depends on socioeconomic status: students with better family background are represented in courses with higher demands to a higher degree than would correspond to their results and vice versa. The positive finding, however, was the fact that in most cases, students are not placed in courses of the same level for math and English, and there is frequent movement between different levels, and so the socialisation of students in individual courses is not different (e.g. the students attending different levels do not have a different relationship to school). Then, certain students are systematically educated as "unsuccessful" and others as "successful" to a much lower degree than in the past.

Despite lots of empirical evidence and studies, American experts still differ in their answers to the question whether it is or is not legitimate to separate children into selective and non-selective tracks. Slavin (1990) is one of the opponents of differentiation, arguing that the division into groups itself has no effect; differences arise when the groups have different curricula, better teachers and more finances. To provide certain students in compulsory education with better teaching conditions than others is antidemocratic within the public education system; therefore, this practice needs to be abolished. On the contrary, Kulik (1992) supports the preservation of the different tracks. The fact that gifted students benefit from selective tracks seems to him a sufficiently convincing argument for their existence. Loveless (1998) believes that given the unconvincing evidence for or against the differentiation, it needs to be left up to the schools whether they want to differentiate or not. In any case, increased effort needs to be put into the improvement of the student division mechanisms and into the care for students in tracks or courses of the lowest difficulty. Also better awareness of the advantages of heterogeneous classes, their possibilities and ways for improvement is highly needed.

Lucas (1999) argues that the new system keeps disadvantaging students with low socioeconomic status and asks whether structural change itself can significantly improve situation in a system where student division is embedded. Lucas warns against hasty removal of selective tracks. He calls for careful study of the effects of such a step so that the potential activities in this direction do not bring more harm than good. He further points out that the removal of labels can easily lead just to making the situation less transparent, where children are going to be divided covertly and parents will not have enough information necessary for making decisions. Lucas, however, asks the American school to look for ways towards the highest possible individualisation of teaching and curriculum differentiation based on the specific needs of individual students so that each can develop to the maximum.

Differentiation of educational careers in the Czech Republic

The Czech Republic has a long tradition of highly differentiated educational system. Tracking occurs very early. In primary school it has mainly form of within school tracking (classrooms with extended curricula of foreign languages or other subjects, classrooms for slightly mentally retarded students). At the age of 11 children can apply for long academic track (multi-year gymnasium), leave basic school and start lower secondary education at upper secondary schools. After finishing compulsory education students can choose between three tracks with very different curricula taught mostly in separate schools (short academic track, technical track and vocational track). The diagram of the Czech education system is included in Appendix A.

In the past decade, the differentiation of educational pathways has been further increasing. It occurs at all levels of the system and takes on many diverse forms. The Educational Act of 2004 launched a curricular reform introducing a bi-level curriculum[1]. Many headmasters interpret the reform as an invitation to determine their educational profiles through optional subjects and to create selective

[1] At the national level the curricular framework is defined while schools are expected to design their own educational programmes following the national framework but also taking into account specific needs of the local community.

classrooms of all sorts to offer parents special educational opportunities for their children[2]. This tendency is enhanced by a decline in the student population that leads to stronger competition between schools for students. These selective schools and classrooms are not visible in regular statistics[3]; differentiation of the system is not monitored. The consequences of tracking in the Czech educational system are not systematically studied.

The international comparative studies, however, repeatedly show that the Czech Republic exhibits a stronger dependence of achievement and attainment on family background than most developed countries (OECD 2001, OECD 2004, and OECD 2007). Many experts argue that this strong relationship between student attainment and family background is harmful for the society and that one of its main sources is the differentiation of educational pathways. The society perceives the differentiation of educational pathways at various levels of education system as differently controversial. While differentiation at the primary school level has so far received minimum attention as it gains strength only in last several years, and differentiation at upper secondary level is perceived as appropriate and desirable, differentiation at lower secondary level is more often perceived as controversial. In this context, multi-year gymnasia seem to be the most controversial and debated part of the system. This long academic track for students from age 11 to 19 was introduced into the system after 1989, following up on pre-war tradition, and recently is attended by approximately 10 % of the respective age cohort[4].

The intention of the ministry of education to abolish tracking at lower secondary level declared in the *National programme of education: White book* (2001) met strong opposition from the Czech society. High tracks are seen as an important tool in the cultivation of elites and the topic of equal opportunities is dismissed, often with references to socialist ideas. In the surveys carried on in 2009 among educators and parents of school children, only 17 % of teachers expressed an opinion that selective schools at the lower secondary level should not exist or their amount should be restricted (Factum Invenio 2009). 76 % of parents supported the current practice of early selection (STEM/MARK 2009). The same survey confirmed that school choice is advantageous for children from families with high socio-economical status. Among families with limited financial resources, only 15 % of parents choose a school for their children while 85 % send their children to the neighboring school. Among affluent parents 60 % choose school for their children. Similar pattern gives the distribution according to the level of education: 66 % of parents with higher education and only 31 % of parents with compulsory education choose school for their child (STEM/MARK 2009).

[2] Besides classes with extended teaching of a certain subject, classes for the gifted, with bi-lingual education and with IT supported education have been emerging. Entrance exams are more and more often introduced in „prestigious" schools with high surplus of demand over supply.

[3] Statistical yearbook shows that the proportion of students educated ouside the mainstream classrooms increased between 1995/96 to 2006/2007 from 22.9 % to 24.5 % while the proportion of students in individual tracks remains more or less stable. Proportion of students in individual tracks is included in Table A1 in Appendix A.

[4] Gymnasia have always played the role of exclusive institutions in the educational system, with exceptionally high demands on their students. The first gymnasium was founded in 1556. In 1848 gymnasia became eight-year institutions divided into a lower and higher level. The United School Act of April 1948 shortened the length of gymnasial studies from the original eight to four years. At that time, 11% population studied at multi-year gymnasia. Although during the socialist period, gymnasium curricula significantly diverged from the curricula of interwar gymnasia, gymnasial studies still represented an educational track for gifted students aspiring to university studies. In the school year 1989, gymnasia were attended by 18 % of all secondary school students, 19.3 % of the given age cohort was admitted to universities. Post-November development was characterized by significant increase of the numbers of gymnasia as well as the emergence of many multi-year gymnasia with varying study periods (five, six, seven, eight years). In the course of the 90's, the gymnasial study period settled at 4, 6 and 8 years. The overall proportion of gymnasia students in the population remained relatively stable. The share of gymnasial students in the population entering secondary education in 2007/2008 represented 18 %, half of which were students admitted to multi-year gymnasia and half were students entering four-year programs.

TIMSS data also show that the composition of students in individual tracks differs significantly with respect to their background. In 2007 47 % of students in multi-year gymnasia had parents with tertiary education while among students in basic schools it was only 14 % parents.

Research questions

In the Czech Republic, no research was carried out to survey the mechanisms and consequences of tracking at the lower secondary level. Czech Republic does not carry out any national assessment that can be used for monitoring trends in the system. No longitudinal survey was organized to follow this age group[5]. The only available data that allow studying the development of inequalities in the system in the post-communist period come from international achievement surveys.

Analysis of data from OECD PISA showed that since 2000 to 2006 there are growing differencies in reading literacy scores of fifteen year olds between individual students, schools and tracks and that schools and tracks differ increasingly also in school climate (Strakova 2010). PISA, however, contains only very limited information on schools and classrooms[6]; it thus does not allow examining the impact of teacher and instruction variables on student achievement and its development. Moreover, PISA in the Czech Republic combines information from last grade of compulsory and first grade of upper secondary level (students that correspond to sample definition are equally distributed into these 2 grades). This makes inferences related to school and teacher variables even more difficult. At the same time it forbids to disentangle the developments at lower secondary (ISCED 2) and upper secondary (ISCED 3) levels. This aggregated information has only limited value. From the viewpoint of education policy it is crucial to learn about the development within compulsory education. IEA TIMS Study allows studying lower secondary education. Another advantage of TIMSS data is that it allows for comparisons in longer time spam than PISA.

The paper seeks answers to the following questions: How do the findings from TIMSS data correspond to the findings from PISA data? Has the growing differentiation of the Czech system of compulsory education led to an increase in differences in results of students in individual tracks and individual schools? Is the growing differentiation of the system accompanied by the growing impact of school factors on student achievement? The hypothesis is that there are increasing differences in achievement of students in individual schools and tracks and that student achievement is increasingly influenced by differentiating school factors.

Data and methods

Data from TIMSS 1995, 1999 and 2007 surveys from grade 8 were used to answer the question of the trends in differentiation of the educational achievement and learning conditions. Analyses used the hierarchical linear modeling approach[7]. Student achievement was characterized by mathematics performance[8]. Student background was characterized by *ses* variable (= factor score of mother highest education, father highest education, number of books at home and possession of a computer). National

[5] The Czech Republic carried out a longitudinal survey PISA-L that followed students surveyed in PISA 2003 during their upper secondary studies and their transition to tertiary education or to the labor market. In 2004 the Czech Republic started longitudinal survey Tertiary studies that followed students during their tertiary education and transition to labour market. No longitudinal survey focused on students in compulsory education.

[6] PISA 2006 collected detailed information on teaching and learning science and on attitudes towards environmental issues but omitted most variables characterizing schools and classrooms in general.

[7] The multi-level modelling method was used because of the methodology of the sample selection. First, schools from the database of all schools with grade 8 were randomly selected, followed by another random selection of one or two 8 grade classes from these schools. It is not, therefore, entirely random sample. Multi-level modelling allows for separation of school-level characteristics (common to all students in the given school/class) and student-level characteristics, specific for each student.

[8] Plausible values were standardized to the mean of 0 and standard deviation 1. Multi-level modeling was carried on in HLM software that allows for correct use of plausible values.

variable *m-y gymnasium* was used to distinguish between two main lower secondary tracks: basic school and multi-year gymnasium. Learning conditions were characterized by student perception of safety (variable *s_safety* - occurrence of theft and bullying)[9]; teacher perception of limitations of mathematics teaching caused by diverse characteristics of student academic abilities (variable *t_diversity*) and lack of student interest (variable *t_lointerest*)[10]; and variable *p_shrt* characterizing shortages of instructional materials, instructional space and computers from the perception of school principal[11]. Mathematics teaching was characterized by the highest education of mathematics teacher (variable *t_hied*) and the frequency of working on problems for which there is no immediately obvious method of solution (variable *t_problems*)[12]. Variables characterizing learning conditions were standardized (see Appendix B).

Results

Is there an increase in differences in achievement of students in individual tracks and individual schools at the lower secondary level?

Table 1 shows the proportion of variance in mathematics achievement of grade 8 students that can be attributed to the differences between individual schools[13]. The table shows that since 1995 the between school variance has been gradually increasing. The differences in achievement of students in individual schools are growing.

Table 1 Between school variance, mathematics achievement

	1995	1999	2007
between school variance (%)	20.8	27.8	32.4

Source: TIMSS 1995, 1999, 2007

Table 2 shows the parameters of multi-level models in 1995, 1999 and 2007 that explain mathematics achievement of grade 8 students by socio-economic status and attended track. The models show that the contribution of attendance of multi-year gymnasium in comparison with basic school has been continually increasing. The proportion of variance explained at the school level by attended track increased significantly between 1995 and 2007.

Table 2 Impact of attended track and home background on mathematics achievement

	1995			1999			2007		
	coeff	s.e.	p-value	coeff	s.e.	p-value	coeff	s.e.	p-value
intercept	-1.208	0.168	0	-1.252	0.124	0	-1.688	0.116	0

[9] The mean score of the agreement (yes – no) on the following statements: In school, did any of these things happen during the last month? Something of mine was stolen, I was hit or hurt by other student(s), I was made to do things I didn't want to do by other students, I was made fun of or called names, I was left out of activities by other students.

[10] The mean score of the agreement on the following statemets: In your view, to what extent do the following limit how you teach the TIMSS class? (1-not at all, 4-a lot); *t_diversity:* students with different academic abilities, students who come from a wide range of backgrounds, students with special needs; *t_lointerest:* uninterested students, disruptive students.

[11] scale 1-not at all, 4 – a lot

[12] scale 1- never, 2-some of the lessons, 3-half of the lessons, 4-every all almost every lesson. This variable serves as a proxy for demandingness of mathematics education.

[13] null model

m-y gymnasium	1.114	0.138	0	1.223	0.083	0	1.506	0.101	0
ses	0.167	0.03	0	0.163	0.028	0	0.185	0.019	0
explained variance (%)			37			41			53

Source: TIMSS 1995, 1999, 2007

Comparisons of model parameters given in Tables 1 and 2 show that since 1995 there has been a significant increase in the differences in achievement of students in different schools and tracks at the lower secondary level. This confirms the first part of the above stated hypothesis.

Is there an increase in the impact of school factors on student achievement?

We showed that in last decades the differences in mathematics achievement between students of individual schools and tracks have been growing. It is important to learn whether the differentiation of student achievement is accompanied also by the differentiation of learning conditions. The hypothesis is that due to the differentiation of the system, schools have been to an increasing extent differentiating in the quality of the teachers, expectations and requirements on students, equipment, and school climate. Students in some schools are more than before disadvantaged in their learning experience and opportunities and this has a negative impact on their achievement.

Table 3 shows parameters of multi-level models for 1995 and 2007 that estimate the impact of student and school variables on student mathematics achievement. The first model explains student achievement by socio-economic status (*ses*) at the level of both student and school (*ses_school*), characterizing thus the family background of students attending the given school. At the level of school, also track is included in the model (multiyear gymnasium in comparison with basic school). At the school level the model includes variables characterizing school climate (*s_safety*), learning environment (variables *t_diversity*, *t_lointerest*), teacher qualification (*t_hied*), demandingness of mathematics teaching (*t_problems*) and insufficiencies in school equipment (*p_shrt).* P-values show that demandningness of mathematics teaching, teacher education and shortages in school equipment (as approached by TIMSS variables) do not have a statistically significant impact on student achievement either in 1995 or in 2007.

In the second model only variables that exhibit statistically significant impact on student achievement at least in one period are included. Comparison of model parameters for 1995 and 2007 shows that contribution of all included variables increased between 1995 and 2007. Differentiating learning conditions have growing impact on student achievement. Model 2 includes also an interaction between aggregated socio-economical status and student achievement. Its statistical significance in 2007 shows that in schools attended by students coming from advantaged backgrounds the relationship between student achievement and socio-economic status is weaker than in schools with less advantaged population.

Table 3 Effect of home background and school-level variables on mathematics achievement

model 1		**1995**			**2007**	
	coeff.	*s.e.*	*P-value*	*coeff.*	*s.e.*	*P-value*
intercept	-0.077	0.039	0.051	-0.783	0.130	0.000
ses_school	0.504	0.070	0.000	0.604	0.076	0.000

m-y gymnasium	0.422	0.063	0.000	0.691	0.116	0.000
s_safety	0.063	0.045	0.163	0.085	0.026	0.002
t_hied	0.024	0.042	0.570	0.033	0.023	0.155
t_diversity	-0.040	0.047	0.392	-0.058	0.028	0.044
t_lointerest	-0.093	0.040	0.023	-0.083	0.026	0.002
t_problems	0.055	0.035	0.691	0.010	0.026	0.120
p_shrt	-0.019	0.035	0.581	0.023	0.025	0.370
ses	0.168	0.029	0.000	0.187	0.019	0.000
variance explained at the school level (%)			64			78
model 2		**1995**			**2007**	
	coeff.	*s.e.*	*P-value*	*coeff.*	*s.e.*	*P-value*
intercept	-0.075	0.039	0.058	-0.790	0.132	0.000
ses_school	0.522	0.071	0.000	0.621	0.075	0.000
m-y gymnasium	0.417	0.059	0.000	0.670	0.118	0.000
s_safety	0.065	0.044	0.141	0.081	0.026	0.003
t_diversity	-0.037	0.049	0.457	-0.047	0.030	0.096
t_lointerest	-0.091	0.042	0.030	-0.081	0.026	0.003
ses	0.166	0.031	0.000	0.208	0.023	0.000
ses_school	0.009	0.062	0.881	-0.114	0.039	0.005
variance explained at the school level (%)			85			92

Source: TIMSS 1995, 2007

To what extent differs the learning experience of students in basic schools and multi-year gymnasia?

Table 4 shows frequencies of several variables from teacher questionnaires that characterize the learning climate and learning conditions of basic schools and multiyear gymnasia in 2007. Table shows that there are significant differences in attitudes of teachers of basic schools and multi-year gymnasia towards their profession and teaching mathematics and in their perception of school climate. According to their statements have gymnasia teachers higher expectations and more demanding requirements in mathematics lessons. They also perceive fewer obstacles in teaching caused by composition of their student body.

Table 4 Teachers´ reports about themselves and their school (%)

	basic school	m-y gymnasium
teachers qualifications		
university degree	96	100
teaching certificate	96	100
attitudes towards the profession	agree	
society appreciates teachers	29	47
students appreciate teachers	55	80
like to change own job	22	7
attitutes towards the school	agree a lot	

feel safe in the school	46	64
	high	
teachers' expectations of student achievement	37	71
students' desire to do well in school	3	36
teaching mathematics		
In teaching mathematics to the students in the TIMSS class, how often do you usually ask them to do the following?	half lessons	
explain answers	82	93
decide on their own procedures for solving complex problems	52	60
work on problems for which there is no immediately obvious method of solution	17	33
In your view, to what extent do the following limit how you teach the TIMSS class?	a lot	
students with different academic abilities	24	0
students who come from a wide range of backgrounds	3	0
students with special needs	6	7
unintersed students	24	0
disruptive students	17	0

Source: TIMSS 2007

Differences in school climate were confirmed also by school principals. Table 5 shows principals´ perception of the occurrence of various behavioural problems in their schools.

Table 5 Principals reports about the occurrence of negative behaviours (%)

behaviours	at least mothly	
late arrivals	28	30
absenteeism	10	8
skipping class	5	0
violating dress code	18	8
classroom disturbance	80	70
cheating	29	8
profanity	76	30
vandalism	38	0
theft	7	0
intimidation or verbal abuse of other students	20	0
physical injury of other students	11	0

Source: TIMSS 2007

Contextual data from TIMSS 2007 show that from the perception of mathematics teachers and school principals there are significant differences in school climate of basic schools and multi-year gymnasia: the occurrence of negative behaviours is less frequent in multi-year gymnasia, students are motivated to achieve good results and teachers have higher expectations from their students. There are no significant differences in qualifications of teachers in both tracks, but teachers in multi-year gymnasia show higher job satisfaction.

Conclusions

Analysis of the TIMSS data showed an increase in the differences in achievement of individual schools and tracks in lower secondary education between 1995 and 2007. At the same time, the impact of school climate and learning conditions on student achievement is also increasing. The analysis of TIMSS data confirms the findings from PISA.

International survey data support the hypothesis that even though according to statistical yearbook the education system appears stable, there is an increasing differentiation within the system and, consequently, growing differences in student achievement in higher and lower tracks. Some students have better conditions for learning than others and this increasingly impacts on their achievement.

Cross sectional studies, however, are not an ideal source for studying the impacts of tracking. The findings presented in this paper should be confirmed by other data. Most valuable source of information would be a longitudinal survey that would study mechanisms of the school choice and compare the achievement of students prior to the selection and during their study in different tracks. At the same time the monitoring of educational system would be helpful that would document the developments in the system with respect to educational choices.

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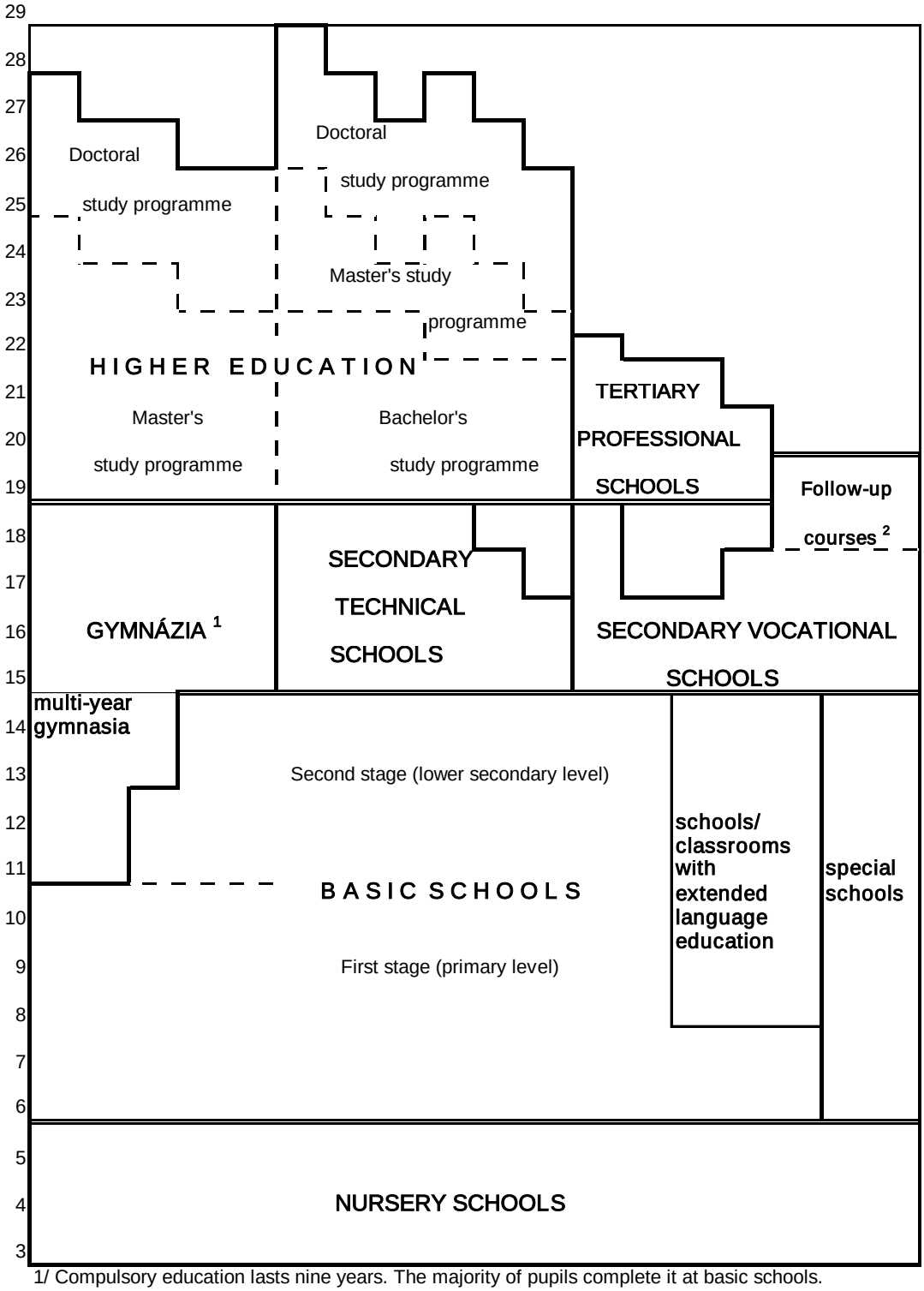
Apendix A

Structure of the education system, the Czech Republic



1/ Compulsory education lasts nine years. The majority of pupils complete it at basic schools. Pupils who study at a multi-year *gymnázium* accomplish it in the relevant years of *gymnasium*.
2/ A follow-up study is designed for graduates at three-year courses of secondary vocational schools. It gives them the opportunity to improve their qualifications and pass "*maturitní zkouška"*, which opens up access to tertiary education study.

Table A1 – Percentage of students in classes with extended curricula, multi-level gymnasia and special schools

	1995/96	**1996/97**	**1997/98**	**1998/99**	**99/2000**	**2000/01**	**2001/02**	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**
classes with extended curiculla	8.90%	7.50%	7.70%	8.00%	8.20%	8.60%	8.60%	9.40%	9.60%	11.30%	9.50%	10.00%
Multi-year gymnasia	9.50%	10.90%	11.40%	10.80%	10.70%	9.70%	9.50%	9.40%	9.60%	9.80%	10.20%	11.00%
special schools	4.50%	4.10%	4.10%	4.00%	3.90%	3.90%	3.90%	4.00%	3.90%	4.00%	3.50%	3.60%
total outside mainstream	**22.90%**	**22.40%**	**23.20%**	**22.90%**	**22.80%**	**22.20%**	**22.00%**	**22.90%**	**23.10%**	**25.10%**	**23.30%**	**24.50%**

Appendix B

Table B1 Variables used in multilevel models

1995					
	N	Minimum	Maximum	Mean	Std. Deviation
Zbimatpv1	2733	-3.06	3.45	0.00	1.00
Zbimatpv2	2733	-3.67	3.37	0.00	1.00
Zbimatpv3	2733	-3.19	3.42	0.00	1.00
Zbimatpv4	2733	-3.10	3.47	0.00	1.00
Zbimatpv5	2733	-2.88	3.43	0.00	1.00
ses	2733	-2.17	2.35	0.00	1.00
t_diversity	133	-2.20	2.38	0.00	1.00
t_lointerest	133	-2.12	2.20	0.00	1.00
s_safety	133	-1.75	2.91	0.00	1.00
t_hied	133	-7.95	0.14	0.00	1.00
t_problems	132	-2.34	3.64	0.00	1.00
p_shrt	133	-1.91	2.41	0.00	1.00
m-y gymnasium	134	0.00	1.00	0.03	0.17
2007					
	N	Minimum	Maximum	Mean	Std. Deviation
Zbimatpv1	3640	-3.53	3.56	0.00	1.00
Zbimatpv2	3640	-3.28	3.25	0.00	1.00
Zbimatpv3	3640	-3.52	3.22	0.00	1.00
Zbimatpv4	3640	-3.73	3.37	0.00	1.00
Zbimatpv5	3640	-3.21	3.55	0.00	1.00
ses	3640	-3.19	2.93	0.00	1.00
t_diversity	202	-2.07	2.58	0.00	1.00
t_lointerest	202	-2.21	1.66	0.00	1.00
s_safety	202	-3.62	1.88	0.00	1.00
t_hied	202	-5.89	0.18	0.00	1.00
t_problems	202	-3.47	2.31	0.00	1.00
p_shrt	202	-1.01	2.73	0.00	1.00
m-y gymnasium	202	0.00	1.00	0.06	0.25