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Abstract

The recently published data from the Programme of International Student Assessment (PISA) has revealed that Germany ranks lowest among the OECD countries for educational equalities. This paper examines whether it is the tracking of children into different types of school environments at a particularly early stage of their intellectual development, i.e. at the transition from primary to secondary school, which contributes to such inequalities. The analysis is based on data taken from two surveys of learning achievement, the Third International Mathematics and Science Study (TIMSS) and the Programme of International Student Assessment (PISA). The data consistently reveal that although ability is a key selection criterion, children's educational achievement varies greatly within the respective school tracks to which they are allocated. Although migrants are predominately selected to lower academic school tracks, they do not face educational inequalities if their socio-economic background and measured ability is similar to that of German nationals. On the other hand, children from rural areas, pupils from lower socio-economic backgrounds and boys in general have a significantly lower probability of being selected to the most academic school track even when their educational ability is similar to that of their urban and better socially placed counterparts. Since the outcome of sorting is difficult to correct and school choice shapes career options, there is a high likelihood that such educational inequalities in secondary schooling will have an impact on pupils' lives and career opportunities long after they have completed compulsory education.

Keywords: educational inequalities, transition, secondary schooling, selection
JEL Classification: D63, I20

1. Introduction

In J. K. Rowling's 'Harry Potter' books the children at the school for wizardry are sorted into different houses by the 'sorting hat'. This is placed on pupils' heads, examines their character and talents and allocates them to the house which fits them best. The sorting hat never fails. In reality, however, we cannot explore a child's head to make a perfect selection. In Germany children are sorted into different school environments in the transition process from primary to secondary school by the selection criterion of child's ability. This transition process is in contrast to that of other industrialized countries insofar as children are selected into differentially challenging school environments at a particularly early stage of their intellectual development. It is precisely this early sorting that may account for why Germany ranks so low for educational equalities among OECD countries, as reported by the recently published PISA data (OECD, 2001) and by UNICEF (2002).

The main task of this paper is to examine whether the German sorting process is fair to the child. We thus focus exclusively on the selection process from primary to secondary school as reflected in the tripartite secondary school system, and consequently examine neither educational achievements in the intermediate school or *Gesamtschule*, nor whether this type of school offers a valid alternative to inequitable sorting of children.

In addition to a review of the existing literature on the transition from primary to secondary school we add new research evidence on the educational inequalities generated by the transition process based on two surveys of learning achievement: the Third International Mathematics and Science Study (TIMSS) conducted by the International Association for the Evaluation of Educational Achievement (IEA) in 1995, and the Programme of International Student Assessment (PISA) coordinated by the OECD.

TIMSS was conducted by the International Association for the Evaluation of Educational Achievement (IEA) in 1995.[1] The target population we focus on covers data on 7th and 8th graders' achievement in mathematics and science. PISA is co-ordinated by the OECD[2] and assesses pupils in mathematics, science and reading literacy in 2000. The target population for PISA consists of 15 year-olds attending secondary school irrespective of their school grade. In addition, both surveys provide comprehensive information on pupils' learning environments, family background and school variables. However, the data on mathematics and science results differ in PISA and TIMSS due to the diverse assessment of pupil ability. TIMSS test items rely heavily on the schedule of the school curricula, whereas PISA refers to pupil 'literacy' as the capacity to put knowledge and skills to functional use. The examination of educational inequalities in the transition process by focusing on both surveys therefore enables us to capture pupils' learning achievements regarding school curricula as well as their ability to apply the knowledge acquired in real-life situations.

We found the following key results:

- Although ability is a key criterion in the selection process, children's educational achievement within school tracks differs greatly. Taking pupils' capability in mathematics, for example, about 8 per cent of those entering the least prestigious school track and 40 per cent of those entering a middle academic school track would be well enough equipped to attend the most prestigious secondary school track given their educational achievements.
- Boys have lower chances than girls of attending the most academic school tracks even if their educational ability is similar to that of their female counterparts.

[1] See http://www.timss.org. Germany did not participate in the repeat survey of TIMSS in 1999.
[2] See http://www.pisa.oecd.org.

- Migrants are predominantly selected to lower academic school tracks; however, once we control for children's ability and socio-economic background, their tracking does not differ from that of German nationals.
- Pupils with a lower socio-economic background face severe educational inequalities and have to display better test scores than their counterparts with a higher socio-economic background in order to be recommended for the most academic school track. In other words, pupils whose parents completed tertiary education are about 30 per cent more likely to attend the prestigious *Gymnasium* than their counterparts whose parents did not complete upper secondary schooling, irrespective of educational ability.
- If urban and rural children's school performance is equal, children in urban areas have a more than 35 per cent greater probability of being selected to the most academic school track than their rural counterparts.
- These educational inequalities shape pupils' later educational opportunities and career options, since their prospects for correcting unequal tracking are extremely limited after the transition from primary to secondary school.

The remainder of this paper is structured as follows: Section 2 introduces the German educational system and describes the rules of the transition process from primary to secondary school. Section 3 illustrates the importance of the secondary school choice: institutional impediments hampering pupils' shifts between different types of secondary schools and the close linkage between school tracks and later lifetime opportunities. Since tracking into secondary schools is a process that cannot be corrected easily and has a great influence on children's professional future, the 'fairness' of the selection process is a central point for guaranteeing children's equal rights for their future prospects. Hence, Section 4 examines whether sorting is fair and unbiased. It contains a review of the literature that illustrates the general patterns of pupils' access to secondary school tracks, and that guides the building of hypotheses underlying the factors that shape differential school track selection. In order to examine these hypotheses we apply logistic regression models that are estimated with survey microdata from PISA and TIMSS. Our regression results indicate which groups of children face incongruent educational opportunities for attending different types of secondary school tracks even if we control for children's learning achievements. The last section concludes by summarising the results.

2. The German Educational System and the Transition from Primary to Secondary School

▪ 2.1 *Primary schooling and the main secondary school tracks*[3]

The German Basic Law guarantees cultural sovereignty in *Land*-specific educational legislation so that education is decentralized into the country's sixteen individual states or *Länder*. Differing educational policies across the *Länder* are harmonised by the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* (KMK), which tries to ensure national comparability of educational standards and guidelines through joint agreements with the *Länder*.

Throughout Germany compulsory schooling starts at children's age of 6 years in the primary school or *Grundschule*. It generally consists of 4 years' schooling[4] in mixed-ability classes after which children are divided into the main different secondary school tracks, *Hauptschule*, *Realschule*[5] and *Gymnasium*. The main criterion for educational segregation is 'ability'. This idea of promoting children with different educational capacities into different school environments with curricula appropriate to a pupil's ability dates back to the 19th century. Today, the German secondary school system is still predominantly characterised by this tripartite system as evidenced by the different value attributed to the three respective school leaving certificates.

The *Gymnasium* or grammar school is the preferred school track taken by the most academically-inclined children and prepares pupils with 8 or 9 years' education ending with the *Abitur*. This qualification is not only the precondition for university entry but also an entry ticket for competitive vocational training opportunities. About 90 per cent of those[6] who obtained the *Abitur* in 1999 had attended *Gymnasium* (Statistisches Bundesamt, 2000b),[7] making *Gymnasium* the main and most important school track for recruiting university students.

The *Realschule* or intermediate school is attended by children with medium levels of assessed ability at primary school and lasts 6 years (5th to 10th grade). It provides general knowledge and preparation for white-collar

[3] This subsection provides a short description of the general schooling system (*allgemeinbildende Schulen*) in Germany from which vocational and evening schools have been excluded. For a comprehensive introduction to the educational system in Germany, see KMK (2000a).

[4] In Berlin and Brandenburg primary schooling lasts six years.

[5] In most of the new *Länder,* both lower tracks of secondary schools are integrated into a single schooltype.

[6] About 2.5 per cent of students obtaining the *Abitur* did so after attending evening schools or *zweiter Bildungsweg*.

[7] Besides the *Gymnasium*, *vocational Gymnasium*, *Fachgymnasium* and the *Gesamtschule* and several *Land*-specific evening schools also offer the *Abitur*. The provision and quality of these schools varies across *Länder.*

occupations. If children complete *Realschule* successfully and meet *Land*-specific requirements they can continue schooling in the *Gymnasium*.

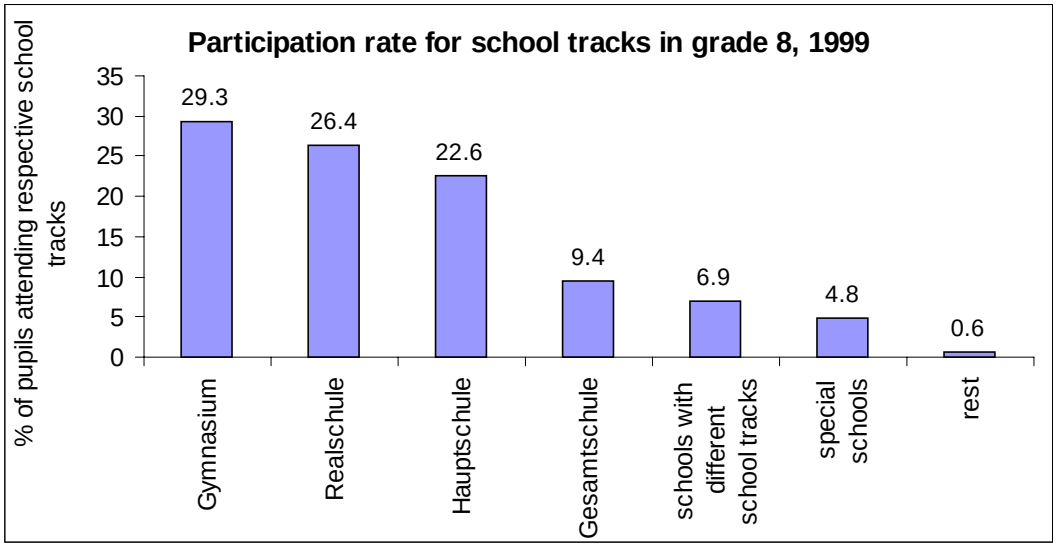
The value generally attributed to the *Hauptschule* or general school and the professional opportunities offered by the *Hauptschule* qualification are limited in comparison to the leaving certificates of the two other traditional school tracks. Moreover, this school type has a less favourable reputation with regard to problems of discipline and violence (Müller *et al.,* 1998; Ashwill, 1995). Pupils with only low average academic achievement at the primary school generally enrol in this school track. The *Hauptschule* consists of 5, sometimes 6, years of schooling (5^{th}–9^{th}/10^{th} grade) and is designed to provide pupils with more basic instruction combined with practical abilities since most children start practical vocational training after its completion. However, after completing *Hauptschule* pupils can continue schooling in both of the more academic school tracks if their achievement levels meet the stipulated *Land* ability requirements.

The traditional tripartite structure of the secondary school system has been expanded with the introduction of several new and mainly *Land*-specific kinds of school and the *Gesamtschule*[8] or comprehensive school is now a well-established school-type in most *Länder*. It was established as a result of a movement to promote a more egalitarian access to education in the 1960s. In contrast to the other school tracks the *Gesamtschule* makes provision for students with differing levels of ability within a single school. Since the *Gesamtschule* also includes the *Gymnasium* school track pupils can obtain the *Abitur* by attending this type of school. However, official statistics reveal that in 1999 only about 6 per cent of pupils who received the *Abitur* did so at the integrated *Gesamtschule*.[9]

[8] The *cooperative comprehensive school* combines all three schools in the traditional system in a single unit whereby the pupils are enrolled in only one traditional secondary school track. Pupils in the *integrated comprehensive school* can switch between school types depending on their aptitudes in respective subjects. Therefore, within the integrated comprehensive school a 'clear' transition does not take place since pupils may attend a '*Gymnasium'* level for one subject and a *'Realschule'* level for another.

[9] Author's own calculations based on data taken from Statistisches Bundesamt, 2000b.

Figure 1: *Percentage of pupils by school track*



Source: KMK, 2000b.

Figure 1 reports rates of pupil participation by school track in Germany for the 8th grade in 1999, and is an indication of the respective weight attributed to the different school tracks. In 1999, the three traditional tracks *Hauptschule*, *Realschule* and *Gymnasium* accounted for about 80 per cent of all pupils in Germany, whilst only about 10 per cent of pupils attended the *Gesamtschule*. Other new and *Land* school types have had little success in attracting children (ca. 7 per cent of German pupils) which confirms the traditional tripartite arrangement still forms the backbone of the German secondary school system.

▪ 2.2 *The transition from primary to secondary school*

The rules governing the transition from primary to secondary school are based on *Land* legislation. First, children are selected to different school tracks and secondly, they are admitted to a particular school. The latter does not normally influence the decision on the selected school track.[10] The selection process sorts children into secondary school tracks after primary schooling, that is, at the end of the 4th grade at the age of about 10 years. In some *Länder* schooling remains partly comprehensive for one or two more

[10] After the school track decision has been taken, parents apply for admission to a preferred school within the chosen school track. In *Länder* where parents are entitled to choose a school track independently of the school recommendation, the case of overcrowding in preferred school tracks may lead to a second selection of children. However, there is a lack of literature examining the decisional process of headteachers who are responsible for school admission. Finally implemented admission procedures seem to change from one school to another (Ashwill, 1995). Since the number of pupils enrolling in the first year of schooling has declined since 1998 (KMK, 2000b) today the probability of a second selection due to overcrowding of preferred school types is very low.

years due to the 'orientation stage' or *Förderstufe*,[11] or a longer duration of primary schooling (KMK, 2000a).[12] However, the early selection of children into different types of learning environment in Germany is striking in comparison to other OECD countries where comprehensive schooling over a longer period of time tends to be the norm.

Generally, the decision about school track is taken by both parents and the local educational authorities (Avenarius and Jeand'Heur, 1992; KMK, 1999),[13] but children's measured ability remains the most important factor determining the selection process. This takes the form of a primary school recommendation for a secondary school track, generally based on a pupil's marks in the core subjects of German and mathematics. Additionally, teachers are advised to take into account a child's learning and working behaviour, their level of motivation, and general development.

The impact of the recommendation on the selection process differs across *Länder*.[14] In most *Länder* (Berlin, Bremen, Hamburg, Hessen, Mecklenburg-Vorpommern, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, and Schleswig-Holstein) parents are entitled to choose a school track other than that recommended by the primary school, but this freedom might be partly offset by the fact that in these *Länder* parents often have to go through consultations if they prefer another school track to the one recommended.[15] In the other *Länder* (Baden-Würtemberg, Bayern, Brandenburg, Saarland, Sachsen, Sachsen-Anhalt and Thüringen) parents are not entitled to choose a school track which differs from the one recommended by the primary school and therefore only have a negligible impact on the choice of school attended by their children.[16]

Children's ability at the age of 10, and assessment at the end of primary schooling both have an enormous impact on the educational selection process. However, the validity of educational ability at the age of 10 as the sole selection criterion for directing children into differing school environments is

[11] The purpose of the 'orientation stage' is to allow for additional assessment by delaying the final decision on secondary school placement until the end of the 6th grade.

[12] In the school year 1998/1999 the share of pupils receiving comprehensive schooling independent of the school type in grades 5 and 6 was about 22 per cent: these pupils are most likely to be found in the *Länder* of Berlin, Brandenburg, Bremen, Niedersachsen and Sachsen-Anhalt. In other *Länder* comprehensive schooling in the 5th and 6th grade is almost zero or remains low (Bellenberg *et al.*, 2001).

[13] In Germany the law stipulates that parents have a primary right of education for their children (Art. 6 II GG) and that the different *Länder* have supreme sovereignty within the field of education (Art. 7 I GG) (Avenarius and Jeand'Heur, 1992).

[14] For a summary of *Land*-specific legislation on the transition from primary to secondary school see KMK, 2000c.

[15] In some *Länder* parents must consult the primary teachers, whereas in other *Länder* the enforcement of parents' choice needs to be consequently 'lobbied' through consultations with the local educational authority.

[16] Parents may express their wish for their children to attend another secondary school track which differs from the one recommended. This leads to testing of the child's ability, which differs in length and form across *Länder*. It is the final test result and not parental preference which determines the choice of secondary school track.

questionable given that children develop skills at different stages of their childhood and may therefore have the potential for catching up after primary schooling, i.e. long after the selection has taken place. Moreover, the assessment of ability by focusing predominantly on achievement in the key subjects of mathematics and German may well give a limited picture of their overall skills, educational ability and expected future developments. Additionally, primary school recommendations are not always objective (Lehmann *et al.,* 1997). However, it is often assumed that the shortcomings of the selection criterion 'ability at age 10' will be balanced out by the opportunity for a child to switch school-tracks after completion of each successive school grade. The next section examines whether the secondary school system indeed allows for a correction of the selection outcome *after* the transition.

3. The Importance of Secondary School Choice

Our examination starts by focussing on those institutional barriers embedded in the educational system that may limit educational choices after the transition to secondary school, especially for lower tracked children, and goes on to discuss the real-life outcomes of the secondary school decision in terms of professional opportunities and incomes.

▪ 3.1 *Institutional barriers limiting opportunities for lower tracked children*

A low level of permeability between the different tracks of the standardised secondary school system[17] may enforce the secondary school choice and thus constitute a significant institutional barrier that reinforces inequitable secondary school selection. In particular, low permeability between school tracks (3.1.1), and the consequences of the school track decision (3.1.2), are likely to impede correction of the early assessment of a child's ability. Furthermore, the rigid structure of the German labour market is likely to limit a child's range of choice once they are tracked into the less prestigious secondary schools (3.1.3).

▪ 3.1.1 *Permeability between school tracks*

Figures for changes between school tracks illustrate the rather rigid nature of the tracking decision. Children who demonstrate a high level of academic ability and/or pass an examination generally have the opportunity to switch to a more prestigious secondary school track after completion of their school qualification and after completing each successive school grade. This is

[17] On the low permeability of the secondary school system, see Rösner 1997, Henz 1997a. For a contrasting interpretation, see Köller *et al.* 1999.

important since the better the reputation of the school's final leaving certificate, the better pupils' later educational and occupational opportunities (see section 3.2). Table 1 illustrates how far pupils took up the opportunity to switch school track after transition in the year 2000/2001. It presents the origin of pupils within the respective school tracks for several grades. Generally speaking, over 93 per cent of pupils in any one grade attended the same school track as the previous year. The figures are even higher for the *Gymnasium* so that, with the exception of the 7th and 11th grades, normally less than 4 per cent of those attending *Gymnasium* had been upgraded from a lower school track. Only about 0.4 per cent of *Gymnasium* pupils in the 6th–10th grades previously attended the *Realschule* school track. Given the roughly equal proportions of students attending *Realschule* and *Gymnasium* this demonstrates the extremely low probability of being upgraded from the one to the other.[18]

The lower share of pupils in grade 7 that has attended respectively *Realschule*, *Gymnasium* and *Hauptschule* also the year before, seems to portray a higher rate of mobility after the 6th grade. However, these figures do not reflect a greater probability of upgrading after the 6th grade but only pupils' first selection into secondary school tracks, since the 'orientation stage' postpones the selection process for two years. Furthermore, the circa 11 per cent of *Realschule* pupils upgraded from *Hauptschule* in the 7th grade are the result of specific institutional school regulations. This is because about 95 per cent of those upgraded came from the *Land* of Bayern[19] where *Hauptschule* pupils are selected for *Realschule* after the 6th grade.[20] Hence, in all the other *Länder* where pupils are selected to *Realschule* directly after primary schooling an average of only about 5 per cent of *Hauptschule* pupils experienced upgrading.

The low probability of being upgraded is even more striking if we consider that the opportunity to switch to a more prestigious school track after the lower secondary school leaving examination has often been stressed as an important opportunity to correct the selection process. In reality, however, in 2000/2001 only about 1 per cent of 10th graders in the *Realschule* had been upgraded from *Hauptschule,* and only about 5 per cent of *Gymnasium* pupils in the 11th grade had been educated in the *Realschule* before (Table 1).

[18] Generally, permeability differs between *Länder*. For example, in Nordrhein-Westfalen 16 per cent of pupils attended *Gymnasium* after having completed the *Realschule* qualification in 1997 (Bellenberg and Klemm, 1998). Moreover, we can assume that internal school mechanisms also influence the number of pupils changing schools and remaining within the specific school track (Mauthe and Rösner, 1998).

[19] Own calculations based on personal communication with the Statistische Bundesamt.

[20] In Bayern, pupils are selected for the *Gymnasium* and *Hauptschule* after the 4th grade. Better performing pupils in the *Hauptschule* are only selected for *Realschule* after the 6th grade, so that *Realschule* schooling starts in the 7th rather than the 5th grade.

Table 1: *Pupils' origin in respective school tracks by grades in 2000/2001*

Origin of *Gymnasium* pupils for grades 6–11 in 2000/2001

Track attended in previous school year

	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11
Gymnasium	***95.6***	***74.8***	***97.6***	***97.5***	***97.3***	***90.8***
Hauptschule	0.0	0.1	0.0	0.0	0.0	0.3
Realschule	0.2	0.3	0.1	0.2	0.3	4.7
Gesamtschule	0.1	0.3	0.1	0.1	0.0	1.1
'orientation stage'	0.9	21.8	-	-	-	-
rest	3.2	2.7	2.2	2.2	2.4	3.1

Origin of *Realschule* pupils for grades 6–10 in 2000/2001

Track attended in previous school year

	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Realschule	***96.5***	***58.9***	***94.0***	***95.0***	***95.5***
Hauptschule	1.1	10.7	0.7	0.5	1.1
Gymnasium	2.0	4.2	4.0	3.1	2.0
Gesamtschule	0.1	0.3	0.2	0.1	0.1
'orientation stage'	0.0	24.3	-	-	-
rest	0.3	1.6	1.1	1.3	1.3

Origin of *Hauptschule* pupils for grades 6–10 in 2000/2001

Track attended in previous school year

	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Hauptschule	***93.3***	***78.1***	***93.5***	***93.7***	***96.6***
Realschule	1.8	3.4	3.9	3.6	1.6
Gymnasium	0.2	0.3	0.2	0.3	0.3
Gesamtschule	0.2	0.2	0.2	0.2	0.2
'orientation stage'	0.1	15.5	-	-	-
rest	4.4	2.5	2.2	2.2	1.3

Source: Statistisches Bundesamt, 2001.

Note: Figures report the percentages of *Gymnasium*, *Realschule* and *Hauptschule* pupils who attended the same or another school the previous year. 'Rest' covers *Land*-specific schools, Freie Waldorfschule, special schools and missing values.

A pupil's risk of being downgraded to a lower school track[21] is significantly higher than his or her likelihood of being upgraded to a more prestigious one. As shown by pupils' origin in the *Realschule* and the *Hauptschule*, in grades 7–9 about 4 per cent of pupils were downgraded. The PISA data show that 11 per cent of 15 year-olds reported having been downgraded, whilst 5.8 per cent reported being upgraded during the 5 years of secondary schooling (Baumert *et al.*, 2001).[22]

[21] However, the general practice is to require those who perform less well to repeat the grade rather than to downgrade them to less academic school tracks.

[22] Again the latter figure is mainly determined by the regular school change from *Hauptschule* to *Realschule* after 6th grade in Bavaria.

Taken together, figures on changes between school tracks reveal that only a limited number of pupils is likely to correct secondary school selection after transition and that any permeability of secondary school tracks tends to be predominantly downwards.

▪ 3.1.2 *Consequences of the school track decision*

The lack of permeability between school tracks would be less limiting for pupil choice were there adequate and standardised provision for different secondary school-types. Comparably prestigious secondary school qualifications could facilitate pupils' access to the German vocational system which is of a particularly high international standard (Müller, 1999). Today, there is now an increasing range of schools offering the *Abitur*[23] but these differ a great deal across *Länder* so that provision is geographically skewed. Although not equivalent to the *Abitur*, since 1970/71 pupils with the *Realschule* qualification are entitled to obtain a *Fachhochschulreife*, or higher education entrance qualification for the *Fachhochschule*,[24] but the *Abitur* entitles school-leavers to study at any institution of higher education in any subject or field, whereas the *Fachhochschulreife* only makes pupils eligible for *specific* types of university courses (KMK, 2000a). In 1999, 28 per cent of pupils aged 17–21 obtained the *Abitur*, whilst 9.5 obtained the *Fachhochschulreife* (KMK, 2000b).[25] Hence, this qualification offers *Realschule* leavers a real opportunity to enter university. However, children at the lowest end of the tracking process continue to have the worst educational opportunities. Even if the chances of catching up with higher educational levels have increased somewhat through the introduction of a geographically differential choice of evening schools, Henz (1997b) demonstrates that such opportunities still tend to filter pupils by their parental background so that children from a more prestigious socio-economic background are more likely to obtain qualifications in evening schools. Hence, pupils most disadvantaged by their parental background constitute an even higher proportion of adults with the lowest level of educational attainment after taking into account educational qualifications obtained at evening schools.

▪ 3.1.3 *Labour-market segregation*

A third important measurement of institutional barriers for lower tracked children is the occupational segmentation of the German labour-market. In Germany, labour-market position is strongly predicted by level and type of

[23] For example, depending on the *Land*, the *Berufliches Gymnasium*, *Fachgymnasium*, *Kolleg*, *Abendgymnasium* (evening schools for working people) or *Berufsoberschule*.

[24] The *Fachhochschule* are universities of applied science which concentrate on applied and practical education.

[25] These figures have risen more for pupils who obtained the *Abitur* than for those who obtained the *Fachhochschulreife* in the 1990s.

education (Müller, 1999; Müller *et al.,* 1998),[26] and the strong occupational specialisation of apprenticeships. The expectation of employers of finding workers with the required qualifications reinforces this occupational segmentation. The higher the level of secondary schooling, the greater the opportunities for vocational or academic training, which again leads to a higher labour-market position. Inversely, the lower the secondary school qualification, the higher the risk of unemployment (Riphahn, 1999). These lifetime career outcomes for students are discussed in more detail in section 3.2.1, and the income of persons with different secondary school qualifications in section 3.2.2.

▪ 3.2 *School choice and lifetime career chances*[27]

▪ 3.2.1 *Occupation*

The relation between educational qualifications and occupational outcome is particularly salient when assessing the importance of the transition process, since it helps reveal to what extent the school decision determines opportunities later in life. The respective secondary school tracks are designed to prepare children for diverse occupational directions since the different secondary school qualifications imply different entry opportunities for further education. It is thus not surprising that there is a high correlation between children's early educational qualifications and their adult occupation. Those who obtain a *Hauptschule* qualification are likely to receive blue-collar vocational training; only a few of them will enter white-collar occupations, and even fewer will attend university.[28] By contrast, the *Gymnasium* qualification is associated with an academic degree, although today a higher proportion of pupils with the *Abitur* opt for white-collar vocational training (Dustmann, 2001). Children from the *Realschule* tend mainly to enter white-collar or vocational school training.

Similar results have been found for the occupational prestige of first jobs by educational attainment (Müller *et al.,* 1998) so that the prestige of the type of secondary school attended is therefore likely to match the status of first job. If we compare the impact of education on occupational status over time in Germany, educational qualifications today reflect the later occupational status of children better than fifty years ago (Müller *et al.,* 1998; Baumert *et al.*, 2001).

[26] This is in contrast to labour markets that are mainly segmented between firms.

[27] Due to the very low probability of post-transition change of school track, we assume that the highest secondary school qualification is a sufficiently good indicator of the school track decision after primary schooling.

[28] Less than 1 per cent of men born between 1920 and 1956 with a *Hauptschule* qualification subsequently attended university, in contrast to the over 70 per cent of those with a *Gymnasium* qualification (Dustmann, 2001).

▪ 3.2.2 *Income*

There appears to be a clear correlation between a child's secondary school attainment and their subsequent work income (Dustmann, 2001) due also to the tight linkage between occupation and income. Table 2 reports the increase in entry wages for those with a *Realschule* and *Gymnasium* qualification respectively compared to a benchmark worker with a *Hauptschule* qualification with further training. Male workers with a *Gymnasium* qualification who entered the labour market between 1984 and 1990 earned about 54 per cent more than their cohort counterparts with a *Hauptschule* qualification when age is controlled for, and the difference for women was even higher. Hence, the secondary school track decision is associated with subsequent earning opportunities.

Table 2: *Percentage of an individual's additional earnings by secondary school qualification compared to those with a Hauptschule qualification and controlled for age*

	Male	Female
Realschule	21.7	33.5
Gymnasium	54.2	72.6

Source: Dustmann, 2001.

▪ *3.3 Conclusion*

The early decision on children's future career paths deriving from the secondary school selection is not easily corrected. Given the low permeability between school tracks a very small proportion of pupils are upgraded to higher school tracks, and a larger group is downgraded. It is debatable whether this lack of opportunity to correct the school track decision can be offset by a limited and *Land*-dependent increase in the provision of new types of school. Moreover, the difficulty of correcting the early transition process persists *after* secondary schooling. The high level of credentialism, i.e. matching qualifications to labour-market positions, and the occupational segmentation of the German labour market tends to limit the likelihood of a post-school correction. Pupils with a *Hauptschule* qualification are much less able to compete with pupils from higher school tracks in the competitive market for apprenticeships. Indeed there is a clear link between the school track attended and later income and occupational opportunities. It is therefore the secondary school choice, based on a decision usually taken when a pupil is 10 years old, that shapes an individual's lifetime chances and limits professional opportunities, especially for children tracked at the lower end of the hierarchical tripartite school system.

4. Hidden Educational Inequalities Inherent in the Selection Process

Given the importance of the secondary school selection process for lifetime career and occupational chances insofar as unequal tracking is likely to impede children's potential chances and opportunities throughout their later working life, it is vital that the selection decision be equitable. This section examines whether inequalities in access to the more prestigious forms of secondary schooling are inherent in the selection process.

Tracking after comprehensive primary schooling is based on the assumption that different levels of educational ability need to be differentially promoted in different types of secondary school environments. Hence, educational inequality exists if children from different types of family backgrounds, but with the same level of ability, are selected differently into the secondary school tracks. For the purposes of analysis, *educational inequality* has been narrowly defined as the differential tracking patterns of pupils from different types of family background *conditional on ability.* By contrast, *educational disparities* have been defined as the unbalanced distribution of children from different types of family backgrounds by school type *unconditional on ability*. Children who face educational disparities are not necessarily also hit by educational inequality since they may well display a generally lower level of ability than children with other background characteristics.

Section 4.1 illustrates that ability is indeed an effective indicator of children's school attendance, but that there are certainly other factors which have an impact on the selection process. Such potential factors are hypothesised in section 4.2. We go on to describe educational disparities by pupils' family background with a review of the literature and using TIMSS and PISA microdata. These educational disparities indicate that the selection process may not be appropriate when it comes to 'smoothing out' those disadvantages in children's learning capabilities which are due to different parental background. However, in order to examine whether the biased pattern of selection for diverse family backgrounds reflects also educational inequality, we have to control for children's ability. To do so we run logistic regressions using TIMSS and PISA microdata: the model and variables of our regressions are described in section 4.3. Whether the selection process produces educational inequality for children from different types of family background is discussed in the results in section 4.4.

▪ 4.1 *Ability and secondary school track*

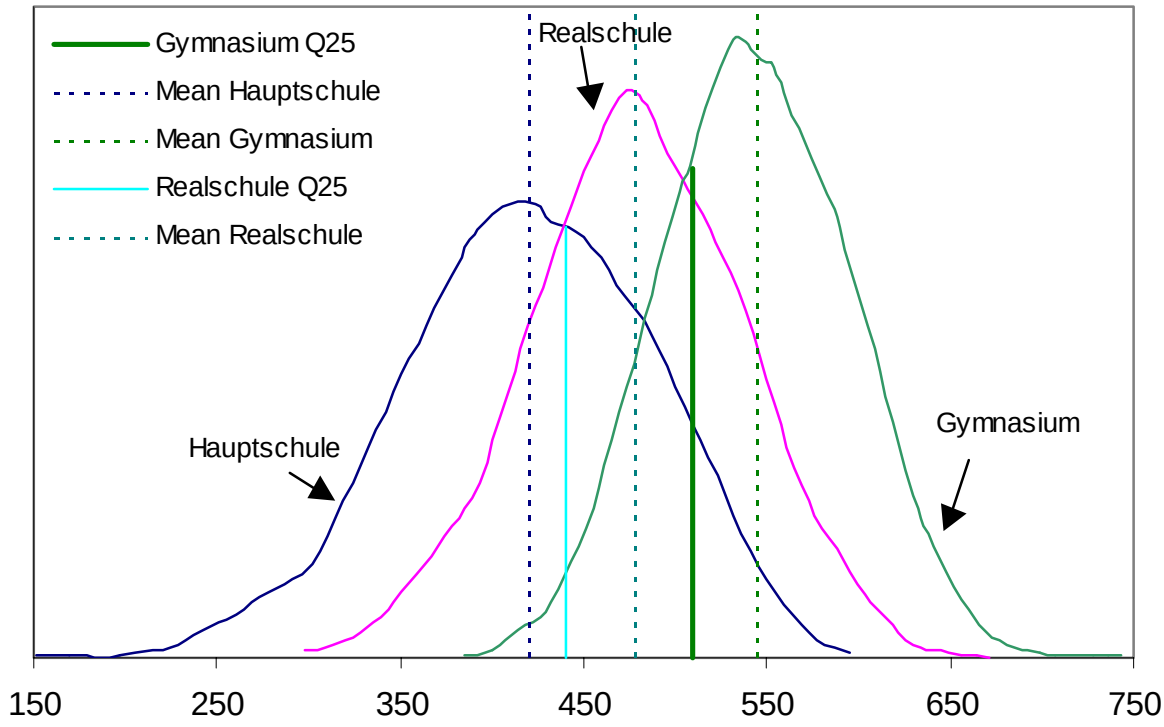
The general notion of 'ability' comprises a wide range of knowledge and skills from pupils' understanding of key concepts to specific knowledge, from the application of acquired knowledge to strategies for problem-solving. However, no educational achievement survey or primary school recommendation can capture all those facets that describe a pupil's current ability and future potential, and these measurements only reflect a better or worse approximation of what we understand in terms of the broader concept of ability. In this section and the following sub-sections we will refer to diverse approaches of measuring ability.

Figure 2 reports the average mathematics scores of pupils drawn from the Third International Mathematics and Science Study (TIMSS) 1995.[29] The data give the distribution of pupils' educational achievement within school tracks in mathematics at the end of the 7th grade.[30] Indeed, *Gymnasium* pupils report on average higher test scores than children in *Realschule*, and children in *Realschule* again perform better than those in *Hauptschule*. Given our focus on the selection to schools in the tripartite system, Figure 2 does not give the distribution of pupil achievement in the *Gesamtschule.* Nevertheless, the very low performance of pupils in the *Gesamtschule* is worth mentioning: although this school type comprises pupils eligible to attend classes in all three tracks of secondary school, their mean achievement is considerably below that of *Realschule* pupils. However, the mean achievement of *Hauptschule*, *Realschule* and *Gymnasium* pupils indicates that ability plays a key role in the secondary school tracking decision. Nonetheless, children's educational achievement within school tracks intersects strikingly as illustrated by the overlapping bell curves giving the distribution of children's ability by school track. For example, Table 3 illustrates that about 8 per cent of *Hauptschule* pupils and 30 per cent of *Realschule* pupils score better than the bottom quartile of *Gymnasium* pupils in mathematics, and that in science 13 per cent of *Hauptschule* pupils and 36 per cent of *Realschule* students report educational levels of achievement above those for the bottom quartile for the *Gymnasium*. Moreover, about 40 per cent of *Hauptschule* pupils would be well enough equipped to attend *Realschule* given their achievement levels in mathematics and science.

[29] For a description of the TIMSS data see Section 1.

[30] We assume that the TIMSS data for 7th graders constitutes a good estimation of children's ability at the end of primary schooling. Schooling within one school track normally amounts to an equalising of children's performance within that track since lower performing students report better learning progress than those with an already very high level of educational achievement (Baumert *et al.*, 2001; Lehmann *et al.*, 1997). Hence, over time we expect an adaptation of students' achievement to the respective school track average (hence a decreasing standard deviation for ability within school tracks). This leads to a lower overlapping of our bell curves giving the distribution of pupil ability by school track. Therefore, data on 7th graders is likely to underestimate the figures on pupils that could be better tracked in other school tracks given their ability (see also section 4.3.2.).

Figure 2: *Pupils' educational achievement by school track*[31]



Source: TIMSS 1995, 7th grade, mathematics scores, author's own calculations.

Table 3: *Hauptschule and Realschule pupils with better test scores than the bottom quartile of Gymnasium and Realschule (Q25) by subject*

Pupils as % of respective school track	*Gymnasium* Mathematics	*Gymnasium* Science	*Realschule* Mathematics	*Realschule* Science
Hauptschule	8.4	13.3	39.7	39.9
Realschule	29.8	35.8	75.1	74.9

Source: TIMSS, 7th grade, author's own calculations.

Additional factors other than ability also influence the school track decision and the following sub-section examines which parental background factors conditional and unconditional on ability, are likely to shape the selection process.

[31] The mean score for the respective school tracks are 544 (standard deviation 50.4) for *Gymnasium*, 478 (57.6) for *Realschule*, 419 (66.9) for *Hauptschule* and 443 (59.3) for *Gesamtschule*.

▪ 4.2 *Other factors shaping the choice of secondary school track*

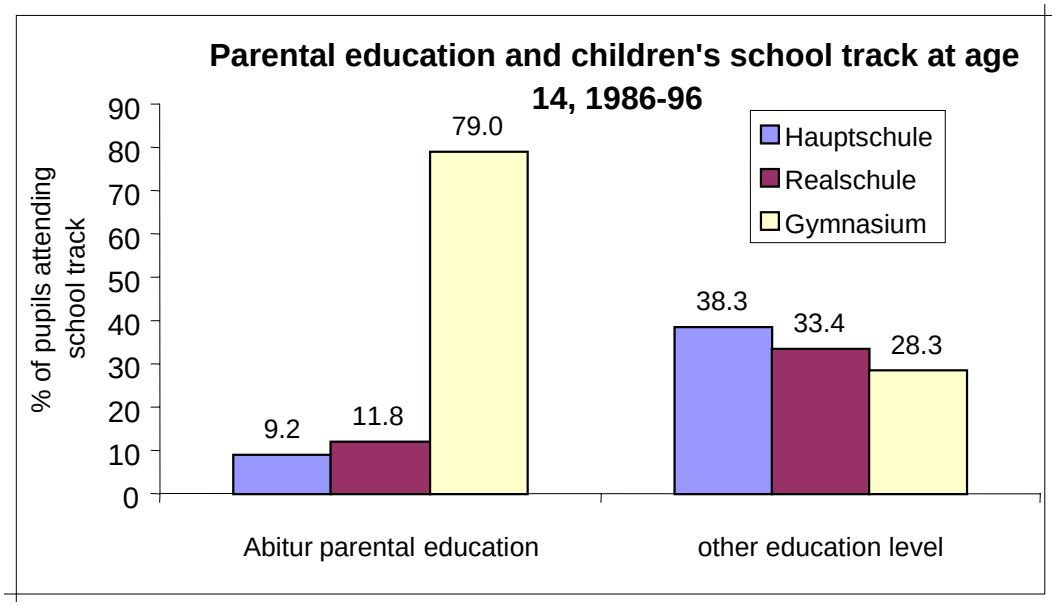
In the 1960s Roman Catholic girls with a blue-collar worker as father and living in rural areas had the lowest likelihood of attending the prestigious *Gymnasium* (Dahrendorf, 1968). Today religion is no longer so important for the tracking decision (Böttcher and Klemm, 2000), but as Germany has become a net immigration country, children's nation of origin has gained in importance for the selection process. Hence, parental background, gender, migration status, and region are the key characteristics influencing inequitable tracking into secondary schools.

▪ 4.2.1 *Parental socio-economic background*

The explanatory power of parental socio-economic background in secondary school tracking is based on the assumption that also in case that meritocracy is the only guiding principle of the educational system this does not automatically lead to a class-neutral educational attainment (Bourdieu, 1977). Families of different social status differ in terms of their cognitive knowledge, linguistic codes and their class-specific 'habits'. In particular, two factors may generate educational disparities in secondary school selection. First, *primary disparities*, where class-dependent differences in cultural resources such as knowledge, are often inherited by the younger generation. These refer to children's diverse abilities dependent on their respective parental education and class. Secondly, educational disparities are also generated by different experiences and different access to cultural resources as well as a more cognitive structuring and awareness of educational opportunities which in turn generate different levels of decisional intervention on the part of parents depending on their social background. Hence, varying parental decisional ability by parental socio-economic background refers to *secondary disparities* (Breen and Goldthorpe, 1997).

Of the three parental background factors generally discussed when examining influences on children's educational outcome, the level of parental occupation and parental income have some impact on children's tracking into secondary schools, but it is parental education which appears to be the most important explanatory factor when it comes to examining patterns of the selection outcome (Büchel *et al.,* 2000).

Figure 3: *Parental education by child's school track*



Source: Büchel *et al*., 2000.

Figure 3 illustrates the average percentage[32] of pupils in different school tracks by parental education in Western Germany. Of pupils living in households where the head of household completed the *Abitur*, 79 per cent attended *Gymnasium* while only 28 per cent of pupils with a lower level of parental education received higher secondary schooling in the period 1986–1996.[33] Inversely, less than 10 per cent of pupils with more well educated parents attended *Hauptschule,* while this proportion was the highest for the offspring of lower educated parents. In Eastern Germany the correlation between level of parental education and child's school track is less marked than in Western *Länder*. Although a similar percentage of children from Eastern Germany whose family head of household had not completed *Abitur* attended *Gymnasium* (26.1 per cent), only 58.3 per cent of children whose parents completed *Abitur* did so in the period 1991–1998 (Kesler, 2001). However, in summary the children of educated parents have a much higher probability of attaining *Abitur* than children of less well educated parents (see also Dustmann, 2001).

The implementation of educational reforms in the last decades does not appear to have improved this biased pattern of secondary school selection by parental background. Indeed, educational opportunities of 14–18 year-olds in the period 1950–1989 demonstrate that in terms of changes in the probability of being tracked to *Gymnasium* rather than *Hauptschule* or *Realschule*,

[32] The results are based on the average of pupils aged 14 in the period 1986–1996 using data taken from the German Socio-Economic Panel (SOEP).

[33] The German General Social Survey (ALLBUS) data for the period 1991–1998 reveal identical results for the unified Germany: 78.3 per cent of children whose parents obtained the *Abitur* also gained this qualification, while only 25 per cent of children with parents who did not receive *Abitur* finished the prestigious credential (Kesler, 2001).

educational disparities actually appear to have increased (Schimpl-Neimans, 2000).[34] Kesler (2001) has illustrated that there is a continuing trend in this direction in Western Germany and that this is more slightly marked in East Germany following unification.

Turning to the impact of parental occupation, the same applies, insofar as the probability that a pupil from the highest social occupational level[35] will attend *Gymnasium* rather than intermediate school is more than four times greater than the probability for a pupil whose father is a skilled worker. Furthermore, pupils from families where the head of household has a prestigious occupational status are only half as likely as those whose father is a skilled worker to attend *Hauptschule* instead of *Realschule* (Baumert *et al.*, 2001). If we examine Western and Eastern Germany separately, there is virtually no significant difference in the linkage between *Gymnasium* attendance and the social background of parents (Kesler, 2001; Büchner and Krüger, 1996).

In addition to primary educational disparities, secondary educational disparities are also important in explaining pupils' biased selection by parental background factors.[36] Unfortunately, data on parental school aspiration and on other parental factors influencing the selection process are not generally available for Germany as a whole.

Table 4 is based on a survey conducted in the Rheinland-Pfalz in 1996 (Mahr-Georg, 1999) and shows parental aspirations for children's school track by parental education about half a year before the selection process. Generally parents want their children to attain at least their own level of educational status, and of parents who have completed *Abitur* 74 per cent want their children to do the same. This figure is in contrast to the 18 per cent of parents whose educational attainment is *Hauptschule* or below.[37] The focus on parental occupation gives similar results: parents with a lower occupational status are likely to be more uncertain and less ambitious about

[34] This is even more striking as regards labour-market entry opportunities. Today higher formal qualifications are required in order to gain access to positions of the same level as twenty or thirty years ago (De Rudder, 1999) so that children with the same level of educational attainment as their parents will not automatically achieve the same labour-market position and occupational prestige levels.

[35] This category is based on the highest occupational class of the EPG classification (Erikson, Goldthorpe and Portocarero, 1979) but also includes information on the hierarchical level obtained within the occupation.

[36] Although parents can only make the final decision about children's school track in about half of the German *Länder*, parents generally do have some degree of influencing the decision on their children's school track in the other *Länder*. Furthermore, in the *Länder* where parents have the right to a final decision they need to follow through a communication process with school officials in order to enforce their school track aspirations. Hence, in all *Länder* parents need to have a clear understanding and firm aspiration concerning their children's secondary choice if they want to channel their child into a more academic school track than that recommended.

[37] Additionally, by integrating the category 'don't know' we obtain the striking result that within the entire sample one out of four parents do not express a clear preference for a particular school track. Parents with *Hauptschule* qualification or below are most uncertain about their school track aspirations.

the school track decision than parents with a higher level of education and more prestigious occupations (Mahr-Georg, 1999).

Table 4: *Parental aspirations for children's school track by parental education in the Rheinland-Pfalz*

Parents' level of educational attainment	Parental aspirations		
	Hauptschule	*Realschule*	*Gymnasium*
Hauptschule or below	18.8	63.5	17.7
Realschule	6.2	56.0	37.8
Abitur	1.8	24.6	73.7

Source: Mahr-Georg, 1999.

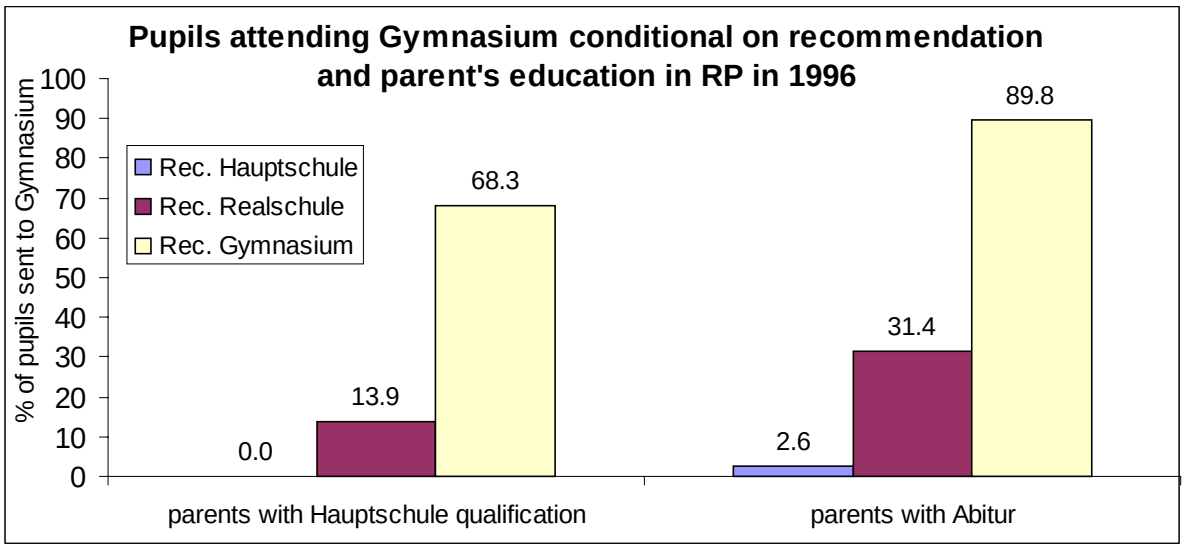
However, the less ambitious aspirations of lower educated parents are not merely derived from their realistic estimation of their offspring's limited ability. Figure 4 reports the percentage of those attending *Gymnasium* in the 5th grade by level of parental education and pupils' primary school recommendation. It thus illustrates whether parents with different levels of educational attainment are more inclined to comply with or to contrast a teacher's recommendation.

Within the group of parents with a *Hauptschule* qualification and with children who were attributed a high ability by a primary school recommendation for the *Gymnasium*, only 68 per cent decided to send their children to the *Gymnasium* while the remaining 32 per cent opted for a lower school track. This is in contrast to only 10 per cent of parents with *Abitur* who channelled their children to lower-than-recommended school tracks. Additionally, parents who completed *Abitur* are more likely to take action in order to channel their children into higher-than-recommended school tracks. Twice as many pupils of these parents than pupils with parents holding a *Hauptschule* qualification attended the *Gymnasium* although they were only recommended for *Realschule*. Hence, parents with a higher level of educational attainment are more likely to ignore a primary school recommendation than parents from a lower educational background with regard to more prestigious school tracking. This may arguably be due to differing levels of parental confidence about children's ability to meet the higher requirements of the *Gymnasium*.

However, the parental decision-making process is difficult to track. Survey results for Hamburg (Lehmann *et al.,* 1997) reveal that children of fathers with higher educational credentials did not attend *Gymnasium* despite a recommendation to the contrary, more often than children of fathers with a lower level of educational attainment. Nevertheless, the literature generally assumes that families of lower social classes take fewer risks in regard to

higher secondary school tracks than families of higher socio-economic classes (Schimpl-Neimanns, 2000; Ditton, 1992; Stallmann, 1990).

Figure 4: *School attendance by level of parental education and primary school recommendation in Rheinland-Pfalz*



Source: Mahr-Georg, 1999.
Note: 'Rec.' stands for 'recommended to'.

In addition to differing parental aspirations for the secondary school track there are other reasons why children from lower socio-economic backgrounds who perform well at school are disadvantaged in comparison to their counterparts. By conducting an ability test at the beginning of 5th grade examining reading, writing, mathematics and literacy skills, Lehmann *et al.* (1997) demonstrated that teachers expect higher school performance from children with lower parental education for issuing a *Gymnasium* recommendation (Ditton, 1992; Lehmann *et al.*, 1997). Children whose father's educational attainment was a *Hauptschule* qualification or below had to have significantly higher test scores for a *Gymnasium* recommendation than children with fathers with a higher level of educational attainment.

It is difficult to estimate whether and to what extent, biased primary school recommendations or the less demanding school track aspirations of parents with lower levels of education, or other additional factors impact on a biased tracking of children from lower socio-economic background. Nevertheless, using TIMSS data Table 5 presents evidence that the final selection results indicate a clear relation between socio-economic background, ability and secondary school track.

Table 5: *Hauptschule and Realschule pupils with better test scores than the bottom quartile of Gymnasium and Realschule (Q25) by parental background*

% of respective school track	Parental education	*Gymnasium* Mathematics	*Gymnasium* Science	*Realschule* Mathematics	*Realschule* Science
Hauptschule	No tertiary	11.8	19.1	50.8	54.6
	Tertiary	6.7	14.8	36.6	41.9
Realschule	No tertiary	31.2	39.3	78.4	79.3
	Tertiary	28.5	35.2	73.8	72

Source: TIMSS, 7th grade, author's own calculations.

If we make a breakdown of the data by parental background (see Table 3), we find that more than half of all *Hauptschule* pupils with a low level of parental education, and a third of those with a high level of parental education report better scores for mathematics than the bottom quartile of *Realschule* pupils. For the other subjects and school tracks we also find that a smaller proportion of children whose parents completed tertiary education, but a much larger proportion of children with less well educated parents could fit perfectly well into *Realschule* or *Gymnasium* respectively.

The general trend, that children with lower parental background obtain better test scores than those from a higher socio-economic background in *Hauptschule* and *Realschule* is also reflected in the differing mean levels of achievement for pupils in the respective school tracks. For TIMSS the average mathematics score for 7th graders in *Hauptschule* is 419. *Hauptschule* pupils of parents with tertiary education display a poorer average of 414, whilst pupils with parents of upper secondary education level show an average mathematics score of 430, and children with the least educated parents achieve the highest *Hauptschule* average with 441. Differences between these means of students whose parents completed tertiary education and those with parents below upper secondary schooling are significant.[38] The picture is similar for differences among pupils with different parental backgrounds in *Realschule* where pupils with the lowest level of parental education display significantly better test scores than pupils with highest parental education.[39]

[38] Testing the hypothesis that the mean of pupils with the highest educated parents and the mean of pupils with the lowest educated parents is equal leads to a rejection of this hypothesis with a *t*-statistic of $t = 2.28$ (5 per cent level). While there is no significant difference between the means of pupils whose parents have the lowest or middle-range educational qualifications, there appears to be a significant difference between pupils whose parents hold tertiary education and those with only upper secondary education ($t = 1.9$, 10 per cent level).

[39] The total average for mathematics achievement in *Realschule* is 478. While children whose parents have tertiary credentials achieve an average of 472, pupils whose parents only completed upper secondary education report an average of 483 and were insignificantly surpassed by children

Taken together, children from lower educated parental backgrounds have more disadvantaged home learning environments and generally demonstrate a lower level of ability and thus account for a larger proportion in the less prestigious school tracks. Moreover, there are a series of indicators which demonstrate that children from lower socio-economic backgrounds face educational inequalities insofar as they need to have a higher level of ability for being recommended to *Gymnasium,* and if they tackle this impediment they may also receive less encouragement for attending *Gymnasium* from their parents than children from more advantageous parental backgrounds. Indeed, TIMSS data indicate that respectively in *Hauptschule* and *Realschule* pupils from lower socio-economic class backgrounds display better average achievement than their counterparts.

Hence, we expect to reject, Hypothesis 1*: Children with parents of a higher socio-economic background are not more likely to attend Gymnasium than other pupils, conditional on ability.*

▪ 4.2.2 *Gender*

In 1998, every fifth man aged 50–54 held an *Abitur* or *Fachhochschulreife*, in contrast to every eighth woman in the same age cohort. In more recent cohorts, however, this blueprint of gender inequality in educational attainment has vanished[40] and women aged 20–24 now account for 35 per cent and men only 31 per cent of those holding *Abitur* or *Fachhochschulreife*. This trend is confirmed by PISA data, illustrating that in 2000 about 56 per cent *Gymnasium* pupils were girls while boys were over-represented in the *Hauptschule* at 55 per cent (Baumert *et al.,* 2001).[41]

Is this advantage due to a higher level of academic ability on the part of girls, or do boys face educational inequalities? Figure 5 presents a comparison of gender-specific educational scores in the *Gymnasium* for 9th graders in the key subjects of mathematics and reading literacy. A disproportionately high share of boys display mathematics scores above the average for *Gymnasium*, indicating the much lower average capability of girls in this subject. On the other hand, girls display noticeably better results in reading than their male counterparts.[42] Hence, given mathematics capabilities, a higher share of girls would fit into less academic school tracks, but given reading achievement a

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of the least educated parents with a test score of 484. Nevertheless, the *t*-test checking the hypothesis whether the mean of pupils with highest and lowest educated parents is equal rejects this assumption with a *t*-statistic of $t = 1.9$.

[40] However, although the positive trend of gender equality is prevalent in secondary education it has not yet percolated up to university attendance and vocational training (Böttcher and Klemm, 2000).

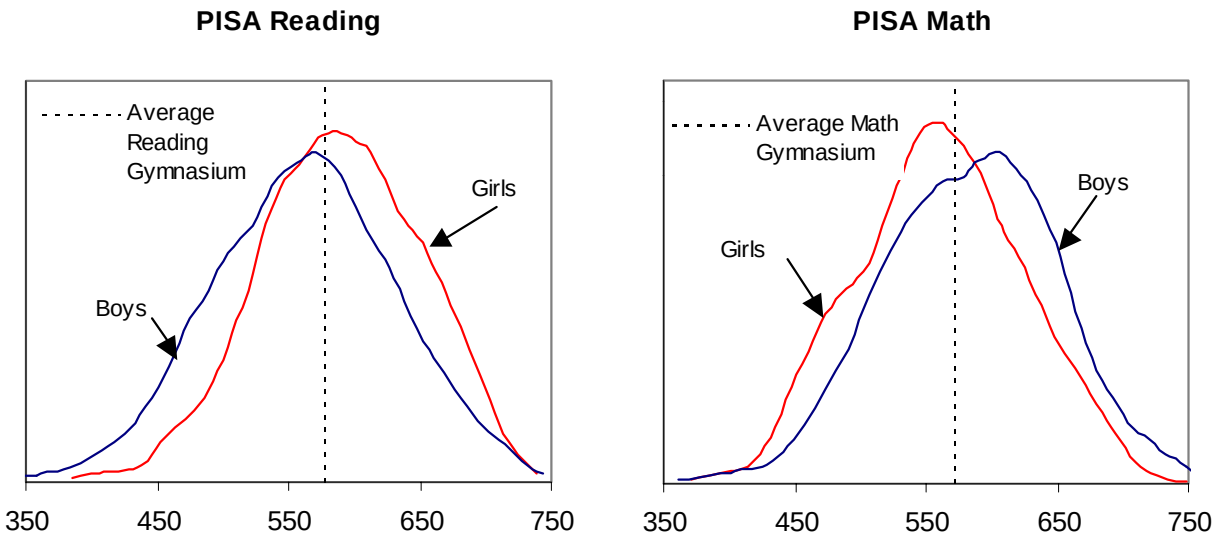
[41] TIMSS data give an even more pronounced overrepresentation of girls in more academic school tracks. In 1995 about 58 per cent of *Gymnasium* pupils were girls, while they comprised only 40 per cent of *Hauptschule* pupils.

[42] For a detailed description on gender differences by subjects and school tracks, see Baumert *et al.* (2001).

higher share of boys could be tracked to the *Realschule*. However, there is evidence to suggest that girls are more likely to receive a recommendation for *Gymnasium* irrespective of ability in either mathematics or reading ability subjects. A study of pupils at the end of 4th grade in Hamburg demonstrated that girls could score lower but still be recommended to the most academic school track than their male counterparts (Lehmann *et al.*, 1997).

We therefore expect to reject Hypothesis 2: *Girls are as likely to be tracked to Gymnasium as boys conditional on ability*.

Figure 5: *Pupil achievement in Gymnasium in reading and mathematics by gender*



Source: PISA 2000, 9th graders in *Gymnasium*, author's own calculations.

▪ 4.2.3 *Migrant status*

In recent decades immigration has altered Germany's demographic structure[43] due to migrants' diverse age composition and their higher fertility rates.[44] Today, migrant children account for almost 10 per cent of all children in the public education system (Statistisches Bundesamt, 2000a), and over 12 per cent of children born in 1999 were the sons or daughters of non-nationals so that migrant children will tend to account for an increasing share of the education population.[45]

[43] For a detailed overview on the demographic composition of migrants, see Fertig and Schmidt (2001).

[44] The share of migrants differs very much across *Länder*: the lowest share of migrants can be found in the new (ex DDR) *Länder* with normally below 2 per cent, while in Hamburg 18.2 per cent of the population were migrants in 1997 (Karakasoglu-Aydin, 2001). Furthermore, there are striking variations between rural and urban areas.

[45] Information of Statistisches Bundesamt based on Table B15 (Bevölkerung am 31.12.1999 nach Alters- und Geburtsjahren), www.destatis.de.

Beside the higher proportion of migrants' offspring[46] who leave secondary school without any qualification,[47] their participation in respective school tracks illustrates that non-nationals do not keep up with the schooling attainments of German nationals. In the school year 1999/2000 the share of non-nationals in the *Hauptschule* was almost twice as high as the total share of non-nationals in the school system, whilst non-nationals were underrepresented in the *Realschule* and *Gymnasium* (Statistisches Bundesamt, 2000a).

Migrants' lower access to more academic school tracks may be accounted for by their diverse socio-economic background, since the educational credentials of migrant parents are generally poorer than those of German nationals (Frick and Wagner, 2001). Given that lower levels of parental education influence pupils' allocation of school track, we would expect the disadvantage of migrants in attending *Gymnasium* to decrease when controlling for parental socio-economic background. Nevertheless, we assume that the marked differences between German nationals and migrants in school attendance cannot be explained solely by parental socio-economic background.

Consequently we expect to reject Hypothesis 3a: *Migrants are as likely to attend Gymnasium as German nationals unconditional on ability and conditional on parental education*.

The lower attendance levels of migrants in *Gymnasium* may be accounted for by their generally lower educational performance or by inequality in tracking. Lehmann *et al.* (1997) has demonstrated that migrants may display lower capabilities than German nationals and still obtain a recommendation for *Gymnasium*. Additionally, there is evidence that migrant status is not significant for *Gymnasium* attendance once ability is controlled for (Frick and Wagner, 2001; Baumert *et al.*, 2001). Indeed, migrants' lower attendance in more prestigious school tracks does not appear to be the result of educational inequalities (see Table 6). Generally speaking, more German nationals than migrants seem to be tracked lower than their displayed achievement would suggest. About 9 per cent of German nationals in *Hauptschule* display better mathematics test scores than the lower bottom of *Gymnasium* pupils, as opposed to about 4 per cent of migrants. Additionally, about 15 per cent more German nationals than migrants in *Hauptschule* obtained mathematics test results above the bottom quartile of *Realschule*. In line with these results we find migrants' significantly lower average achievement in each of the school

[46] In Germany migrants fall into two main groups: migrant workers from Mediterranean countries who emigrated to Germany in the 1960s and 1970s (the so-called 'guest-workers'), and immigrants from Eastern Europe who arrived after the fall of the Berlin wall in October 1989 (the so-called 'ethnic Germans') and who have German citizenship. The following definition of migrants includes the German-born foreigner and foreign-born foreigners and excludes ethnic Germans.

[47] In 1998, 8.1 per cent of German nationals left school without receiving any educational qualification, but this figure rises to 17.6 per cent for non-nationals (Bellenberg *et al.*, 2001).

tracks. German nationals obtained an average mathematics test score of 546 in *Gymnasium*, pupils with one migrant as parent displayed an average of 535 and outstripped the average of pupils where both parents were migrants (519).[48]

Table 6: *Hauptschule and Realschule pupils with better test scores than the bottom quartile of Gymnasium and Realschule (Q25) by migrant status*

% of respective school track	Migration	*Gymnasium* Mathematics	*Gymnasium* Science	*Realschule* Mathematics	*Realschule* Science
Hauptschule	German national[49]	9.4	15.8	42.8	45.7
	Migrant	4.2	2.7	28.0	17.6
Realschule	German national	31.1	37.3	77.4	78.3
	Migrant	16.3	19.8	51.6	40.8

Source: TIMSS 1995, 7th graders, author's own calculations.

This leads to the expectation that we will reject Hypothesis 3b: *Migrants differ from Germans regarding their probability of attending Gymnasium conditional on ability and parental education*.

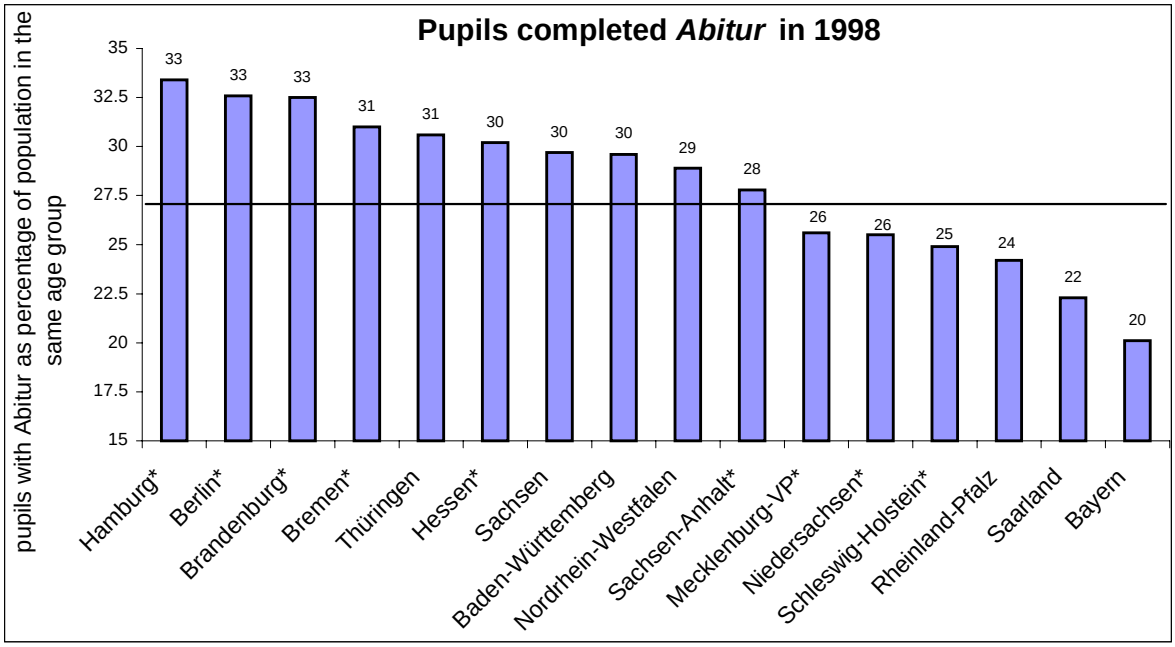
▪ 4.2.4 *Region*

Children's chances of attending higher secondary schooling is also shaped by the region where schools are situated, especially the *Land* of residence. The *Land* variable for PISA and TIMSS is not available to the author, so that the regression analysis cannot take into account differences between *Länder*. Nevertheless, there is evidence of *Land*-specific educational disparities and inequalities. Figure 6 illustrates the percentage of those who completed the *Abitur* in 1998 by *Land*. In Bayern only a fifth of pupils finished schooling with the completion of *Gymnasium*, whereas in Hamburg, Berlin and Brandenburg about a third of children received the *Abitur*.

[48] Author's own calculations, TIMSS 1995, 7th graders. Differences of means between German nationals and pupils with one migrant parent are on a 5 per cent level significant; mean differences between pupils with one and pupils with two migrant parents are on the 10 per cent level significant. The same pattern of migrants' lower performance within school tracks results also by using PISA data and examining migrants' achievement in *Realschule* and *Hauptschule*.

[49] The term 'nationals' or 'German national' is defined as children having at least one German parent, whereas in the case of migrants both parents have immigrated to Germany.

Figure 6: *Pupils who obtained the Abitur in 1998*



Source: KMK, 2000b; Avenarius and Jeand'Heur, 1992; Land legislation.

Note: The figures present the average for those aged 17–20 (12 years' schooling) or the average for those aged 18–21 (13 years' schooling) of the population that received *Abitur* in 1998 and were registered in respective *Länder*. * indicates that parents had a choice in the secondary school track decision in 1990.

We can assume that the distribution of children with high and low ability is roughly the same across *Länder*, i.e. there is no reason to assume that children in Bayern should be less intelligent than those in Hamburg. Hence, the disparities between the shares of pupils who obtained *Abitur* appear relatively high. We can therefore assume that pupils in different *Länder* have diverse probabilities of attending *Gymnasium* quite irrespective of their educational ability. However, diversely restrictive *Land* regulations on the selection process seem not to impact on the respectively displayed average figure on *Gymnasium* attendance (Baumert *et al.,* 2002). The asterisks indicating that parents had a choice in the secondary school track decision in 1990[50] are relatively equally distributed between *Länder* with higher and lower numbers of pupils completing *Abitur*.

Nevertheless, using PISA data Baumert *et al.* (2002) report that the lower the *Land*-specific level of *Gymnasium* attendance, the better the average *Gymnasium* achievement in mathematics, science and reading for 9th graders. Although *Gymnasium* attendance cannot explain all the differences between differing levels of achievement in *Gymnasium* across *Länder*,[51] it does

[50] The school decision for pupils who received the *Abitur* in 1998 must have taken place around the year 1990.

[51] The relation between *Land*-specific average in *Gymnasium* attendance and average reading literacy in *Gymnasium* is $r = -0.34$. For mathematics Baumert *et al.* (2002) obtained a relation of $r = -0.54$.

indicate that generally higher selectivity leads to a better level of achievement for a smaller group of children.

In addition to educational disparities in *Gymnasium* attendance across *Länder* there is also evidence for *Land*-specific educational inequalities. Conditional on ability, children from high-status families had the best chances of attending *Gymnasium* in Bayern, the Rheinland-Pfalz and Schleswig-Holstein (Baumert *et al.,* 2002). Hence, in these *Länder*, where *Gymnasium* attendance is relatively low, social origin may exert more influence on children's selection into secondary school tracks. However, in some *Länder* where average *Gymnasium* attendance is high, educational inequalities also appear to be great.[52] This may indicate that other factors such as *Land* educational legislation, educational implementation and school rules may also impact on the decision on the secondary school choice.

Besides the lack of research literature on the outcomes of *Land* legislation on the selection process, there is also a lack of research on educational disparities below the *Land* level. However, there is evidence to suggest that unconditional on ability, children in metropolitan areas have a slightly higher probability of being enrolled in *Gymnasium* (Frick and Wagner, 2001). This may be due to the fact that different socio-economic and cultural milieus prevail across different geographical areas and mirror the differing social class, education attainment and occupation as well as the income and origin of the inhabitants. Additionally, educational supply in secondary schools differs between urban and rural regions. Since the number of children in rural areas is generally lower, the *Gesamtschule* offering schooling for children of all abilities seems to be more efficient in terms of meeting the general demand for education. Furthermore, parental decision to send children to a specific secondary school is much more guided by the practical problem of the distance children have to travel each day in rural areas than in metropolitan areas. Therefore, in rural areas children's ability may exert less influence on the decision on differential secondary school selection.[53]

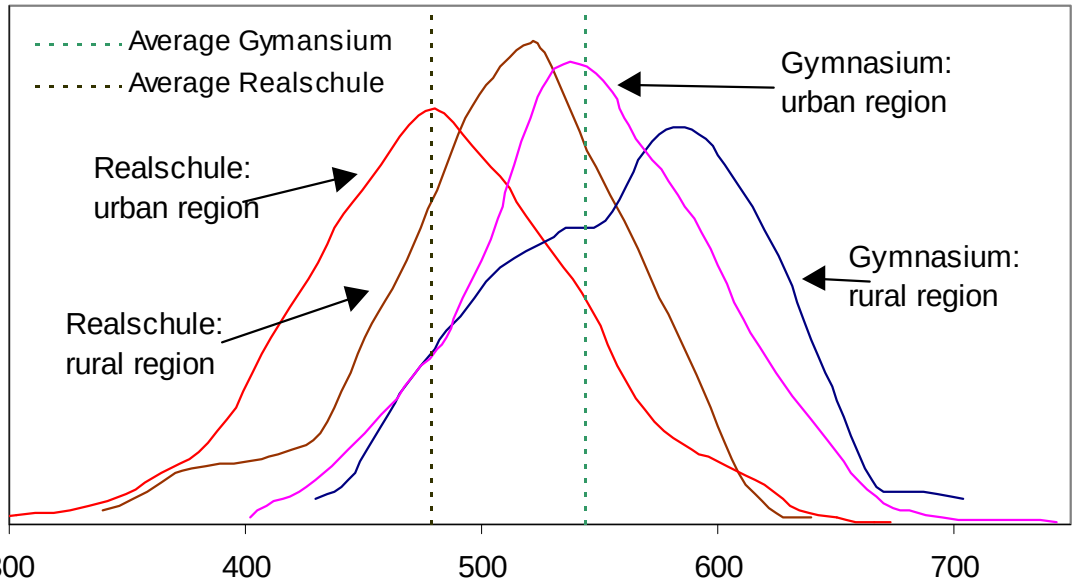
Figure 7 highlights the differences in the selection of pupils from urban and rural areas to *Gymnasium* and *Realschule* by their level of achievement. Indeed, the peak of students in urban areas tracked to *Gymnasium* and *Realschule* meets the average mathematics test score of their school form. However, the achievement levels of those from rural areas for both school tracks are markedly above those of their urban counterparts: the largest share of rural children in *Realschule* report mathematical capabilities more in line

[52] For example, if we focus on the correlation between social class and *Gymnasium* attendance controlling for children's ability, Baden-Württemberg reports the second highest relation of both factors, although *Gymnasium* attendance in this *Land* is relatively high. Nevertheless, in addition to Baden-Württemberg, the Rheinland-Pfalz, Niedersachen, Schleswig-Holstein, Bayern and Saarland also display a high correlation between social origin and *Gymnasium* attendance (Baumert *et al.,* 2002, Table 6.4). These are the *Länder* where *Gymnasium* selectivity is highest.

[53] This might also be true due to the general pattern that *Länder* with lower shares of pupils completing Abitur (see Figure 6) tend to have a higher share of rural population.

with those of the *Gymnasium* average than that of the *Realschule*. Probably due to this vast range of students from rural areas who performed well at primary school tracked to the *Realschule*, the distribution of achievement levels in mathematics for pupils from rural areas in *Gymnasium* is shifted to even higher test scores than the average of the most academic school track. Moreover, in both the TIMSS and PISA data, the average achievement level by school track and region reflects that students from rural areas display test scores significantly better than their urban counterparts.[54]

Figure 7: *Educational achievement levels in Gymnasium and Realschule by region*



Source: TIMSS 1995, 7th graders, author's own calculations.

Hence, we are likely to reject Hypothesis 4: *Children in rural areas are as likely to attend Gymnasium as children in urban areas conditional on ability*.

[54] For TIMSS's 7th graders we obtained the following average achievements in mathematics by school track and region. In *Gymnasium* rural children displayed a test score for mathematics of 563 in contrast to urban students' average achievement of 547. In *Realschule* rural children obtained on average 25 test points more than their urban counterparts. The differences of both groups are slightly smaller for rural children (437) and urban children (416) in *Hauptschule*. The *t*-test on the equality of means reveals that these differences between regions are significant on the 1 per cent level for *Realschule* and *Hauptschule*. Moreover, the focus on 9th graders in the PISA sample shows that students from rural areas display significantly better average achievements in *Hauptschule* for mathematics and reading and in *Realschule* for mathematics.

▪ 4.3 *Research Design*

▪ 4.3.1 *Data*

The data used to measure educational inequalities in Germany is taken from two cross-national surveys of learning achievement, the Third International Mathematics and Science Study (TIMSS), and the Programme for International Student Assessment (PISA).[55]

▪ 4.3.2 *Model*

On the basis of the hypotheses developed in section 4.2 we assume that the probability of *Gymnasium* attendance is determined according to the following model:

$$P(Gym_i) = F(\alpha + A_i\sigma + G_i\omega + R_i\chi + N_i\delta + SE_i\phi + FT_i\zeta + GR_i\omega)$$

where *A* denotes a pupil's level of achievement, *G* is gender, *R* is the region where the pupil's school is situated, *N* captures pupil's nationality, *SE* is the socio-economic background of parents, *FT* refers to pupil's family type, and *GR* controls for students' diverse levels of achievement in respective grades. Results were obtained from maximum likelihood estimation of the probability[56] of attending *Gymnasium* by using a logistic regression, revealing the importance of the various variables for attending the *Gymnasium*. Hence, we limit our examination to factors determining *Gymnasium* attendance and omit participation in *Hauptschule* and *Realschule* as dependent variables. Since the *Gymnasium* is the most prestigious school track leading to university entry and to prestigious vocational apprenticeships, factors impeding *Gymnasium* participation are most important for scrutinising educational inequalities. The focus of our model relies therefore on the probability of attending *Gymnasium* in comparison to the probability of participating in *Realschule, Hauptschule* or *Gesamtschule*.[57]

Since there is no nation-wide data available on 5th graders, the data used here measure the factors determining school choice in a late state of schooling. By focusing on 8th graders' abilities[58] taken from PISA and TIMSS, our data measure factors determining selection about three to four years after the selection process. This time lag is advantageous insofar as it allows us to take into account the not negligible number of pupils who are tracked two

[55] See Introduction for a description of these two surveys.

[56] The functional form adopted for *p* is the logit given by: $p = 1/(1 + (\exp(-\beta x))$.

[57] Pupils attending *Gesamtschule* were not omitted since they comprise about 10 per cent of the entire sample. Additionally, only a very small percentage of these pupils completed *Gesamtschule* with the final certificate or *Abitur* (see 2.1). However, running the regressions without the population in *Gesamtschule* gives us very similar results.

[58] We also include pupils from other grades in our regression by controlling for differing abilities of these students in comparison to 8th graders (variable GR).

years after the 4th grade.[59] On the other hand, the use of data quantifying ability in the 8th rather than the 5th grade raises the question of whether we use our model to measure data on:

(a) the probability for 8th graders to be selected to *Gymnasium and* of their post-transitional shift to *Gymnasium* dependent on social background factors (thus focusing on $t = 8^{th}$ grade for all variables in our model);

or whether we can additionally examine,

(b) the probability of being selected to *Gymnasium* dependent on social background factors (thus focusing on $t = 5^{th}$ grade although our data reflects 5th grade +3 years).

While (a) focuses on educational inequalities in secondary schooling in general, (b) may add additional information on educational inequalities that drive the selection process. In addition to general educational inequality in secondary schooling, we want to interpret regression results by examining (b). Hence, we may be dealing with endogenous effects such as *Gymnasium* attendance probably determining children's ability, although we only want to measure to what extent children's ability impacts on *Gymnasium* participation. However, there are a number of reasons why these endogenous effects are marginal and more likely to underestimate educational inequalities, so that our research outcome for (a) also describes our research interest formulated in (b).

First, due to the low level of secondary school permeability we assume that even three to four years after selection the dependent variable *Gymnasium* attendance is an accurate reflection of the school choice in the 5th grade of schooling. Additionally, parental socio-economic background and nationality as well as school's region are unlikely to have changed in this brief period. However, ability coefficients may be biased, since they reflect student's ability about three to four years after the transition process. Nevertheless, as discussed in section 4.1,[60] schooling within respective school environments leads to an adaptation of pupils' school performance within school tracks (Lehmann *et al.*, 1997). We can therefore suppose that differences in ability decline within school tracks during 3 years of schooling while they increase between school tracks (Baumert *et al.*, 2001; Schnabel and Schwippert, 2000). Hence, the bias in the achievement variable will probably lead to an *overestimation* of the importance of level of achievement in explaining the choice of school track and to an *underestimation* of the influence of parental background factors.[61] Therefore, results on educational

[59] For example, pupils in Berlin and Brandenburg and in the 'orientation stage' are not normally selected to respective school tracks before the end of the 6th grade (see section 2.2).

[60] See also note 30 above.

[61] For example, *Hauptschule* pupils who perform well are likely to come from less prestigious parental socio-economic backgrounds (see section 4.2.1). Since children with an already high level of ability will tend to acquire new knowledge less rapidly than their lower performing counterparts in the same school track (Lehmann *et al.*, 1997), their educational advantage is likely to decline over time in comparison to that of their counterparts in the same school track. Hence, the impact of

inequalities are more likely to underestimate the influence of parental background factors on the school-track decision taking place three to four years earlier. Hence, an endogenous impact of the variable 'ability' is unlikely to overestimate a potentially resulting biased access to academic school tracks. Our regression model is, therefore, likely to reveal information on both research interests (a) and (b) so that we will mainly focus on factors determining the transition process.

▪ 4.3.3 *Variables*

Table 7 presents the variables used and their coding for both surveys. Table A1 in the Appendix gives the summary statistics for the variables for TIMSS, Table A2 for PISA including the respective sample sizes. The Appendix also gives a summary of the relatively small differences in coding between TIMSS and PISA variables.

Ability

As discussed in section 2 the primary school recommendation is generally based on a pupil's level of achievement in the core subjects of mathematics and German which includes reading, writing and comprehension skills. Since TIMSS only covers levels of achievement in mathematics but not German literacy skills,[62] we can operationalise ability only by controlling for mathematics knowledge when using these data. Interpretations of the results have to bear in mind that our measurement of 'ability' may be biased, since pupils who perform best in mathematics do not necessarily achieve similar scores in reading. However, PISA data allows us to control for both reading and mathematics literacy.

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the parental socio-economic background is underestimated since pupils from lower socio-economic background are likely to face a smaller increase of abilities within *Hauptschule*. The same effect occurs for the variables region, since pupils in rural areas are more likely to build the 'better part' of *Hauptschule* pupils, while urban pupils comprise the 'lower part' of *Gymnasium* pupils (see section 4.2.4).

[62] Although skills in science, which are available in TIMSS, are slightly correlated with literacy (UNICEF, 2002), achievements in science measure predominantly children's skills related to subjects which were not introduced before secondary schooling.

Table 7: *Variables and coding*

Term used in formula	**Variable**	**Coding of variable**
Dependent variable	*Gymnasium*	1 = *Gymnasium* attendance, 0 = other
Independent variables		
A (ability)	Reading test score (*only PISA*)	Metric science test scores
	Maths test score	Metric maths test scores
G (gender)	Gender	0 = female, 1 = male
R (region)	Region	0 = urban area, 1 = rural area
	Missing region	0 = region available, 1 = missing value
N (nationality)	Language	0 = respondent always speaks German at home, 1= rest
	Missing language (*only TIMSS*)	0 = language available, 1= missing value
	Parents Migrants	0 = at least one parent born in Germany, 1 = both parents migrants
SE (Parents' socio-economic background)	Books in household	0 = 0–100 books, 1 = more than 100 books
	(Parents below upper secondary)	(Control group: neither parent completed secondary education)
	Parents upper secondary	1 = at least one parent completed upper secondary education, credentials of both parents are below tertiary education, 0 = rest
	Parents tertiary	1 = at least one parent holds some tertiary education (university or vocational training), 0 = rest
	Missing education	0 = parental education available, 1 = missing value
GR (grade)	Grade 7, Grade 9, Grade 10 (*only PISA*)	0 = other grade, 1 = respectively grade 7, 9 or 10 (control group: grade 8)
	Grade (*only TIMSS*)	0 = grade 8, 1 = grade 7
FT (Family type)	Single parent	0 = nuclear family, 1 = single parent
	Sibling	0 = child without siblings, 1 = other

Grade

The need to control for pupil's grade derives from the special design of the dataset that includes 7th and 8th graders in TIMSS and additionally 9th and 10th graders in PISA.[63] Children in different grades are likely to display varying average abilities due to a different number of years spent in school.[64] Hence, in regressions where we control for ability we also controlled for diverse ability within different grades[65] (see the Appendix for a detailed description of the regression calculations).

▪ 4.4 *Results*

Table 8 presents the results of the logistic regression for TIMSS data and Table 9 gives the results for PISA data. Both tables present similar regression models for each column with the exception of the different measures for ability[66] and slightly differing coding for variables on parental education and region (see Appendix). As an aid to judging the importance of the estimated parameter we used the following equation:

$$\frac{dp}{dx_i} = p(1-p)\beta_i$$

where x_i is the *i*th element of the independent variables in our model. Thus, at p=0.5, the estimated effect on the predicted probability of a unit change in a continuous variable, or the turning on of a dummy variable, is approximately equal to

$$\beta_i / 4$$

▪ 4.4.1 *Parental socio-economic background*

Columns 1 of Tables 8 and 9 report the regression results for parental socio-economic background unconditional on ability. We measure parental background by the variables 'books in household' and by the distinction between parents without completed upper secondary education (control group), parents with completed upper secondary education, and parents with tertiary education. In line with the literature, the regression results confirm that parental socio-economic factors have a significant impact and in the expected direction for *Gymnasium* attendance. Given a predicted probability of *Gymnasium* attendance of one-half, children of parents who completed

[63] For the purposes of analysis, we omitted 3 pupils in grade 11 and 1 pupil in grade 6 of the original PISA sample.

[64] In the regressions grades were included to maximise the sample size.

[65] In the results the positive coefficient for 7th graders in TIMSS shows that pupils with one year less schooling are more likely to attend *Gymnasium* once ability is controlled for because their average ability is smaller than that of 8th graders.

[66] Ability with TIMSS data is only measured by focusing on achievements in mathematics, while we can apply a more comprehensive definition of achievement by controlling for mathematics and reading literacy with PISA data.

upper secondary education have about a 15 per cent higher probability (0.649/4) using TIMSS data (Table 8), and a 25 per cent greater probability (1.033/4) using PISA data (Table 9) of being tracked to *Gymnasium* than children in the control group. The *ceteris paribus* effect of parents with tertiary education increases a child's probability by some 30 percentage points with TIMSS and by about 40 per cent with PISA data. In both surveys children living in households with more than 100 books consistently report a circa 30 per cent higher probability of attending *Gymnasium* than children in households with fewer books.

However, in examining whether children have equal chances of being selected to diversely challenging secondary learning environments it is important to certify whether parental socio-economic background factors remain significant for *Gymnasium* attendance even controlling for ability (Hypothesis 1). Columns 2 of Tables 8 and 9 illustrate the regression results conditional on ability. The improvement of the log-likelihood indicates the high explanatory power of the variable 'mathematics test score' for TIMSS and 'reading' and 'mathematics' literacy for PISA data. Indeed, the higher a child's ability, the greater its probability of attending *Gymnasium*. However, the results consistently show that parental education still has a strongly determining impact on the probability of *Gymnasium* attendance. Children whose parents completed upper secondary schooling display a 12 per cent (TIMSS), and (much higher) 24 per cent (PISA), higher probability of being tracked to *Gymnasium* than the control group (given $p = 0.5$). Using data from both surveys, children whose parents hold some tertiary credentials have a 30 per cent greater probability of being tracked to *Gymnasium*. Hence, the influence of parental education on secondary school attendance decreases only slightly and therefore remains relatively high even when children's ability is controlled for. Children of less educated parents therefore face educational inequalities in the transition process, since they have a much lower probability of being tracked to *Gymnasium* than their counterparts with similar levels of ability. Although the influence of other socio-economic background factors, captured by the variable 'books in household' has decreased by about two-thirds in both surveys once ability is controlled for, they still play an important role for explaining *Gymnasium* attendance besides parental education.

Table 8: *Logistic regression models predicting likelihood of Gymnasium attendance, TIMSS 1995*

	TIMSS 1995 N=5519	(1)	(2)	(3)	(4)	(5)
Ability	Mathematics test score		0.033 (13.88)***			0.033 (14.23)***
Gender	Gender	0.467 (3.65)***	0.934 (5.51)***	0.426 (3.60)***	0.462 (3.69)***	0.931 (5.54)***
Parental socio-economic background	Books in household	1.189 (10.22)***	0.438 (3.59)***		1.154 (10.10)***	0.472 (3.91)***
	Parental tertiary	1.175 (7.52)***	1.136 (5.81)***		1.210 (7.58)***	1.118 (5.66)***
	Parental upper secondary	0.649 (5.38)***	0.519 (3.36)***		0.660 (5.35)***	0.513 (3.26)***
	Education missing	-0.175 (1.19)	0.088 (0.51)		-0.151 (1.02)	0.070 (0.41)
Migrant status	Parents migrants			-0.548 (2.19)**	-0.224 (0.86)	0.071 (0.27)
	Language			-0.401 (2.23)**	-0.366 (2.10)**	0.248 (1.19)
	Language missing			0.362 (0.96)	0.460 (1.23)	0.748 (1.94)*
Region	Region	-2.220 (2.06)**	-2.861 (2.43)**	-2.215 (2.13)**	-2.280 (2.22)**	-3.002 (2.75)***
	Region missing	-0.151 (0.35)	0.199 (0.42)	-0.146 (0.35)	-0.190 (0.45)	0.160 (0.34)
Family type	Single parents	-0.233 (1.87)*	-0.122 (0.84)	-0.322 (2.86)***	-0.265 (2.12)**	-0.141 (1.00)
	Siblings	-0.150 (1.40)	-0.241 (2.07)**	-0.087 (0.83)	-0.134 (1.24)	-0.229 (1.98)**
Grade	Grade		0.674 (6.02)***			0.652 (5.97)***
Statistics	Constant	-1.389 (4.54)***	-18.565 (14.60)***	-0.470 (1.58)	-1.415 (4.39)***	-18.960 (14.98)***
	Pseudo *R*-squared	0.16	0.47	0.07	0.17	0.47
	log-lklhd	-3002.83	-1913.35	-3337.81	-2970.98	-1885.71

Source: TIMSS 1995, author's own calculations.

Note: robust *z* statistics in parentheses;* significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

Table 9: *Logistic regression models predicting likelihood of Gymnasium attendance, PISA 2000*

	PISA 2000 N=2389	(1)	(2)	(3)	(4)	(5)
Ability	Mathematics test score		0.015 (7.75)***			0.015 (7.73)***
	Reading test score		0.011 (6.75)***			0.011 (6.72)***
Gender	Gender	0.383 (2.75)***	0.561 (2.65)***	0.329 (2.52)**	0.384 (2.74)***	0.561 (2.64)***
Parental socio-economic background	Books in household	1.172 (9.16)***	0.418 (2.75)***		1.126 (8.77)***	0.421 (2.77)***
	Parental tertiary	1.586 (10.73)***	1.167 (6.62)***		1.589 (10.71)***	1.166 (6.62)***
	Parental upper secondary	1.033 (6.16)***	0.977 (4.70)***		1.031 (6.13)***	0.976 (4.69)***
	Education missing	-0.298 (1.49)	0.199 (0.80)		-0.150 (0.74)	0.166 (0.65)
Migrant status	Parents migrants			-0.460 (1.85)*	-0.197 (0.74)	0.015 (0.05)
	Language spoken at home			-1.194 (3.52)***	-0.751 (2.28)**	0.211 (0.49)
Region	Region	-1.336 (3.40)***	-1.482 (3.41)***	-1.394 (3.59)***	-1.352 (3.45)***	-1.480 (3.40)***
	Region missing	-0.826 (1.53)	-0.631 (0.99)	-0.897 (1.62)	-0.782 (1.44)	-0.638 (1.01)
Family type	Single parents	-0.345 (1.98)**	-0.297 (1.43)	-0.336 (2.01)**	-0.376 (2.14)**	-0.290 (1.40)
	Siblings	-0.308 (1.83)*	-0.406 (1.98)**	-0.211 (1.50)	-0.297 (1.76)*	-0.406 (1.99)**
Grades	Grade 7		-0.300 (0.18)			-0.443 (0.26)
	Grade9		-0.059 (0.19)			-0.047 (0.15)
	Grade 10		-0.913 (2.42)**			-0.900 (2.41)**
Statistics	Constant	-1.408 (5.20)***	-14.477 (15.19)***	-0.146 (0.61)	-1.351 (4.95)***	-14.538 (14.98)***
	Pseudo *R*-squared	0.22	0.48	0.08	0.22	0.48
	log-lklhd	-1169.23	-786.09	-1371.85	-1162.89	-785.89

Source: PISA 2000, author's own calculations.

Note: robust *z* statistics in parentheses;* significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

▪ 4.4.2 *Gender*

Columns 1, 3 and 4 of Tables 8 and 9 report the regression results unconditional on ability and indicate that girls have about 10 per cent higher probability of attending *Gymnasium* than boys controlling for background factors (and given $p = 0.5$) which confirms the attendance data presented in section 4.2.2.

PISA and TIMSS coefficients on girl's probability of being tracked to *Gymnasium* differ once ability is controlled for. Columns 2 and 5 for TIMSS data (Table 8) display a strikingly higher probability on the part of girls to be selected to the most academic school track (about 25 per cent given $p = 0.5$) than when using PISA data. This is due to the one-sided operationalisation of the variable 'ability' with the subject 'mathematics' by using TIMSS data.[67] The PISA data results, with the application of a more comprehensive measure of ability, are more reliable for estimating gender equality in *Gymnasium* access and reveal that girls are about 14 per cent more likely to be selected to the *Gymnasium* than boys irrespective of a similar level of ability. This may confirm the results of the Hamburg study where girls were found to be more likely than boys to receive a recommendation for *Gymnasium* despite the fact that they displayed similar levels of academic performance. This could be due to the gender inequality in pupil's school selection whereby primary school teacher's assessment of a child's learning and working behaviour will impact on the secondary school recommendation insofar as girls may be more likely to conform to teachers' studying expectations than boys. However, the evidence is that the educational inequality suffered by girls in the 1960s in terms of the likelihood of being tracked to *Gymnasium* (Dahrendorf, 1968) now seems to have shifted to boys.

▪ 4.4.3 *Migrant status*

Columns 3–5 of Tables 8 and 9 present regression results for the impact of migration on *Gymnasium* attendance unconditional on ability and parental background, conditional on parental background (Hypothesis 3a), and conditional on ability and parental background (Hypothesis 3b). Migrant status is measured by two variables: first, whether both parents migrated to Germany, and second whether pupils always speak a language other than German at home.[68]

[67] Since girls tend to perform less well in mathematics, controlling for mathematics alone neglects their much better achievements in reading so that that their likelihood of being tracked to *Gymnasium* is overestimated (see section 4.2.2).

[68] Beside these two variables for being the son or daughter of a migrant, there were also data available on the age at which children immigrated, and respectively mother's and father's migrant status. Regressions run with these variables displayed results with higher standard errors and generally a lower improvement of the model measured by the log-likelihood.

In line with previous research, results in column 3 indicate that migrants are less likely to be tracked to *Gymnasium* than non-migrants. If the language spoken at home is controlled for, migrant pupils still have a circa 10 per cent lower probability with both survey data to attend *Gymnasium* given p=0.5.[69] By using PISA data, pupils who do not speak German at home are 30 per cent less likely to enrol in *Gymnasium*. With TIMSS data the variable 'migration status' has a higher explanatory power than the variable 'language' while the reverse is true for PISA data.

The PISA and TIMSS data reveal (Tables 8 and 9, column 4) that speaking a language other than German at home reduces the chances of being tracked to *Gymnasium* by between 10 (TIMSS) and 20 per cent (PISA) once socio-economic background of parents is controlled for and we measured migration by both variables. Migrant pupils' probability decreases slightly if we do not control for parental immigration.[70] The impact that being a non-national pupil has on *Gymnasium* attendance is confirmed by testing the joint impact of both correlated variables showing that the variables language and parental migration taken together are still significant at the 1 per cent level for PISA and 10 per cent level for TIMSS.[71] Hence, TIMSS and PISA data show that there is still a disadvantage for non-nationals in comparison to German nationals with the same level of parental background although the significance and the value of the coefficient has decreased in comparison to Model (3).

However, we expected to reject the hypothesis that migrants differ from Germans regarding their probability of being tracked to *Gymnasium* conditional on ability and parental education (Hypothesis 3b). Indeed, once we control for ability our two variables measuring migration are no longer significant with either the TIMSS or PISA data (column 5 of Tables 8 and 9). This effect does not only appear due to correlation effects of both variables, since the joint impact of both migration variables also decreased to insignificance.[72] Hence, migrants do not face unequal access to secondary school tracks once we control for parental background and ability.

[69] Running a regression by using only one variable for migrants gave us the following results: for TIMSS the coefficient for language increases to –0.775 (3.40)*** in the regression without parental migration and for migration of parents to –0.825 (3.35)*** without controlling for language; the results for PISA are even more pronounced: parental migration does matter with a coefficient of –1.074 (5.13)*** and language reveals an even larger influence through the coefficient of –1.595 (5.49)***. Hence, also the joint impact of both variables is very high, given χ^2=12.3*** for TIMSS and χ^2 =31.51*** for PISA.

[70] The TIMSS coefficient for the variable language, without controlling for parents' migration, is -0.508 (2.25)**; by including the language variable R^2 increases with 0.01 and the log-likelihood decreases from 2988 to 2958. Hence, including a control variable for non-native children improves the model and this also applies for the PISA data. The language coefficient without controlling for parental migration is –0.913 (3.19)*** for PISA data.

[71] For PISA the test results is χ2=10.17***; for TIMSS we find χ2=5.30*.

[72] For PISA we find an insignificant χ2 = 0.38; the test of the joint hypothesis for TIMSS also results in an insignificant χ2 = 1.94.

Nevertheless, this positive outcome of the regression analysis does not mean that the high level of educational disparity in secondary school attendance between German nationals and migrants presented in section 4.2.3 need not be taken seriously. On the contrary, although migrants may not face inequality in the selection process the regression results imply that they are worse off than German nationals for two reasons. Firstly, the high influence of parental background on children's school chances hits migrants harder than nationals because migrant parents generally have rather low levels of educational attainment; and the fact that non-national pupils generally report lower capabilities than their German counterparts. These two disadvantages explain their great educational disparities. Since migrants will account for about 12 per cent of the future school population, the capability of the German educational system to integrate non-nationals is likely to depend on active strategies that promote learning capabilities of foreign pupils long before the selection process takes place.

▪ 4.4.4 *Region*

Children's school region is measured by the 'region' variable indicating whether the school attended is in a rural or urban area. We expect to reject Hypothesis 4 that, unconditional and conditional on ability, children in rural areas display the same probability of *Gymnasium* attendance as their counterparts in urban areas. Indeed, for both surveys all regression models show a significant and clear relation between region and *Gymnasium* attendance. Given an initial probability of 0.5, children in rural areas are about 35 per cent (PISA), and even 55 per cent (TIMSS) less likely to be tracked to *Gymnasium* than children in urban areas (column 4),[73] and this probability even decreases when ability is controlled for. Hence, children in rural areas face educational inequality in access to *Gymnasium*. Therefore, as expected, we reject Hypothesis 4. Nevertheless, the highly negative effect of rural area on children's probability of being tracked to *Gymnasium* is striking. Both in PISA and TIMSS, the regional dummy has a higher impact on school selection than parental education. *Land*-specific school provisions, pupils' generally lower average Gymnasium attendance in the *Länder* with a higher share of rural population, the distribution of differing regional school-type, diverse infrastructure and parental decision-making processes regarding children's school attendance may interfere with the result of the regional variable.

[73] These differences between both surveys might derive from the different way in which the variable 'region' has been constructed (see Appendix).

Other control variables

Generally, children living in single-parent households report lower levels of educational achievement than children living in nuclear families. Moreover, there is also evidence that children in single-parent households are less likely to be tracked to *Gymnasium* (Frick and Wagner, 2001). The TIMSS and PISA results both consistently reveal that children living in single-parent households have a circa 7 per cent lower probability of being tracked to *Gymnasium* than their counterparts, irrespective of educational ability. However, once we control for children's ability in TIMSS and PISA pupils growing up in single-parent families no longer differ significantly from their counterparts, so that they do not face educational inequalities.

On the other hand, pupils with siblings face educational inequalities, since PISA and TIMSS regression results display consistently a lower probability of *Gymnasium* attendance for children with at least one sibling once we control for children's ability. This is in line with other research reporting that the higher number of siblings the lower children's educational attainment (Hausner and Kuo, 1998; Bauer and Gang, 2000).

▪ 4.4.5 *Summary of results*

Table 10 summarises the results for columns (2) of Tables 8 and 9 for PISA and TIMSS using calculations of predicted probabilities for pupils that display average levels of achievement in *Gymnasium*. For all calculations, 'books in the family' are set above 100 and 8th graders are assumed to live in a two-parent family without siblings. Since the offspring of migrants do not differ significantly from German nationals once ability is controlled for, we focus solely on differences between gender, regions and parental education.

Table 10: *Predicted probabilities of attending Gymnasium by given characteristics*

	Parents with below upper secondary education		Parents with upper secondary education		Parents with tertiary education	
	PISA	TIMSS	PISA	TIMSS	PISA	TIMSS
Boys in rural areas	0.155	0.080	0.327	0.128	0.370	0.213
Girls in rural areas	0.243	0.181	0.460	0.271	0.507	0.408
Boys in urban areas	0.446	0.603	0.681	0.719	0.721	0.826
Girls in urban areas	0.585	0.795	0.789	0.867	0.819	0.923

Source: TIMSS 1995, PISA 2000, author's own calculations.

Note: The predicted probabilities are based on columns (2) of Table 8 for TIMSS and Table 9 for PISA. For all predicted probabilities we set the following base characteristics: ability is the average level of achievement for *Gymnasium* for 8th graders. Hence, for PISA the average *Gymnasium* score is 529 for mathematics and 524 for reading; for TIMSS the average mathematics achievement is 562. Books in households are set to more than 100. 8th graders are assumed as living in a two-parent family without siblings.

The first two rows give the probabilities for boys and girls of average *Gymnasium* ability and living in rural areas by level of parental education. For girls with highest parental education the predicted probability of attending *Gymnasium* is about one half, while only about one third for boys using PISA data. The predicted probability for pupils from rural areas is even lower with TIMSS data. Those living in rural areas whose parents have below upper secondary education have only a 10–20 per cent predicted probability of attending *Gymnasium* although they display the average ability of the most prestigious school track. Boys in rural areas have the worst chances of being tracked to *Gymnasium*. The particularly low predicted probabilities for boys deriving from TIMSS data are due to the lack of a control variable for reading ability in the regression analysis (see section 4.2.2). As rows 3 and 4 show using PISA, living in an urban area doubles the predicted probability of attending *Gymnasium* when boys' parents hold tertiary education. The effect is even greater for boys who come from a lower socio-economic background. Girls living in urban areas with parental education below upper secondary have about four times higher a chance of being tracked to *Gymnasium* than boys in rural areas with the same parental background and abilities.

Hence, although children would perfectly fit to *Gymnasium* due to their high-level achievement (average *Gymnasium*), the region they live in, their socio-economic background or gender impact heavily on their chance of being selected to *Gymnasium*. Using PISA data, the predicted probabilities for attending *Gymnasium* of equally well performing children differ between the low figure of 16 per cent (boys in rural areas with low parental background), and 82 per cent (girls in urban areas with high parental background).

5. Conclusion

This paper examines whether the selection of pupils in the transition from primary to secondary school in Germany is fair. Using PISA and TIMSS data we studied the kind of pupil characteristics that accompany unequal tracking in the transition process. Both surveys indicate that boys from low socio-economic backgrounds and living in rural areas have the lowest chance of being tracked to most prestigious schools even if their school performance is equal to that of their counterparts. A boy has a lower probability of being selected to *Gymnasium* of about 15 per cent conditional on ability. Parental socio-economic background exerts particular weight: TIMSS and PISA data consistently show that pupils whose parents completed tertiary education are about one third more likely to be tracked to the most challenging school track than children in the control group with the same abilities but whose parents do not hold upper secondary education. Children whose parents finished upper secondary schooling still have a 15 per cent better chance of being tracked more prestigiously than the control group. Pupils from rural areas

encounter the highest educational inequalities insofar as their probability of being tracked to *Gymnasium* is at least 35 per cent lower than that of their urban counterparts. Hence, girls living in an urban area from high-status families have a circa five times greater chance of being selected to *Gymnasium* than boys living in rural areas from low-status families and given pupils' equal abilities.

However, PISA and TIMSS data revealed that migrant pupils do not face educational inequalities *per se.* Although the proportion of migrant children enrolled in *Hauptschule* is almost twice as high as the total share of non-nationals in the secondary school system, they do not have a lower probability of being tracked to prestigious school tracks than German nationals once ability and socio-economic background are controlled for. The fact that migrants do not face discrimination in secondary school tracking does not imply that their lower career options and opportunities do not need to be taken seriously. Besides their lower ability, due probably to language problems, migrants are hit harder by educational inequalities deriving from their generally lower socio-economic background than German nationals.

It is difficult to judge whether the existing educational inequalities in the secondary school system imply that the German 'sorting hat' has failed. In Germany tracking is not only organised by one educational authority but also parents have an impact on their children's educational path in the transition process. The unequal tracking of children may well be created not only by an inherent bias in the educational system, but also by diverse parental preferences and we have presented evidence that not only the educational system but also parental preferences help generate such inequalities.

Whatever factors determine mostly the biased sorting process, the outcome in terms of educational inequalities has a persistent impact. Given the limited opportunity to correct the selection process at the age of 10, those who have been unfairly selected to a lower track are likely to end up with lower wages and more limited career options. Hence, it is likely that the educational inequalities inherent in the transition process continue to have an impact on pupils' lives long after they have left school.

There is a clear need to examine whether, and to what extent, newly implemented educational policies and other mechanisms can overcome or offset the educational inequalities inherent in the selection process and its potential long-term impacts. For example, this paper did not examine whether the *Gesamtschule* constitutes a valid alternative to the tripartite system although TIMSS and PISA data on *Gesamtschule* pupils' mean achievement would suggest that this is not the case. A fruitful direction for further research might be to examine the extent to which a postponed transition process leads to decreasing educational inequalities, whether an improvement of the permeability of the secondary school system is a valid mechanism for correcting unequal tracking, and whether promoting disadvantaged children

may increase their chances of equal access to the more prestigious school tracks within the German secondary school system.

APPENDIX

Table A1: *Summary statistics TIMSS 1995*

Variable	No. obs.	Mean	Std. Dev.	Min	Max
Gymnasium	5763	0.349	0.477	0	1
Mathematics	5763	492.385	75.758	99.13	712
Gender	5685	0.508	0.500	0	1
Books	5647	0.502	0.500	0	1
Parents' tertiary education	3516	0.234	0.423	0	1
Parents' upper secondary	3516	0.336	0.472	0	1
Parents' below upper secondary	3516	0.431	0.495	0	1
Migrant parents	5667	0.121	0.326	0	1
Language	4692	0.116	0.321	0	1
Region	3480	0.201	0.400	0	1
Single parent	5763	0.136	0.344	0	1
Sibling	5678	0.775	0.418	0	1
Grade	5763	0.506	0.500	0	1

Source: TIMSS 1995, author's own calculations.

Table A2: *Summary statistics PISA 2000*

Variable	No. obs.	Mean	Std. Dev.	Min	Max
Gymnasium	2830	0.285	0.451	0	1
Reading[74]	2830	482.803	110.963	119.916	732.442
Mathematics	2830	489.804	98.628	142.022	749.236
Gender	2791	0.508	0.5	0	1
Books	2772	0.497	0.5	0	1
Parents' tertiary education	2366	0.257	0.437	0	1
Parents' upper secondary	2366	0.127	0.334	0	1
Parents' below upper secondary	2366	0.616	0.486	0	1
Migrant parents	2754	0.155	0.362	0	1
Language	2556	0.074	0.262	0	1
Region	2552	0.349	0.477	0	1
Single parent	2769	0.121	0.326	0	1
Sibling	2830	0.884	0.320	0	1
Grade 7	2785	0.116	0.107	0	1
Grade 8	2785	0.149	0.356	0	1
Grade 9	2785	0.603	0.489	0	1
Grade 10	2785	0.236	0.425	0	1

Source: PISA 2000, author's own calculations.

[74] For the calculation we used student's weights for the smaller sample size of achievements in mathematics and the average of the 5 plausible values.

Regression calculations

1. Scores for mathematics and reading

Calculations with STATA 7.0 took the mean of the 5 plausible values for the respective subjects and adjusted standard errors for clustering on the primary sampling unit (PSU) 'school' as described in 2. For TIMSS data we used the adjusted new scale scores of the 1995 TIMSS data.[75]

2. Estimation of standard errors

The TIMSS and PISA sampling design includes varying sampling probabilities for different students and data clusters. Besides the need to apply student's weights, we have taken into account that the TIMSS and PISA sampling procedure is based on a two-stage clustered sample design within each country, with the PSU being the school. Hence, observations in the same PSU are not independent, leading to underestimated standard errors. One way to deal with this problem is the use of the jack knife replied replication method. Since this methodological approach has some disadvantages, we controlled for the cluster design by imputing the PSU 'school'. Furthermore, we took the mean of the 5 plausible values. In order to compare the results of both methods we ran regressions with: a) the jack knife replied replication method by using the programme SPSS; and b) the method controlling for the cluster design and the mean of the 5 plausible values by using the program STATA. The parameters for respective variables give similar results, so that the mean of the 5 plausible values does not change the estimated parameters. Furthermore, the similarity between the respectively estimated standard errors shows that the cluster design with STATA does not lead to an underestimation of the standard errors.

For the calculation with PISA we use the students' weight of the smaller sample of students tested in mathematics rather than the weight for reading literacy achievements, since the regressions are based on the smaller sample that only comprises pupils assessed in both subjects.

[75] The 1995 data were rescaled by the International Study Center, Boston College, in order to make them comparable with the 1999 round of TIMSS (Germany did not participate) by using the same calculation model as in 1999 (see Yamamoto and Kulick, 2000).

3. Missing values

Missing values for the variables ‘parental education’ and ‘region’ and for TIMSS additionally of the variable ‘language’, are relatively high for both datasets (see Tables A1 and A2). We assigned these variables the value 0 for missing data and introduced a regional, educational and language dummy variable to control for imputed data. The results of the dummy variables are presented in the regression outcomes. We controlled for our method of dealing with missing values by running regressions with the original variables as well as with imputed values and dummies. The regression results with and without imputed values for the respective variables are almost identical.

TIMSS and PISA — differences in the coding of variables

1. Variables with similar coding

Variables similarly coded for the calculations with TIMSS and PISA are: gender, books, language, parental migration, single parents and siblings.

2. Variables with slightly diverse coding

a) *Achievement variables*

These variables display test scores of the respective survey on educational achievement and reflect therefore a diverse approach in measuring pupils' ability (see Section 1).

b) *Parental education*

As illustrated in Table 4, we constructed a variable displaying parents with tertiary education and parents with upper secondary education. The percentages of the summary statistics (Tables A1 and A2) reveal the diverse proportion of parents with upper secondary education in PISA and TIMSS. In TIMSS, our variable measures whether parents completed an apprenticeship or the *Gymnasium* (TIMSS 1997). For PISA we selected parents with an ISCED-97 level of 3a (OECD 1999), which reflects upper secondary school credentials (e.g. *Fachhochschulreife, Abitur*). Hence, parents who completed apprenticeships could not be included in the variable 'upper secondary' for PISA, so that the average percentage of this group is lower than in the TIMSS data.

c) *Region*

The regional variable distinguishes between schools situated in rural and urban areas. For TIMSS we defined 'rural area' as one where the headmaster responded that the school was situated on the 'outskirts of town' or 'village or town'. In PISA we defined 'rural area' as one where the school was located in villages or towns with about or below 15,000 inhabitants.

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A SORTING HAT THAT FAILS?
THE TRANSITION FROM PRIMARY TO SECONDARY SCHOOL IN GERMANY

Germany ranks lowest regarding educational equalities among OECD countries, as the recently published PISA 'Programme of International Student Assessment' data revealed. This might be due to the remarkable German transition process from primary to secondary school where children are selected into diversely prestigious school environments at an early stage of their intellectual development. This paper aims at examining whether sorting of children is leading to educational inequalities. Based on the two different surveys of learning achievement TIMSS ('Third International Math and Science Study') and PISA we find consistently that although ability is a main criterion of the sorting process, pupils' socio-economic background, their gender and the region they live in also exert a significant influence on the selection results. Since sorting is difficult to correct and school choice determines career options, these educational inequalities in secondary schooling very probably have an impact on pupils' life even long after they have finished school.

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