

EQUITY WITHIN THE EUROPEAN UNION EDUCATION SYSTEMS: A STUDY BASED ON PISA 2015

EQUIDAD EN LOS SISTEMAS EDUCATIVOS DE LA UNIÓN EUROPEA: UN ESTUDIO BASADO EN PISA 2015

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ABSTRACT

Equity in education has recently become a hot topic for international debate and it has gained much interest in the Netherlands as well the last years. In this study, we evaluate and compare equity across the educational systems of European Union member states with a focus on the Dutch context by using PISA 2015 data. PISA 2015 considers inclusive education and fairness as important aspects of equity. Inclusive education is reflected in the segment of students that are 15 years of age and are still in school as well as those students who obtain a basic level to function well in society. Fairness relates to how well countries manage to achieve education outcomes independent of the background characteristics of students. EU countries are compared with one another on these categories using effect sizes derived from differences in PISA scores in science, reading and mathematics. Particular attention is paid to equity results in the Netherlands. Although there is still room for improvement, for many aspects of equity, the Dutch education system scores well when compared to other EU countries.

Keywords: PISA, equity, inclusive education, fairness, structural equation modeling

RESUMEN

La equidad en educación se ha convertido recientemente en un tema central para los debates internacionales y en los Países Bajos también ha adquirido mucho interés en los últimos años. En este estudio evaluamos y comparamos la equidad en los sistemas educativos de los Estados miembros de la Unión Europea en la base de resultados de PISA 2015 haciendo hincapié en el contexto neerlandés. PISA 2015 considera la educación inclusiva y la justicia como unos aspectos importantes de la equidad. La educación inclusiva está reflejada en un segmento de estudiantes de 15 años que siguen estudiando en colegio o ya han obtenido un nivel básico de educación para funcionar en la sociedad. La justicia se relaciona con lo como los países consiguen lograr los resultados buenos de enseñanza independientemente de las características del entorno de los estudiantes. Se comparan los países de la UE entre sí, en estas categorías utilizando los tamaños de efecto derivados de las diferencias en los resultados obtenidos en las evaluaciones de PISA en ciencia, lectura y matemáticas. Se presta una atención especial a los resultados de equidad en los Países Bajos. Aunque todavía queda margen de mejora, el sistema educativo neerlandés tiene una buena puntuación comparando con otros países de la UE.

Palabras clave: PISA, equidad, educación inclusiva.

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INTRODUCTION

PISA, the Programme for International Student Assessment, defines equity in education as providing people the means to benefit from education, regardless of their background, defined by characteristics such as gender, ancestry and socio-economic status (OECD, 2016a). Scholarly literature interprets equity in the following three ways: access to education and resources, quality and diffusion of knowledge and, finally, it may also refer to a responsibility of policy makers to compensate for inequalities that already exist outside of education (Castelli, Ragazzi, & Crescentini, 2012). The topic of equity in the education system is getting more and more political attention in the Netherlands. In 2016, for instance, the Dutch Ministry of Education, Culture and Science presented an action plan designed to help promote equal opportunity in education. This plan was initiated following signals that equity in the Dutch educational system was under pressure. For example, a report by the Dutch Inspectorate of Education found that students whose parents had received little education were less likely to receive a high secondary education track recommendation than children whose parents had been educated to an academic level, even though both sets of pupils achieved similar high scores on the end of primary education test (Inspectorate of Education, 2017). In the international political arena, equity is also a hotly debated topic. Recently, the European Union (EU) found a pressing need to improve equity in the education systems of its member countries (European Union, 2017). The European Commission considers equity in education to be vital to achieve such things as sustainable growth and, as such, also underscores the economic importance of equity within the education sector. Note, however, that this does not mean that all students should achieve the same learning outcomes or that they should be provided with the same education services. It means conditions must be created that minimise any negative influence on learning outcomes as a result of the background characteristics of students. In this context, equity can be regarded as the means to create equality¹.

In this study, we aim to compare equity in education in the Netherlands with other EU countries. In terms of equity, PISA 2015 highlights inclusive education and fairness, in particular. Inclusive education can be defined as ensuring all students gain essential baseline skills. These baseline skills are those that are required to function properly in society. An education system which has not provided large numbers of students with these skills, will be regarded to have failed in terms of inclusiveness (OECD, 2016a). This study will review the inclusiveness of education systems in the EU based on two dimensions. First, we assess the proportion of all 15-year-old students in a certain country who are receiving education. Second, we calculate the subset of students who have at least obtained proficiency level 2 on the PISA core components science, reading and mathematics. Proficiency level 2 can be defined as the basic level required to function properly in society. Fairness refers to the degree to which the background characteristics of students impact education outcomes. Education systems are deemed to be fairer if learning outcomes rely more on the abilities of students and factors which they themselves can influence, such as willpower. Education systems are seen as less fair when learning outcomes depend more on background characteristics which students can't influence such as their gender, immigration background and socio-economic status (OECD, 2016a). This study evaluates to what extent PISA scores differ between relevant subpopulations in EU countries, as well as how any observed differences between these groups found in the Netherlands relate to those in other countries. We first evaluate the relationship between the various background characteristics of students and PISA scores separately. Next, we also evaluate the combined relationship between the background characteristics and PISA scores. The latter is important as there may be substantial overlap in the prevalence of background characteristics. The combined effect gives the most complete picture of fairness in the education systems across Europe.

¹ <https://en.unesco.org/world-education-forum-2015/5-key-themes/equity-education>

This study compares the inclusiveness and fairness of education systems in all EU countries in order to gauge how the results in the Netherlands compare to other European countries. This article will address the following two research questions:

1. What is the extent of the inclusiveness of education systems in various European Union countries?
2. To what degree are European Union countries able to minimise the effects of background characteristics on learning outcomes?

1. METHODS

PISA is an international comparative study, evaluating knowledge and skills in among others the key subjects science, reading and mathematics of 15-year-old students worldwide. It started in 2000 under the auspices of the Organisation for Economic Co-operation and Development (OECD). PISA is conducted in three year cycles with each cycle featuring a different core component. Since the first cycle in 2000, the number of countries and students participating in PISA has increased. In total, more than 500,000 students from 73 different countries and economies took part in PISA 2015. All 35 countries who are members of the OECD, as well as 34 non-member states (so-called partner countries) and 4 regional entities participated in PISA 2015. This study covers 27 out of 28 EU member countries that have taken part in PISA 2015². Overall, 176,543 students in the EU have participated in PISA 2015.

PISA cognitive results are presented using scales that are standardised to an international (OECD) average of 500 with a standard deviation of 100. Student background characteristics that are included in this study are gender, immigration background, language spoken at home, age and an index of economic social and cultural status (ESCS). Percentages by country for these variables are found in the appendix. Gender is simply measured by asking students if they are a boy or a girl. Immigration background is measured by asking students to indicate where they and their parents were born. Student responses were divided into three categories: students with at least one parent born in the country in which the test was taken with the student born in that country as well; students with both parents born in a different country, but with the student born in the country in which the test was taken; and students born in a country other than the one in which the test was taken. Since that last category only occurs rarely in some EU countries, a classification was made for students who belong to the first group (indicated here as students without an immigration background) and a single group of students that belong to the second and third categories, indicated as students with an immigration background. The differences between the percentages of students with an immigration background in a country are large in the EU, which can be seen in Appendix Table 3. In Luxembourg, more than half of the students have an immigration background, while that is less than a half percent in Poland. In the Netherlands, nearly 11% of students have an immigration background. Students were asked what language they typically spoke at home. After categorization, there were two possible responses: the language in which the test was taken or a different language. Malta (87.72%) and Luxembourg (84.47%) were the two main outliers with regard to the percentage of students who speak a different language at home than the one they took the test in. In the Netherlands, more than 7% of students speak a language other than Dutch at home. The age of the student is determined by subtracting the birth year and month of the students from the date of testing. The differences between average age per country are very small. In PISA, the economic social and cultural status of the students is measured by the ESCS index. This index is composed of four underlying constructs: an indicator for the education level of the parents; an indicator for the employment positions of the parents;

² Cyprus has not been included in this study as it not included in the regular PISA database (https://webfs.oecd.org/pisa/PUF_SPSS_COMBINED_CMB_STU_QQQ.zip#_ga=2.131235343.1073097510.1559059003-1408911781.1543232607).

more than a dozen variables that measure household possessions; and several questions regarding the number of education resources in the household of the student. The differences in the ESCS index are relatively large between countries in the EU. The Scandinavian countries of Finland (0.25), Sweden (0.33) and specifically Denmark (0.59) score high on this index. The Netherlands has the same score as Belgium (0.16) and scores a bit higher than Germany (0.12).

2. DATA ANALYSES

We address the question as to how inclusive the various education systems in the EU are, based on the percentage of 15-year-old students who are attending school and the percentage of students who have at least achieved performance level 2 on the PISA core components. Fairness is evaluated by making use of effect sizes in order to assess the influence of the learning characteristics on performance outcomes. The effect sizes of the nominal variables gender, immigration and language spoken at home on PISA scores are expressed using Cohen's d . Cohen's d is defined as the difference between two means, divided by the (pooled) standard deviation. An effect size of zero means there is no effect. Cohen defines an effect size of (-)0.2 as a small effect, an effect size of (-)0.5 as a moderate effect and an effect size of (-)0.8 as a large effect for differences between group averages (Cohen, 1988). The effect sizes for the continuous variables ESCS index and age are expressed using Cohen's f^2 values. The ESCS index estimates the economic, social, and cultural status of the students. These f^2 values are based on the explained variance. Cohen's f^2 cannot be negative. Values of 0.02, 0.15 and 0.35 are considered to be a small, a moderate and a large effect for this effect size based on R-squared values (Cohen, 1988). Cohen's f^2 values are also used to evaluate in which countries the background characteristics in a combined model relate most closely to PISA scores. In these models, all student characteristics are included simultaneously as independent variables, allowing an assessment to be made of the extent to which background characteristics affect PISA scores. The R-squared values on which Cohen's f^2 values are based are calculated by using the PISA scores as the variable to be predicted in a structural equation model and, depending on the analysis, one or more student characteristics are included as independent predictors in the model. Extensive descriptions of structural equation models can be found in Kline (1998) and Ullman and Bentler (2003). All analyses were performed in the open-source software R (R Core Team, 2016). To calculate the R-squared values, the *lavaan.survey* software package is used (Oberski, 2014).

3. RESULTS

3.1. HOW INCLUSIVE ARE THE EDUCATION SYSTEMS IN THE VARIOUS EUROPEAN UNION COUNTRIES (INCLUSIVENESS)?

In this section, we will start by discussing the number of 15-year-olds who attend school. The following section discusses the number of students achieving the PISA basic proficiency level 2 in EU-countries.

3.1.1. SEGMENT 15-YEAR-OLDS ATTENDING SCHOOL

PISA does not measure the percentages of 15-year-olds attending school directly but proxy indices can be calculated which provide information about the percentages of 15-year-olds attending school in a given country. National statistics provide information about the overall number of 15-year-olds in a given country. This comprises the total number of both children who are registered with a school and those who aren't. The weighted number of participating students per country represents the number of students represented by PISA samples in participating countries. Table 1 displays the overall number of 15-year-olds and the weighted number of students. The relationship between these numbers is a proxy variable for the number of 15-year-olds attending

school in a country. The OECD calls this measure the Coverage index 3. The values in this index can thus be regarded as the percentage of 15-year-olds who are excluded or included in the education system, whereby low values suggest a less inclusive system (OECD, 2016a; OECD, 2017).

Table 1: Segment of 15-year-olds registered with a school.

	Total number 15-year-olds	Weighted number of students	Coverage index 3
Malta	4,397	4,296	97.70
Finland	58,526	56,934	97.28
Ireland	61,234	59,082	96.49
Germany	774,149	743,969	96.10
The Netherlands	201,670	191,817	95.11
Sweden	97,749	91,491	93.60
Czech Republic	90,391	84,519	93.50
Romania	176,334	164,216	93.13
Belgium	123,630	114,902	92.94
Estonia	11,676	10,834	92.79
Slovenia	18,078	16,773	92.78
Greece	105,530	96,157	91.12
France	807,867	734,944	90.97
Poland	380,366	345,709	90.89
Spain	440,084	399,935	90.88
Croatia	45,031	40,899	90.82
Lithuania	33,163	29,915	90.20
Hungary	94,515	84,644	89.56
Slovakia	55,674	49,654	89.19
Denmark	68,174	60,655	88.97
Latvia	17,255	15,320	88.78
Portugal	110,939	97,214	87.63
Luxemburg	6,327	5,540	87.56
United Kingdom	747,593	627,703	83.96
Austria	88,013	73,379	83.37
Bulgaria	66,601	53,685	80.61
Italy	616,761	495,093	80.27

Source: <http://gpseducation.oecd.org/CountryProfile?primaryCountry=NLD&treshold=10&topic=PI>

The percentages in the Coverage index 3 vary from 97.0% (Malta) to 80.27% (Italy). The Netherlands also scores high on this measure. More than 95% of Dutch 15-year-olds are represented in the PISA outcomes. Noteworthy countries that scored below 90% on this metric besides Italy, included the UK (83.96%) and Denmark (88.87%).

If the 15-year-olds who were not represented in PISA 2015 do not systematically perform better or worse than the participants in a country, this will not have an effect on the mean performance score of that country. However, if there is a systematic difference between participants and non-participants, the results are biased. In this case the PISA results cannot merely be generalised to the total group of 15-year-olds in a country because the participants no longer represent all 15-year-olds in that country. This means that one should exercise caution when comparing countries with large discrepancies in the coverage percentages. The 15-year-olds who were not presented in the PISA samples are likely to perform less well and, therefore, the results of countries with lower coverage values may be positively biased (OECD, 2016a).

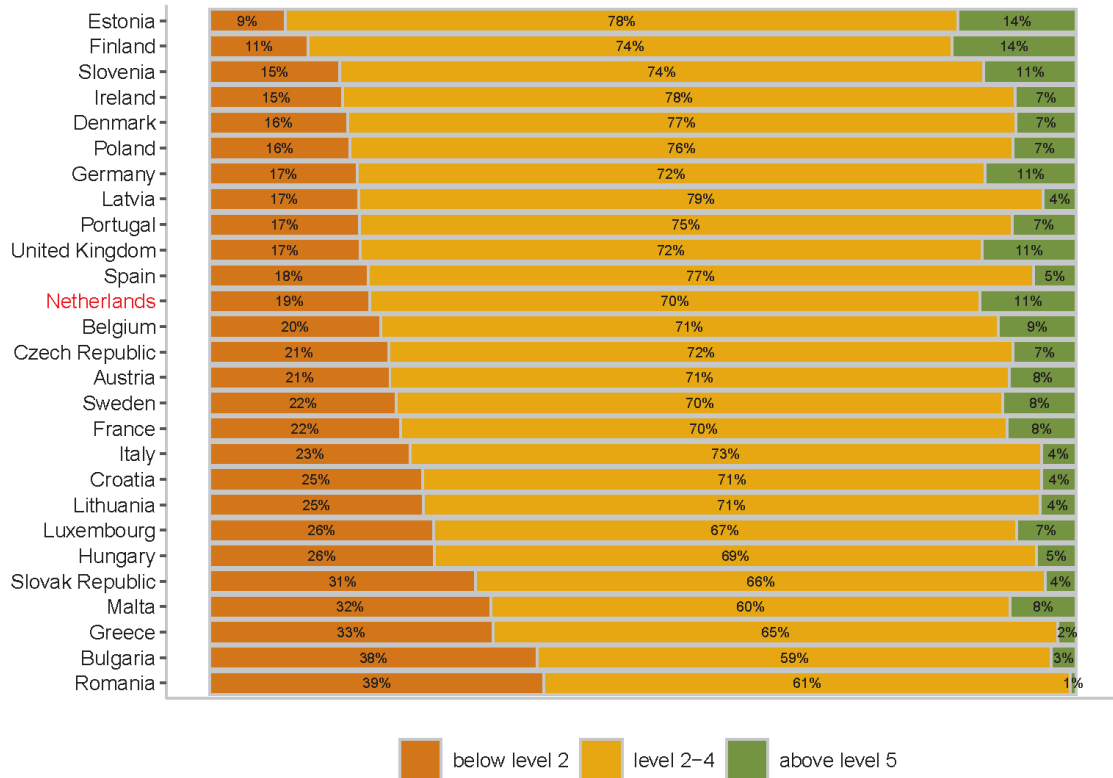
As the PISA Coverage index 3 is a proxy variable for measuring the segment of 15-year-olds in school, we have looked for external information to verify these figures. The Eurostat publication “Being young in Europe today” contains data about the number of registrations by age range in EU countries in 2012 (Eurostat, 2015). Unfortunately, this publication does not include any information about the number of 15-year-olds who are registered at school. However, it does contain information about the number of 15 to 19 year olds who are registered at school³. The percentages of 15 to 19-year-olds that attend school in a country based on the official Eurostat statistics and the PISA Coverage index 3 correspond closely with each other, with two significant exceptions: Malta and Luxembourg. Malta ranks very high in the Coverage index 3, but very low in the percentage of 15 to 19-year-olds that go to school. However, in Malta, many residents study abroad (the same applies to Luxembourg). All in all, there is sufficient reason to be confident in using the PISA Coverage index 3 as an indicator of the percentage of 15-year-olds that go to school.

3.1.2. PERCENTAGES OF STUDENTS AT PROFICIENCY LEVEL 2

The scores of the students for all subjects in PISA have been subdivided into proficiency levels. These levels indicate what students with a certain proficiency score know and what they are capable of. Proficiency level 2 is considered the basic level of what all students should be capable of before they complete compulsory education (OECD, 2016a). The OECD states that not achieving this level likely leads to substantial disadvantages later in life (OECD, 2010). The minimum scores necessary to obtain proficiency level 2 are 409.5, 407.0 and 420.1 for science, reading and mathematics respectively (OECD, 2017). In Figures 1, 2, and 3 the percentages of students are shown at various proficiency levels for science, reading, and mathematics respectively. The EU countries are ordered according to the percentage of students that perform below level 2. The figures also show percentage of students that have obtained at least proficiency levels 5. Students who perform at proficiency level 5 or higher are regarded as high-achievers or top performers by the OECD.

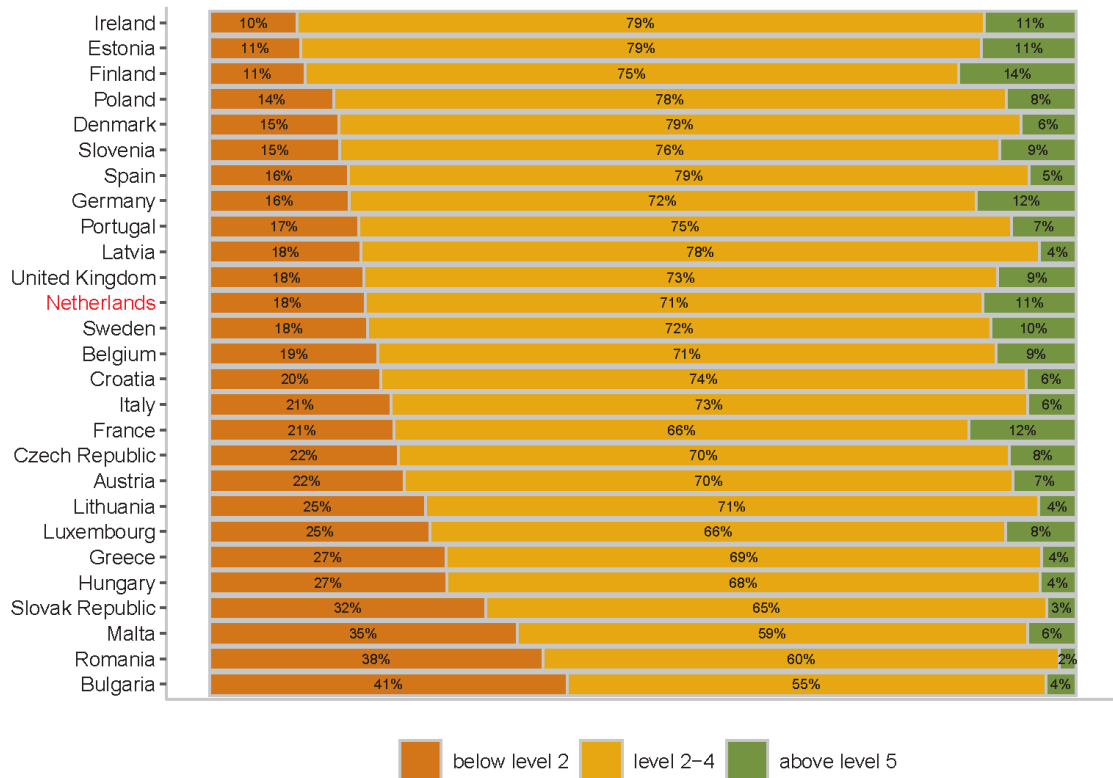
³ http://ec.europa.eu/eurostat/statistics-explained/index.php/Being_young_in_Europe_today_-_education#Childcare_attendance_and_participation_in_education

Figure 1: Percentages of students per skill level for science



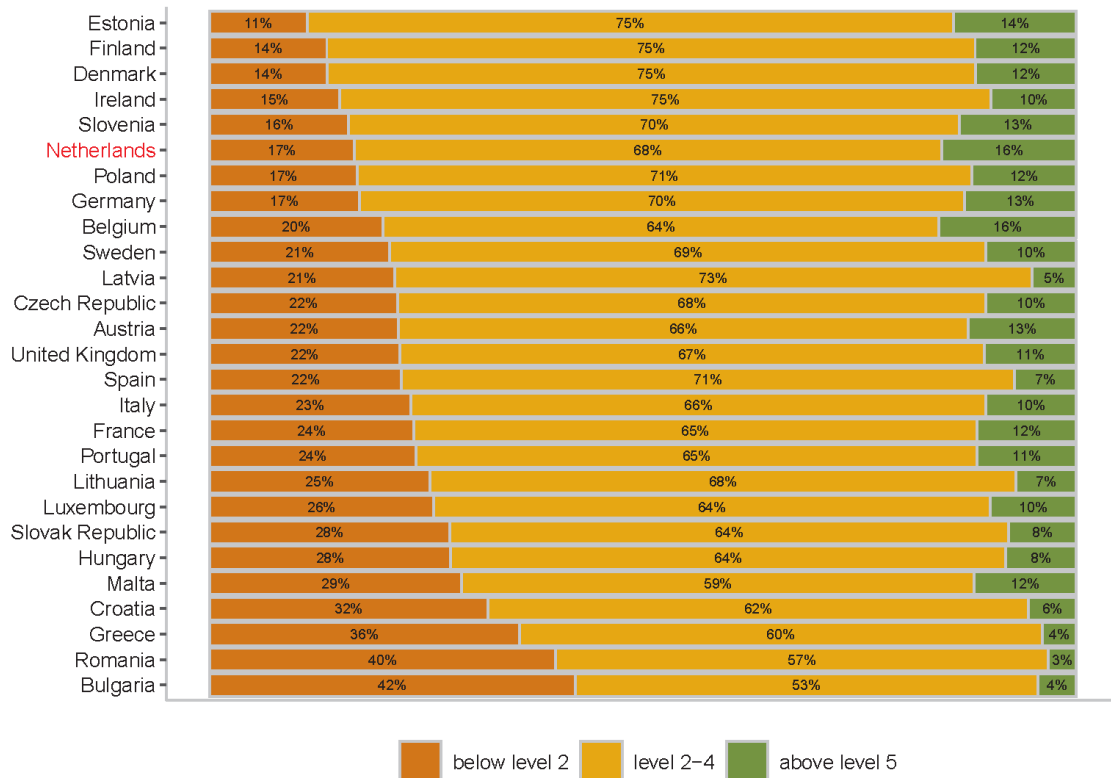
Source: PISA, 2015

Figure 2: Percentages of students per skill level for reading



Source: PISA, 2015

Figure 3: Percentages of students per skill level for mathematics



Source: PISA, 2015

Estonia, Finland, Denmark and Ireland score high on this dimension of inclusive education. On all three subjects, these countries are located in the top five countries in the EU with the smallest segment of students who score lower than proficiency level 2. Internationally, the Netherlands performs better in mathematics than science or reading. With regard to mathematics, the Dutch education system is certainly successful in educating many students to at least a proficiency of level 2 as well as getting a relatively large number of them to at least proficiency level 5. These percentages are 17% and 18% respectively. Although the percentages of low-achievers in the Netherlands in mathematics and reading are not much smaller than those for science, there are more countries which are more successful than the Netherlands in educating students to at least this level in science.

3.2. TO WHAT DEGREE ARE EUROPEAN UNION COUNTRIES ABLE TO MINIMISE THE EFFECTS OF BACKGROUND CHARACTERISTICS ON LEARNING OUTCOMES (FAIRNESS)?

In the following sections, the relationships between the individual background characteristics and PISA scores are reviewed separately. This will be done for gender, immigration, language spoken in the home, age and ESCS respectively.

Table 2 shows the effect sizes between the background variables gender, immigration background and home language and the PISA scores in science, reading, and mathematics, respectively. For gender, the mean score for boys is subtracted from the mean scores for girls in each country. That means that a negative number in the table for the country corresponds with a higher score for boys in that country and a positive number corresponds with a higher average score for girls.

Table 2: Effect sizes (Cohen's *d*)

Country	Gender science	Gender reading	Gender mathematics	Immigration background science	Immigration background reading	Immigration background mathematics	Home language science	Home language reading	Home language mathematics
Austria	-0.20	0.21	-0.30	0.79	0.70	0.82	0.89	0.77	0.91
Italy	-0.19	0.18	-0.23	0.38	0.57	0.41	0.41	0.55	0.40
Ireland	-0.12	0.15	-0.22	0.06	0.17	0.11	0.15	0.31	0.17
Belgium	-0.12	0.17	-0.16	0.71	0.66	0.73	0.74	0.75	0.70
Portugal	-0.11	0.20	-0.11	0.18	0.08	0.28	0.43	0.42	0.44
Germany	-0.11	0.22	-0.20	0.78	0.64	0.66	0.95	0.86	0.84
Czech Republic	-0.09	0.28	-0.08	0.35	0.39	0.25	0.49	0.53	0.34
Spain	-0.08	0.25	-0.20	0.51	0.50	0.56	0.20	0.30	0.14
Luxembourg	-0.08	0.21	-0.13	0.43	0.39	0.42	0.57	0.58	0.43
Poland	-0.07	0.35	-0.14	-0.33	-0.09	-0.44	0.50	0.52	0.49
Denmark	-0.07	0.27	-0.13	0.82	0.74	0.82	0.77	0.80	0.82
Croatia	-0.07	0.31	-0.15	0.30	0.25	0.22	0.47	0.46	0.55
The Netherlands	-0.04	0.25	-0.03	0.62	0.50	0.59	0.66	0.62	0.72
Estonia	-0.04	0.35	-0.07	0.38	0.36	0.35	0.52	0.61	0.37
Hungary	-0.03	0.27	-0.09	-0.18	-0.23	-0.22	0.29	0.24	0.29
France	-0.02	0.28	-0.07	0.66	0.55	0.62	0.76	0.75	0.76
United Kingdom	-0.01	0.24	-0.13	0.24	0.19	0.14	0.28	0.28	0.18
Slovak Republic	0.01	0.37	-0.06	0.76	0.92	0.71	1.17	1.32	1.11
Sweden	0.05	0.42	0.03	0.74	0.66	0.74	0.62	0.64	0.64
Slovenia	0.06	0.51	-0.05	0.80	0.60	0.70	0.91	0.76	0.82
Romania	0.08	0.20	-0.01	0.08	0.07	0.08	0.13	0.16	0.18
Lithuania	0.08	0.45	0.02	0.09	0.07	-0.10	0.66	0.56	0.54
Malta	0.09	0.38	0.04	-0.30	-0.19	-0.22	0.64	0.60	0.46
Greece	0.10	0.41	0.00	0.52	0.51	0.53	0.65	0.73	0.60
Latvia	0.14	0.55	0.03	0.17	0.15	0.29	0.55	0.54	0.48
Bulgaria	0.16	0.45	0.02	0.77	0.88	0.81	0.83	0.92	0.87
Finland	0.21	0.55	0.10	0.91	0.96	0.85	0.73	0.80	0.58

Source: Original material

Table 2 shows that in most European countries, boys score on average higher in science than girls. However, the differences are generally small. The difference between boys and girls in the Netherlands is small as well. On average, boys scored 4 points higher than girls in the Netherlands which corresponds to an effect size of -0.04 in this case. The effect size is smaller than those found in Belgium (-0.12) and Germany (-0.11) and comparable to the effect sizes of Denmark (-0.07) and France (-0.02). In eastern Europe, there are various countries in which girls score higher than boys on average. In Finland, the effect of gender on PISA scores is the largest in favour of girls (an effect size of 0.21). In Austria (-0.20) and Italy (-0.19), the result are found in the opposite direction, with the biggest numbers in favour of boys.

In all EU countries girls score higher on average on reading than boys. The effect sizes between gender and reading are a bit larger than between gender and science. Finland is again the country in which the effect size is the largest (0.55, a medium effect size). In Slovenia, Greece, and Bulgaria, the differences between boys and girls are also relatively large. In these countries, larger differences were also found for science. In the Netherlands, this effect is smaller: 0.25. In Belgium, the effect size is somewhat smaller (0.17). In Germany (0.22), the number is comparable to that of the Netherlands.

On average boys score higher than girls in mathematics. However, the effect size is small in the Netherlands (-0.03), also compared to Belgium (-0.16) and Germany (-0.20). It is striking that in some of the countries in which the percentage of girls that go to school is several points below 50%, such as Bulgaria, Greece, Finland, and Slovenia, girls perform better than boys in all three areas. The fact that these higher scores for girls may be the result of a selection effect cannot be entirely excluded.

The effect sizes of immigration background on the PISA scores are small in several countries (e.g. the United Kingdom and Ireland), moderate in most countries (including the Netherlands), and large in a few countries (among others Finland). Other countries in which the effect sizes are large include Denmark (0.82), Austria (0.82), Bulgaria (0.81), and Sweden (0.74). In Poland and Hungary, students with an immigration background perform better than students without one. The effect sizes in these countries are -0.33 and -0.16, respectively. However, the percentage of students with an immigration background in Poland is very small (0.26%) nor is it much higher in Hungary (2.69%). What is both striking and perhaps counter-intuitive are the somewhat smaller effect sizes for reading when compared to the effect sizes for science and mathematics in the Netherlands and surrounding countries.

The effect sizes of the home language on the PISA scores are moderate to large in many north-western European countries. In the Netherlands, the effect sizes are moderate: 0.66, 0.62, and 0.72 for science, reading, and mathematics, respectively. In Germany, the effects of speaking a different language at home are even larger, 0.95, 0.86, and 0.84, respectively. In the United Kingdom these effects were found to be smaller (0.28, 0.28 and 0.18).

Table 3 shows the effect sizes (presented as Cohen's f^2 values) of the ESCS index on the PISA scores for the three core components.

Table 3 Effects sizes (Cohen's f^2)

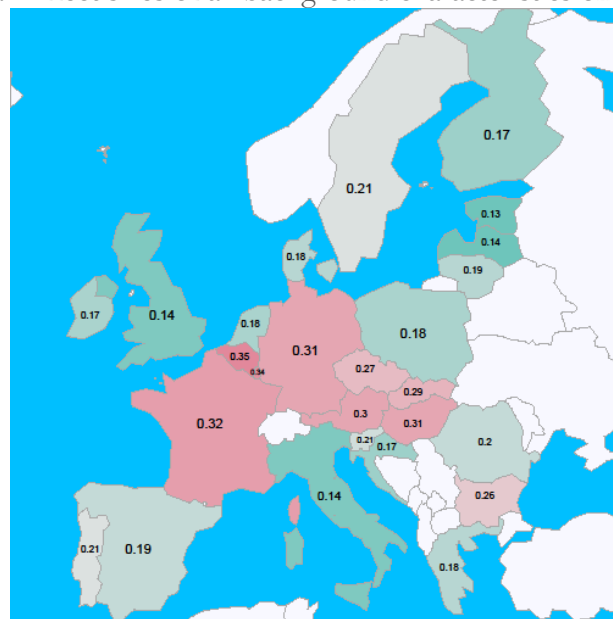
Country	ESCS science	ESCS reading	ESCS mathematics	Age science	Age reading	Age mathematics
Estonia	0.09	0.08	0.13	0.01	0.01	0.02
Latvia	0.11	0.11	0.15	0.00	0.00	0.00
Italy	0.12	0.13	0.12	0.00	0.00	0.00
Finland	0.12	0.11	0.16	0.00	0.00	0.00
United Kingdom	0.13	0.10	0.14	0.00	0.00	0.00
Denmark	0.13	0.12	0.15	0.00	0.00	0.00
Lithuania	0.14	0.13	0.15	0.01	0.01	0.01
Croatia	0.15	0.14	0.17	0.00	0.00	0.00
Sweden	0.15	0.13	0.20	0.00	0.00	0.00
The Netherlands	0.16	0.12	0.14	0.00	0.00	0.00
Greece	0.16	0.14	0.14	0.00	0.00	0.00
Ireland	0.16	0.14	0.20	0.00	0.00	0.00
Slovenia	0.17	0.13	0.14	0.00	0.00	0.00
Poland	0.17	0.14	0.17	0.00	0.00	0.00
Spain	0.17	0.15	0.20	0.00	0.00	0.00
Malta	0.19	0.14	0.16	0.00	0.00	0.00
Romania	0.19	0.17	0.23	0.00	0.00	0.00

Portugal	0.19	0.16	0.19	0.00	0.00	0.00
Austria	0.21	0.17	0.20	0.00	0.00	0.00
Germany	0.21	0.15	0.20	0.00	0.00	0.01
Slovak Republic	0.21	0.19	0.23	0.00	0.01	0.00
Bulgaria	0.22	0.20	0.22	0.00	0.00	0.00
Czech Republic	0.26	0.20	0.31	0.00	0.00	0.00
Belgium	0.26	0.19	0.25	0.00	0.00	0.00
France	0.28	0.20	0.30	0.00	0.01	0.00
Luxembourg	0.29	0.21	0.28	0.00	0.00	0.00
Hungary	0.30	0.24	0.32	0.00	0.00	0.00

Source: Original material

The effect size of the ESCS index on science is moderate in the Netherlands (0.16), but is below the EU average. In Germany (0.21), France (0.28), and Belgium (0.26), the effects of the economic, social, and cultural status of the student are somewhat larger than in the Netherlands. The strongest association of science competence and ESCS is found in Hungary. Estonia and Latvia are quite successful at keeping the relationship between this index and learning performance fairly limited. The results for reading and mathematics are not significantly different from the results for science. In order to determine the cumulative effect of student background characteristics on the PISA scores, we use a structural equation model in which all background characteristics are predictors for the PISA cognitive scores. In this way, we can assess to what extent it is possible to predict the PISA scores in a country based on background characteristics. When the effect of the background characteristics on the PISA scores is small, it can be concluded that the countries are successful in realising equity *for the collection of variables in the model*. In this case, these variables are gender, immigration background, home language, age, and the ESCS index. Figures 4, 5, and 6 show the effect sizes (Cohen's f^2) of these background characteristics on the PISA scores. Once again, the countries are shown in red if the relationship between the background characteristics and the PISA scores is larger than the EU average and they are shown in green if the value is below the average.

Figure 4: Effect sizes of all background characteristics on science

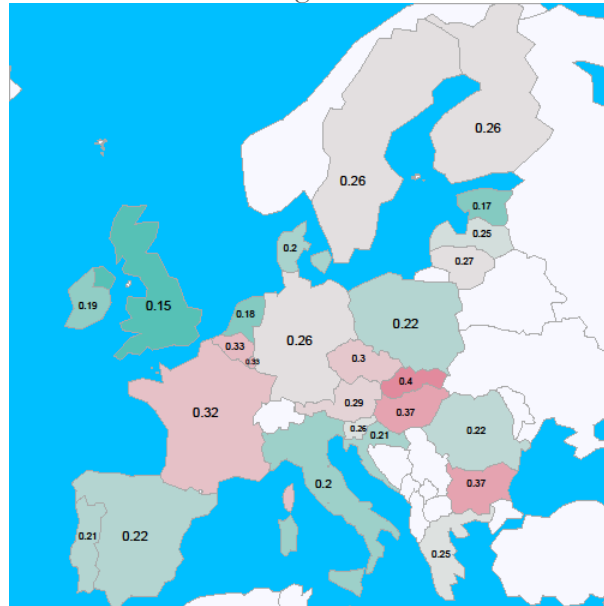


Source: Original material

The average effect size of all student characteristics on science is 0.22 in the EU. The effect size in

the Netherlands is below this average (0.18). This is a moderate effect size. In Belgium, the effect size is the largest (0.35) and the effect of student characteristics on science scores could be called large. In Germany (0.31) and France (0.32), the effect sizes are fairly high as well. Countries in which the effect sizes are smallest include Estonia, Latvia, the United Kingdom, and Italy.

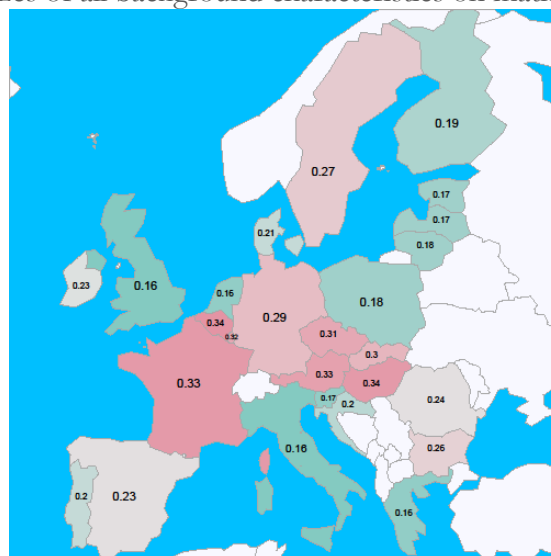
Figure 5: Effect sizes of all background characteristics on reading



Source: Original material

The average effect size (0.26) in the EU on reading scores is higher than on science scores and mathematics scores. This means that the background characteristics of students are more closely related to reading scores than with those in the two other areas. The effect size of the background characteristics on reading in the Netherlands (0.18) is one of the lowest in the EU, along with those of Estonia (0.17) and the United Kingdom (0.15). In Belgium, the effect size is rather high (0.33). The country with the largest effect of the background characteristics on reading scores was Slovakia (0.4).

Figure 6: Effect sizes of all background characteristics on mathematics



Source: Original material

The Netherlands also scores well below-average for the effect of the background characteristics on mathematics scores. In the Netherlands, this effect is 0.16, while it is 0.23 in the EU as a whole.

4. CONCLUSION AND DISCUSSION

The degree to which inclusive education has been achieved in European Union (EU) countries and to what extent the EU countries are successful in realising fairness for 15-year-old students have been investigated in this study. This was done using PISA 2015 assessment data. The degree of inclusiveness was assessed by determining which part of the 15-year-old population enjoys access to education and which percentage of the students have achieved the PISA basic proficiency level 2 in the PISA core components science, reading, and mathematics. The degree of fairness was evaluated by calculating the effect sizes of student characteristics on the PISA scores. This was done separately for each individual student characteristic as well as for all student characteristics together.

In the Netherlands, more than 95% of 15-year-olds go to school according to the PISA Coverage index 3. The Netherlands scores very high on this index, along with four other countries from the EU (Malta, Finland, Ireland, and Germany). Countries such as Belgium and Estonia have a somewhat lower coverage for their populations according to PISA 2015, 92.94% and 92.79%, respectively, and the percentages of the 15-year-old populations in countries such as Denmark (88.87%) and the United Kingdom (83.96%) as presented in PISA 2015, were shown to be even lower.

The percentage of Dutch students that obtain at least proficiency level 2 is high when compared internationally. 83% of Dutch students achieve at least this level in mathematics. Even though the percentages in the Netherlands for science (81%) and reading (82%) are not much lower, there are more EU countries which are more successful in getting a higher proportion of their students to a proficiency level of at least 2. In particular, Estonia and Finland score high on this indicator for inclusive education.

In terms of fairness, gender plays a limited role in the EU. Most significant are the higher scores for girls in reading. For other background characteristics fairness remains a challenge. We noted substantial variation across the EU and by characteristics. In most EU countries, students without an immigration background perform better than those with one. These effects are found to be small to moderate. In the Netherlands, fairness is somewhat better than it is in the neighbouring countries. There are only a few countries in which students with an immigration background scored higher than students without one, such as Poland and Hungary. These countries have however a very limited percentage of students with an immigration background. Also, the ESCS index has a fairly significant effect on the PISA scores in EU countries. This effect is smaller than the EU average in the Netherlands when we analysed the effect of all background characteristics together. In the Netherlands, the relationship between student background characteristics and PISA scores is fairly small in comparison to other EU countries. These are moderate effects. This makes the Netherlands one of the countries within the EU in which the background characteristics of students have the smallest effect on the PISA scores. Countries other than the Netherlands that score relatively high in this aspect of equity are the United Kingdom, Estonia, Ireland, and Italy. It should be noted that the proportion of students represented by the PISA data, specifically with regard to the United Kingdom, is relatively low. France and Belgium are western European countries that score relatively poorly with regard to fairness. For these countries, it appears that this stems from the relatively significant impact that the economic, social, and cultural statuses of the students have on the PISA scores rather than gender or immigration background.

In conclusion, it can be said that for many aspects of equity, the Dutch education system scores very well when compared to other EU countries. A high percentage of 15-year-olds participate in

education (and they are represented in the PISA results) and based on the student characteristics, the explained variation of the PISA scores is considered one of the lowest among the EU countries. From an international perspective, there is still room for improvement in the Netherlands with regard to the percentage of students attempting to achieve proficiency level 2 in science and reading. In addition to this, although the explained variance as equity is concerned in the Netherlands is low, it is far from insignificant. In sum, equity in the Dutch education system is internationally relatively well established, but there is potential for improvement.

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APPENDIX

Table 1: Number of participating students in the EU countries

	Number of students in the sample	Weighted number of students
Malta	3,634	4,296
Luxemburg	5,299	5,540
Estonia	5,587	10,834
Latvia	4,869	15,320
Slovenia	6,406	16,773
Lithuania	6,525	29,915
Croatia	5,809	40,899
Slovakia	6,350	49,654
Bulgaria	5,928	53,685
Finland	5,882	56,934
Ireland	5,741	59,082
Denmark	7,161	60,655
Austria	7,007	73,379
Czech Republic	6,894	84,519
Hungary	5,658	84,644
Sweden	5,458	91,491
Greece	5,532	96,157
Portugal	7,325	97,214
Belgium	9,651	114,902
Romania	4,876	164,216
The Netherlands	5,385	191,817
Poland	4,478	345,709
Spain	6,736	399,935
Italy	11,583	495,093
United Kingdom	14,157	627,703
France	6,108	734,944
Germany	6,504	741,872

Source: PISA, 2015

Table 2: Percentages and numbers for girls and boys per country

	Percentage girls	Percentage boys	Weighted number of girls	Weighted number of boys
Bulgaria	47.23	52.77	25,355	28,330
Greece	47.97	52.03	46,124	50,033
Finland	48.24	51.76	27,466	29,468
Slovenia	48.34	51.66	8,109	8,664
Slovakia	48.48	51.52	24,072	25,582
Czech Republic	48.66	51.34	41,126	43,392
Ireland	48.70	51.30	28,773	30,309
Estonia	48.99	51.01	5,308	5,526
Germany	49.11	50.89	364,365	377,507

Poland	49.11	50.89	169,770	175,939
Belgium	49.20	50.80	56,536	58,366
United Kingdom	49.22	50.78	308,940	318,763
Lithuania	49.25	50.75	14,733	15,181
Malta	49.25	50.75	2,116	2,180
Austria	49.53	50.47	36,345	37,034
Portugal	49.53	50.47	48,150	49,064
Sweden	49.55	50.45	45,329	46,161
Denmark	49.77	50.23	30,185	30,470
Hungary	49.90	50.10	42,235	42,409
Latvia	49.92	50.08	7,648	7,672
Spain	50.07	49.93	200,234	199,701
The Netherlands	50.17	49.83	96,225	95,591
Romania	50.24	49.76	82,496	81,720
Italy	50.32	49.68	249,141	245,953
Luxemburg	50.34	49.66	2,789	2,751
France	50.38	49.62	370,234	364,710
Croatia	51.90	48.10	21,226	19,673

Source: PISA, 2015

Table 3: Percentages of students with and without an immigration background per country

	Students without immigration background	Students with immigration background
Luxemburg	48.02	51.98
Austria	79.70	20.30
Belgium	82.28	17.72
Sweden	82.64	17.36
Germany	83.09	16.91
United Kingdom	83.25	16.75
Ireland	85.62	14.38
France	86.82	13.18
Spain	89.00	11.00
Croatia	89.20	10.80
Greece	89.25	10.75
The Netherlands	89.26	10.74
Denmark	89.32	10.68
Estonia	90.02	9.98
Italy	92.02	7.98
Slovenia	92.19	7.81
Portugal	92.66	7.34
Latvia	94.96	5.04
Malta	95.04	4.96
Finland	96.02	3.98
Czech Republic	96.62	3.38
Hungary	97.31	2.69
Lithuania	98.25	1.75
Slovakia	98.80	1.20

Bulgaria	98.96	1.04
Romania	99.62	0.38
Poland	99.74	0.26

Source: PISA, 2015

Table 4: Percentages for each country of students whose home language is either the same as the testing language or a different language

	Students whose home language is the testing language	Students whose home language is a different language
Malta	12.28	87.72
Luxemburg	15.53	84.47
Austria	81.18	18.82
Spain	81.29	18.71
Belgium	83.39	16.61
Italy	83.56	16.44
Sweden	84.26	15.74
Germany	88.17	11.83
Latvia	89.92	10.08
United Kingdom	91.13	8.87
Slovakia	91.20	8.80
Bulgaria	91.24	8.76
France	91.52	8.48
Denmark	92.29	7.71
Slovenia	92.44	7.56
Ireland	92.75	7.25
The Netherlands	92.78	7.22
Finland	94.00	6.00
Greece	94.18	5.82
Estonia	94.20	5.80
Lithuania	94.60	5.40
Czech Republic	95.28	4.72
Croatia	96.90	3.10
Portugal	97.18	2.82
Romania	97.28	2.72
Hungary	97.69	2.31
Poland	98.90	1.10

Source: PISA, 2015

Table 5: Average ESCS value per country

	Average	Standard error
Denmark	0.59	0.02
Sweden	0.33	0.02
Finland	0.25	0.02
United Kingdom	0.21	0.02
Belgium	0.16	0.02
Ireland	0.16	0.02
The Netherlands	0.16	0.02
Germany	0.12	0.02
Austria	0.09	0.02

Luxemburg	0.07	0.01
Estonia	0.05	0.01
Slovenia	0.03	0.01
Malta	-0.05	0.01
Lithuania	-0.06	0.02
Italy	-0.07	0.02
Bulgaria	-0.08	0.03
Greece	-0.08	0.03
Slovakia	-0.11	0.02
France	-0.14	0.02
Czech Republic	-0.21	0.01
Hungary	-0.23	0.02
Croatia	-0.24	0.02
Poland	-0.39	0.02
Portugal	-0.39	0.03
Latvia	-0.44	0.02
Spain	-0.51	0.04
Romania	-0.58	0.04

Source: PISA, 2015

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