

EDULAB

European Youth in Transition to
Education and Labour



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Merged Datasets and Analytical Reports on Youth Pathways and Transitions

Short Report

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Purpose and scope of the deliverable

EDU-LAB is a Horizon Europe collaborative research project (Grant Agreement No. 101177428) running from 2025 to 2027. It addresses systemic challenges in the transition of young people from education into employment, examining how policies, practices and institutional arrangements across different education and training systems (particularly in general education and in professional/vocational education and training) shape outcomes for young people. Among its core concerns are early school-leaving, work-based learning, regional disparities, the policy and investment landscape in the European Education Area, and the identification and promotion of effective and inclusive practices at local, national and EU levels. The project brings together a multidisciplinary consortium of universities, research institutions and policy-oriented organisations from across Europe and aims not only to generate knowledge but to facilitate its uptake through collaborative stakeholder engagement.

D3.2 builds on the WP3A inventory and terms-of-reference work reported in D3.1. It is the quantitative counterpart to the expert-survey strand of the project (WP3B), and its findings are handed to the WP3B online survey of experts and stakeholders and to the WP4 case studies as a structured set of mechanism hypotheses.

Document history

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List of project-specific terms and abbreviations

BRR	Balanced repeated replication (variance estimator)
Cedefop	European Centre for the Development of Vocational Training
CIL	Computer and information literacy (ICILS scale)
COVID-19	Coronavirus disease 2019
CT	Computational thinking (ICILS scale)
EEA	European Education Area
ESCS	PISA index of economic, social and cultural status
ESF+	European Social Fund Plus
ESS	European Social Survey
ETF	European Training Foundation
EU-LFS	European Union Labour Force Survey
EU-SILC	European Union Statistics on Income and Living Conditions
EUROGRADUATE	European survey of higher-education graduates
EUROSTUDENT	European survey on the social and economic conditions of student life
FDZ-DZHW	Research Data Centre of the German Centre for Higher Education Research and Science Studies
GDP	Gross domestic product
GE	General education
ICILS	International Computer and Information Literacy Study (IEA)

ICT	Information and communication technologies
IEA	International Association for the Evaluation of Educational Achievement
ISCED	International Standard Classification of Education
KIESE	Key Indicators on Education, Skills and Employment (ETF)
NEET	Not in employment, education or training
OECD	Organisation for Economic Co-operation and Development
PIAAC	Programme for the International Assessment of Adult Competencies (OECD)
PIRLS	Progress in International Reading Literacy Study (IEA)
PISA	Programme for International Student Assessment (OECD)
PPP	Purchasing power parity
PVET	Professional and vocational education and training
SD	Standard deviation
SES	Socioeconomic status
SUF	Scientific-use file (restricted-access microdata)
TIMSS	Trends in International Mathematics and Science Study (IEA)
WP	Work package

Codes for EDU-LAB target countries

FI Finland	IT Italy	UK United Kingdom
AT Austria	GR Greece	PL Poland
XK Kosovo	PT Portugal	DE Germany

About this report

This is the short report of Deliverable D3.2. It documents the merged datasets and the methodology and presents the core results of the analytical reports. Its executive summary and the conclusions are identical to those of the full report, which contains all 81 figures and 16 tables, the country profiles and the technical appendix and is published at <https://www.edu-lab-project.eu/media-downloads/#deliverables>. References of the form (full report, Section x.x) point to the full report and link to its download page; all other references to chapters, sections, figures and tables refer to this document.

Every microdata estimate cited here and in the full report is recorded in the accompanying Results Register, and the official statistics used in Chapter 13 are documented in a separate macro exhibit. These files and the further materials listed below, including the codebooks of the six harmonised datasets, can be downloaded from the WP3A section of the EDU-LAB Dashboard at <https://dashboard.edu-lab-project.eu/app/wp3a-method>, which also links to the original data providers. The codebooks document how each harmonised variable was derived; the harmonised data files themselves are available upon request from office@economica.eu. The tertiary and graduate analyses draw on two further sources, EUROSTUDENT and EUROGRADUATE. These are confidential scientific-use files released only under a written data use agreement with the data provider. They could therefore not be harmonised into the partner-country files, and neither the microdata nor any derived dataset can be distributed. The Results Register contains only aggregate estimates from these sources.

Beyond the downloadable materials, the EDU-LAB Dashboard presents the WP3A results interactively at <https://dashboard.edu-lab-project.eu/app/wp3a-overview>, and further information on the project is available at www.edu-lab-project.eu.

Accompanying materials

Item	Description	File on the EDU-LAB Dashboard
Six harmonised datasets	PISA, PIAAC, TIMSS, PIRLS, ICILS, ESS: codebooks documenting the derivation of each harmonised variable from original data; partner-country data files (CSV and Parquet) available upon request	Codebook file per programme (e.g. PISA_Codebook.xlsx)
Results Register	All microdata estimates cited in the report, with standard errors, sample sizes and inference methods	WP3A_Results_Register.xlsx
Macro exhibit	Official aggregate statistics from Eurostat, the World Bank, the OECD and the ETF, with sources and verification	WP3A_Macro_Eurostat.xlsx
Research-question coverage matrix	Coverage of all 34 sub-questions of the EDU-LAB research programme	WP3A_D32_RQ_Coverage_Matrix.xlsx
Policy-effectiveness matrix	Joint WP2–WP3A matrix of policy inputs and outcomes by country	WP3A_D32_Policy_Effectiveness_Matrix.xlsx
Targeted hypotheses	Questions handed to the WP3B expert survey and the WP4 case studies	WP3A_D32_Hypotheses_for_WP3B_WP4.docx
Country scoreboard	Key indicators by partner country, full version of Table 5	WP3A_D32_Country_Scoreboard.xlsx

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Executive summary

Work Package 3A (WP3A) of the EDU-LAB project is responsible for the targeted secondary analysis of existing quantitative data on the pathways and transitions of young people in education and training and from education and training to the labour market across the European Education Area (EEA). This deliverable, D3.2, presents the merged and agglomerated datasets that WP3A has constructed and the first full set of analytical reports, organised around the project's four transition fields: the choice of educational pathways, progress and completion within them, and the transitions from general education (GE) and from professional and vocational education and training (PVET) to the labour market and back. It also reports the cross-cutting analyses of education systems, economic crises and policy that the EDU-LAB research-question programme calls for.

The empirical base assembled for this deliverable is substantial. Six international assessment and adult-skills survey programmes were harmonised into analysis files for the nine EDU-LAB partner and case-study countries: Austria, Finland, Germany, Greece, Italy, Kosovo, Poland, Portugal and the United Kingdom. The programmes are the OECD Programme for International Student Assessment (PISA), the OECD Programme for the International Assessment of Adult Competencies (PIAAC), the IEA studies TIMSS, PIRLS and ICILS, and the European Social Survey (ESS). Together these files contain some 640,000 school-age student observations and a further 100,000 adult observations, about 744,000 records in all, spanning two decades of repeated measurement. Each harmonised file is documented by a codebook.

In addition, EUROSTUDENT (waves VII and 8) and EUROGRADUATE (2018 and 2022) are analysed for the tertiary and graduate stages of the trajectory, adding some 224,000 records. They are confidential scientific-use files released only under a written data use agreement with the data provider. They could therefore not be harmonised into the partner-country files and cannot be distributed with this deliverable. They cover only a subset of the partner countries, and their estimates are weighted and robust rather than design-based. Every analytical estimate produced from these microdata sources, harmonised and confidential alike, is recorded in a single results register with its standard error where applicable, sample size and inference method. A separate macro layer of official aggregate statistics from Eurostat, the World Bank and the OECD complements the microdata. It is used to check the microdata findings and to supply comparable European context.

Three findings recur across the whole programme. First, socioeconomic background is the strongest of the measured determinants of educational success, and its association with achievement has not weakened in the past decade. Moreover, socioeconomic differences in competence are clearly established by grade four and are of similar standardised size at every later stage, including among adults. Among fifteen-year-olds, one standard deviation of the PISA index of economic, social and cultural status (ESCS) is associated with 36 score points in mathematics in 2022, up from 33 in 2015. The difference between students one standard deviation below and one above the mean corresponds to some three school years. The same gradient reappears in grade repetition, where students in the lowest socioeconomic quartile are nearly four times as likely to have repeated a grade as those in the highest. It reappears again in completed attainment: the share of young adults holding a tertiary qualification rises from 16 per cent when neither parent completed upper-secondary education to 74 per cent when at least one parent holds a tertiary degree. Early inequality is thus not a transient feature of childhood but the first link in a chain that runs through progression and attainment into the labour market.

Second, education carries a large labour-market premium. Employment rates among adults aged 25–64 rise from about 55 per cent for those below upper-secondary education to 72 per cent at upper-secondary and 85 per cent at tertiary level. Tertiary attainment is associated with less than half the odds of being not in employment, education or training (NEET), and the earnings return to a year of education is about twice as high over the tertiary years as before them. A propensity-score-matching analysis compares tertiary and upper-secondary adults who are alike in age, gender, migration background and parental education. After matching, tertiary attainment remains associated with an 8.2 percentage-point higher probability of employment. Distinguishing the general and vocational branches of upper-secondary education shows a

small vocational employment advantage in every country where both branches can be compared, but no corresponding advantage in earnings. The match between qualification and job adds a further dimension. About one in four employed tertiary-educated adults works in a job that does not require a tertiary qualification, rising to one in three in England. Among recent graduates, EUROGRADUATE puts the share at about a fifth in Austria and Germany and three in ten in Greece.

Third, institutions and crises matter. Early tracking stands out among institutions. Grade repetition is several times more common where students are selected at age ten than where selection waits until sixteen, at broadly similar achievement, and early-tracking systems are markedly more segregated between schools. These are the only two cross-country associations that are robust to the omission of individual countries. Investment volumes show no robust association with outcomes, but in Portugal a focused reform coincided with a fall in grade repetition of about thirteen percentage points relative to the other partner countries. Among crises, the COVID-19 pandemic coincided with a fall in mathematics in every partner country between 2018 and 2022, by about 19 points on average, whereas science was far less affected. Every partner country is now above the EU target of 15 per cent low performers in mathematics.

Beyond these headline regularities, the deliverable asks how far each gap between groups is accounted for by differences in measured characteristics. Decompositions show that gaps of similar size are composed very differently. In seven of the eight countries where natives score higher, socioeconomic status, home possessions and home language account for most of the immigrant achievement gap; a significant unexplained part remains only in Finland and Kosovo. The gender pay gap among employed adults is mostly unexplained, even when job characteristics are taken into account, because women's education, literacy and age would predict slightly higher pay than men's. The gender NEET gap is likewise not accounted for by qualifications. In school, gender gaps depend on the domain: boys lead in mathematics and computational thinking, girls in reading and information literacy. The socioeconomic achievement gap is hardly associated with the other background characteristics, which account for only about a tenth of it.

The WP1 framework expects the determinants to interact rather than simply add up. Allowing for this shows that the socioeconomic gradient is flatter for immigrant-background students in all nine partner countries. Two path models trace how background reaches later outcomes. About two-fifths of the socioeconomic association with grade repetition remains among students with the same achievement. The employment advantage of a tertiary-educated parent runs almost entirely through the respondent's own education and literacy, whereas about two-fifths of the earnings advantage is not accounted for by them.

The quantitative findings are mapped question by question to the EDU-LAB research-question programme, linked to the WP2 policy mapping in a joint effectiveness matrix, and handed to the WP3B expert survey and the WP4 case studies as a structured set of questions.

All results describe associations rather than causal effects, and several limits apply. The public PIAAC files do not record exact age for Austria and Germany, which removes the two dual-system countries from the labour-market analyses, and almost all sources are cross-sectional. For D3.3, WP3A plans to apply for the PIAAC scientific-use files, the EU Labour Force Survey and EU-SILC. These would return Austria and Germany to the labour-market analyses, add regional, job-stability and income information, and allow individuals to be followed over several years.

The main results of this report can also be explored interactively in the WP3A section of the EDU-LAB Dashboard (<https://dashboard.edu-lab-project.eu/app/wp3a-overview>). The codebooks of the harmonised datasets, the Results Register and the other accompanying materials can be downloaded at <https://dashboard.edu-lab-project.eu/app/wp3a-method>, and the harmonised data files are available upon request.

1 Introduction

1.1 The EDU-LAB project and the place of WP3A

EDU-LAB ("European Youth in Transition to Education and Labour") is a Horizon Europe collaborative research project running from 2025 to 2027. Its overarching objective is to expand the knowledge base on the factors that influence young people's choices, pathways and transitions within education and training and from education and training into the labour market in Europe, with a sustained emphasis on equity and inclusion and on the role of policies and investments. The project is organised in interlocking work packages. WP1 develops a theoretical model of pathways and transitions and of the intersectional determinants that shape them. WP2 maps the policies, programmes and investments designed to support youth transitions and assesses their effectiveness and efficiency. WP3 conducts the empirical analysis of existing evidence, divided into a quantitative strand (WP3A) and an expert-survey strand (WP3B). WP4 carries out qualitative case studies.

Within this architecture WP3A has a specific and clearly bounded role: the secondary analysis of existing high-quality open-access and scientific datasets in the European Education Area, covering pathways within general education and within professional and vocational education and training, and transitions to and from the labour market.

1.2 Goals of this deliverable

The terms of reference for D3.2 specify two connected outputs: merged datasets, and initial analytical reports per research theme. The targeted datasets are the international large-scale assessments, to be used both for international comparison and for establishing where each case-study country stands relative to its peers. The specification names TIMSS, PIRLS, PISA, PIAAC, EUROSTUDENT and EUROGRADUATE as the principal sources. The analytical approach combines trend analysis, regression (including threshold models) and propensity score matching, and makes transparent those determinants for which adequate data are not available.

This deliverable fulfils that mandate in three steps. It documents the construction of the merged datasets (Chapter 3), presents the analytical reports by transition field, research-question cluster and deep dive (Chapters 5 to 12), and synthesises the findings and states their limitations (Chapters 16 to 18).

1.3 Relation to the transition fields and research questions

The analyses are organised, as the D3.2 specification directs, around four transition fields that together describe the youth trajectory: the choice of educational pathways, including the early determinants and inequalities that shape which pathway a young person enters; progress and completion within those pathways; the transition from general education to the labour market and back; and the transition from professional and vocational education and training to the labour market and back. These fields cover the same ground as the first four of the nine research-question clusters developed across the EDU-LAB consortium, while the other five clusters are cross-cutting themes.

In this report, Chapters 5 to 8 cover the four transition fields, and Section 12.6 distinguishes the third and fourth by separating the general and vocational branches of upper-secondary education. Chapters 9 to 11 cover the cross-cutting clusters on education systems, economic crises and policy programmes, while the two remaining clusters, on regional and territorial issues and on subjective transition experiences, are covered in the full report only ([full report](#), Section 6.3 and Chapter 16). Chapter 15 relates the findings to all nine clusters.

2 Conceptual framework and policy context

Chapter 1 set out the place of WP3A in EDU-LAB and the mandate of this deliverable. This chapter provides the frame within which the analyses are read.

2.1 Intersectional determinants of pathways and transitions

The conceptual scaffolding for WP3A is supplied by WP1 (Deliverable D1.1), which frames young people's pathways and transitions as the product of intersectional determinants operating at every level of the education system. They comprise the expectations, educational background and resources of parents; the interests, abilities and expectations of students; institutional determinants, such as selection and admission rules; and external contexts, such as the structure of the education system, the labour market and shocks such as pandemics. The working hypothesis of WP1 is that most of these determinants are generic, recurring across pathways and ISCED levels. This makes a secondary-data programme feasible: the same small set of measurable determinants, namely socioeconomic status, parental education, migration background, language, gender and measured competencies, can be followed across surveys and related to outcomes at successive points of the trajectory. Because WP1 defines the determinants as intersectional, their associations need not simply add up, and the analyses also examine how they combine (Section 12.4).

2.2 Synthesis of the existing literature

The literature on educational participation and transitions, surveyed in the EDU-LAB research-question programme, frames several expectations against which the findings can be read. The most firmly established is that socioeconomic background shapes educational success even among students of similar measured ability, and that disadvantaged students face the greatest obstacles at the critical transitions. A closely related strand argues that achievement gaps take root early, at the "school gate", so that early institutional sorting tends to entrench initial disadvantage (García and Weiss, 2017). Comparative work on education-to-work transition regimes relates the age of tracking, the strength of vocational pathways and the link between education and employers to the smoothness of youth transitions and to the reproduction of inequality (Raffe, 2003; Roberts, 2025). A fourth strand concerns scarring: cohorts that enter the labour market in a downturn, and students whose schooling is disrupted by a shock, can carry measurable penalties for years afterwards (Schmillen and Umkehrer, 2017; von Wachter, 2020). The synthesis in Chapter 16 returns to these expectations.

2.3 The policy landscape

The policy context for these transitions is documented in detail by WP2's Deliverable D2.1, on which the policy analysis of this deliverable draws. D2.1 records that NEET rates across Europe fell over the decade in which the EU Youth Guarantee has operated, with the EU average declining from 15.2 per cent in 2015 to 11.1 per cent in 2024, while the United Kingdom and Southern Europe continued to lag. It identifies the recurring ingredients of effective youth-transition systems as integrated support structures, targeted programmes for disadvantaged youth and strong vocational pathways, and those of efficient ones as early investment, coordinated funding, robust evaluation, and work-based learning and apprenticeships.

D2.1 also groups countries into transition regimes, which build on Gallie and Paugam (2000), Walther (2006) and Raffe (2011). Among the partner countries, Austria and Germany belong to the Continental regime built on strong dual vocational education, Finland to the Nordic, the United Kingdom to the Liberal, Greece, Italy and Portugal to the Southern, and Poland to the Eastern regime. Kosovo lies outside the typology and is labelled Transition in this report. The regime labels serve as a shorthand for groups of countries; the report does not test whether the characteristics of a regime account for the differences in outcomes between them.

2.4 The trajectory model and the strategy for measuring determinants

WP1 formalises the youth trajectory as a sequence of positions: entry into a pathway, sustained participation, progression, completion, and transition to and from employment. Socioeconomic status and parental education, competencies, migration background, home language and gender are well measured at these positions. Financial circumstances, by contrast, are observed directly only for higher-education students in EUROSTUDENT; motivation, persistence, parental expectations and ethnicity are largely absent; and family planning and fertility are available only in the ESS. The result is not a full test of the WP1 model, but comparable empirical magnitudes for its measurable core across the partner countries, together with an explicit statement of where a determinant cannot be adequately measured.

3 Data sources and harmonisation

Chapter 2 set out the conceptual frame of the analyses. This chapter describes the merged datasets on which they rest: which datasets were selected (Section 3.1), how they were harmonised into comparable partner-country files (Section 3.2) and how the files were validated against published statistics (Section 3.3).

3.1 Selection of datasets

WP3A's inventory work in Deliverable D3.1 identified the international large-scale assessments as the backbone of a comparable evidence base for the partner countries, complemented by adult-skills and social-survey data for the labour-market side of the trajectory. Six programmes were selected for harmonisation, on the criteria of relevance to the four transition fields, coverage of the partner countries, availability and methodological quality. Four measure school-age students: PISA at age fifteen, TIMSS at grades four and eight, PIRLS at grade four and ICILS at grade eight. Two measure adults: PIAAC at ages sixteen to sixty-five and the ESS at ages fifteen and over. No single source spans the whole pathway from school to work, so the transition fields are assembled by combining school-age assessments with adult and labour-market data.

Two further programmes named in the D3.2 specification reach stages the assessments do not observe at all. EUROSTUDENT surveys enrolled higher-education students, and EUROGRADUATE surveys graduates about one and five years after graduation. Both are confidential scientific-use files released only under a written data use agreement with the data provider. They are therefore analysed separately, outside the harmonisation, and cannot be redistributed with this deliverable.

Country-level data complete the evidence base. The institutional indicators of Chapter 9, namely the age of first tracking, the vocational share and the dual-system classification, are compiled from OECD Education at a Glance (OECD, 2023), Eurydice and Cedefop, and the spending and policy data of Chapter 11 from OECD and Eurostat sources (Eurostat, 2024) and from WP2's Deliverable D2.1. The macro layer of Chapter 13 adds official aggregate statistics from the Eurostat database (Eurostat, 2026), the World Development Indicators (World Bank, 2026), the Education at a Glance database (OECD, 2025b) and, for Kosovo, the ETF's KIESE compilation (ETF, 2022).

The nine partner countries are Austria, Finland, Germany, Greece, Italy, Kosovo, Poland, Portugal and the United Kingdom. They are the WP4 case-study set, chosen to represent the variety of European education and labour-market systems and transition regimes. Their coverage varies by programme (Table 1). PISA covers all nine in every wave used and is therefore the spine of the cross-country comparison. PIRLS also covers all nine, although Greece and Kosovo appear in only one wave each. TIMSS, ICILS and the ESS each cover eight: Greece is absent from TIMSS, the United Kingdom from ICILS and Kosovo from the ESS. PIAAC also covers eight, as Kosovo never took part, and Greece participated only in the first cycle and Portugal only in the second.

Coverage of the two restricted-access sources is narrower, because only countries that deposited microdata appear in them. EUROSTUDENT covers Austria, Finland, Germany and Poland, not all of them in both waves. EUROGRADUATE covers Austria, Germany and Greece in the 2018 pilot, and Austria, Germany, Greece, Italy and Portugal in the 2022 wave, whose Greek file lacks the labour-market module. Kosovo and the United Kingdom are absent from both.

Table 1 summarises the collected data. The six harmonised programmes comprise about fifteen gigabytes of raw microdata across twenty-one survey waves, distilled into analysis-ready partner-country files of some 744,000 records. The two restricted-access sources add four waves and some 224,000 records, which are held and analysed separately. The codebooks of the harmonised datasets and the links to the original data providers are available on the EDU-LAB Dashboard at <https://dashboard.edu-lab-project.eu/app/wp3a-method>, and the harmonised data files themselves are available upon request from office@economica.eu.

Table 1. Harmonised partner-country datasets and complementary restricted-access sources

Dataset	Population	Waves	Partner countries	Records	Key harmonised content
PISA	Age 15	2015, 2018, 2022	9	205,081	Achievement (maths/reading/science), ESCS, immigrant status, grade repetition
PIAAC	Adults 16–65	Cycle 1–2	8 (no XK)	75,244	Employment, earnings, education, literacy/numeracy
TIMSS	Grade 4 & 8	2003–2023 (6 waves)	8 (no GR)	237,290	Mathematics & science achievement, home SES
PIRLS	Grade 4	2001–2021 (5 waves)	9	156,244	Reading achievement, home SES
ICILS	Grade 8	2013, 2018, 2023	8 (no UK)	44,036	Computer and information literacy, computational thinking, SES
ESS	Adults 15+	2020, 2023	8 (no XK)	26,461	Education, parental education, employment, migration, attitudes
EURO-STUDENT	Higher education students	VII, 8	4	130,839	Confidential SUF; not harmonised
EURO-GRADUATE	Higher education graduates	2018, 2022	5	93,127	Confidential SUF; not harmonised

Note: Partner countries is the number of the nine partner countries covered in at least one wave; coverage by wave is described in the text above. Records are respondents in the partner countries, summed over all waves. SUF denotes a scientific-use file released only under a written data use agreement with the data provider.

3.2 Harmonisation strategy

Each programme uses its own variable names, coding conventions and derived indices, and these change across waves and cycles. The harmonisation therefore maps each substantive construct to the internationally comparable derived variable that each programme provides, rather than rebuilding constructs from raw items. Table 2 lists the key harmonised variables by programme; the codebooks available online give the full variable mappings.

For PISA, the harmonised file carries the ESCS index, immigrant status, gender, home language and grade repetition, the ten plausible values in mathematics, reading and science, and the final student weight with its eighty replicate weights. For PIAAC, the education, parental-education, immigrant-background and skills variables are built from the cycle-specific derived variables. The file carries the plausible values for literacy and numeracy and the final weight with the replicate weights and replication method specified for each country and cycle. For the IEA studies, the country files of each wave were combined, keeping only the main national sample and excluding the bridge and special samples of the recent digital cycles. The stable background items were harmonised: sex, age, books at home, the home-resources scale, home language and, where collected, parental education. They are held alongside the plausible values and the weights and jackknife indicators. For the ESS, the 2020 and 2023 rounds were pooled, and the harmonised file carries gender, age, own and parental education, employment status, migration background, urban–rural residence and household income, together with the analysis weight.

EUROSTUDENT and EUROGRADUATE remain outside the harmonisation. Their data use agreements permit analysis but not redistribution or derived datasets, and their instruments, such as study conditions, self-assessed qualification match and field of study, have no counterpart in the assessment programmes. They are therefore analysed wave by wave in their original structure, each with its own design weight.

Table 2. Key harmonised variables by programme

Construct	PISA	PIAAC	IEA (TIMSS/PIRLS/ICILS)	ESS
Socioeconomic status	ESCS index	parental education (PARED)	home-resources scale; ICILS NISB	parental education (eisced m/f)
Achievement / skills	plausible values (maths/reading/science)	literacy/numeracy plausible values	plausible values (maths/science; reading; CIL/CT)	—
Education attainment	—	EDCAT (ISCED)	—	ES-ISCED (eisced)
Gender	ST004D01T	GENDER_R	ITSEX / S_SEX	gndr
Migration	IMMIG	IMGEN	born-in-country / S_IM-MIG	brncntr
Employment	—	C_D05 (derived)	—	mnactic / pdwrk
Weights	W_FSTUWT + 80 BRR	SPFWT0 + 80 replicate	TOTWGT + jackknife zones	anweight

Note: Entries are the variable or derived index taken from each programme's original files; a dash means that the construct is not applicable or not harmonised for that programme. NISB is the ICILS national index of students' socioeconomic background. Full variable mappings are given in the codebooks available online (<https://dashboard.edulab-project.eu/app/wp3a-method>).

3.3 Validation

Confidence in the harmonised files rests on their reproduction of published statistics. Sample sizes match the official figures, for example the German PIAAC Cycle 1 sample of 5,465 and the Polish sample of 9,366, and weighted estimates reproduce the official results to within rounding. The PISA partner-country means and their decline after 2018 match the OECD figures. TIMSS 2019 grade-four mathematics means reproduce the official IEA values (Austria 539, Finland 532, Italy 515, Kosovo 444), as do PIRLS 2021 reading means (Finland 549, Italy 537, Germany 524, Kosovo 421). PIAAC weighted literacy means fall in the expected range. These checks confirm that file selection, weighting and the handling of plausible values are correct, and they underpin the design-based estimates of the following chapters. The two restricted-access sources were checked against the published EUROSTUDENT and EUROGRADUATE indicator reports, and the weighted national figures for the indicators used here reproduce them.

4 Methodology

Chapter 3 described how the datasets were selected, harmonised and validated. This chapter explains how estimates are obtained from them. Section 4.1 sets out how their uncertainty is measured, Section 4.2 which methods are used, and Section 4.3 which assumptions limit how the results can be read. The estimators are documented in full in the technical appendix ([full report](#), Appendix A).

4.1 Statistical inference

The international surveys do not draw simple random samples. They select schools or households in several stages and within strata, and each student in PISA, TIMSS, PIRLS and ICILS answers only part of the test. Every estimate in this deliverable therefore uses the final survey weight for its point estimate and a standard error that follows the sampling design of the survey concerned. The sampling variance is measured with replicate weights: eighty in PISA, seventy-five jackknife zones in TIMSS, PIRLS and ICILS, and the replication method specified for each country and cycle in PIAAC. Differences, decomposition components and the matching estimate are recomputed with each replicate weight, so that their standard errors also reflect the uncertainty of their parts. Achievement and adult skills are provided as plausible values, so every estimate that involves them is computed once for each plausible value and the variation between them is added to the sampling variance. For the ESS, which has no replicate weights, standard errors are approximated from the survey's strata and primary sampling units. Because the United Kingdom sample of PIAAC covers England and

Northern Ireland in Cycle 1 but England only in Cycle 2, analyses that compare or pool the two cycles are restricted to England.

EUROSTUDENT and EUROGRADUATE provide a design weight but no replicate weights, primary sampling units or strata. Their estimates are therefore weighted and reported with robust standard errors. The graduate pay-gap decomposition uses bootstrapped standard errors.

Results for several countries are summarised in two ways. A partner-country average is the unweighted mean of the country estimates, so each country counts equally. A pooled model estimates one regression on the combined sample with the survey weights, so larger countries contribute more. Pooled models include country fixed effects, or country-by-cycle fixed effects where survey cycles are combined, so that they compare people within the same country. Figure and table notes state which of the two summaries is used.

4.2 The analytic toolkit

Levels and trends are described by weighted means and shares for each survey wave. Weighted regressions relate outcomes to background characteristics, with linear models for achievement and log earnings and logistic models, reported as odds ratios, for binary outcomes such as grade repetition, NEET status and low attainment. Where binary outcomes enter decompositions and path models, and in the analyses of EUROSTUDENT and EUROGRADUATE, they are modelled as linear probabilities, whose coefficients read as percentage-point differences. Interaction terms test the intersectional structure that the WP1 framework proposes, and a threshold model allows the earnings return to a year of education to differ below and above fifteen years, the typical start of tertiary education. Propensity score matching compares tertiary-educated adults with adults who are alike in observed background but hold no tertiary qualification, and a difference-in-differences comparison sets the change in grade repetition in Portugal against the other partner countries. The Oaxaca–Blinder decomposition (Oaxaca, 1973; Blinder, 1973) splits a gap between two groups into a part explained by measured characteristics and an unexplained remainder, and path models separate the part of a background association that runs through intervening variables from the part that remains when these are held constant. Cross-country associations are reported with the Pearson and the Spearman coefficient and a leave-one-out check.

All point estimates, standard errors, sample sizes and inference methods are logged in the WP3A Results Register, which serves as the single source for the figures cited in this report. The analysis code is preserved so that every result can be reproduced.

4.3 Assumptions, robustness and validation

Each method rests on assumptions that limit what can be inferred from its results. The regressions describe associations net of the included controls and are read as conditional gradients and gaps, not as causal effects. The matching estimate identifies an effect of tertiary attainment only if, among adults alike in the matched characteristics, tertiary attainment is as good as randomly assigned. The unexplained part of a decomposition is not a measure of discrimination or of an effect of group membership, and the direct part of a path model is not a causal effect either. The difference-in-differences comparison assumes that Portugal would otherwise have followed the same trend as the other partner countries, and the cross-country associations rest on nine countries at most and are treated as descriptive.

These assumptions concern how the estimates can be interpreted. Whether the estimates themselves are reliable is a separate question, which rests on two features documented above: design-based inference, which accounts for complex sampling and the measurement of achievement (Section 4.1), and validation of every dataset against published statistics (Section 3.3).

5 The choice of educational pathways

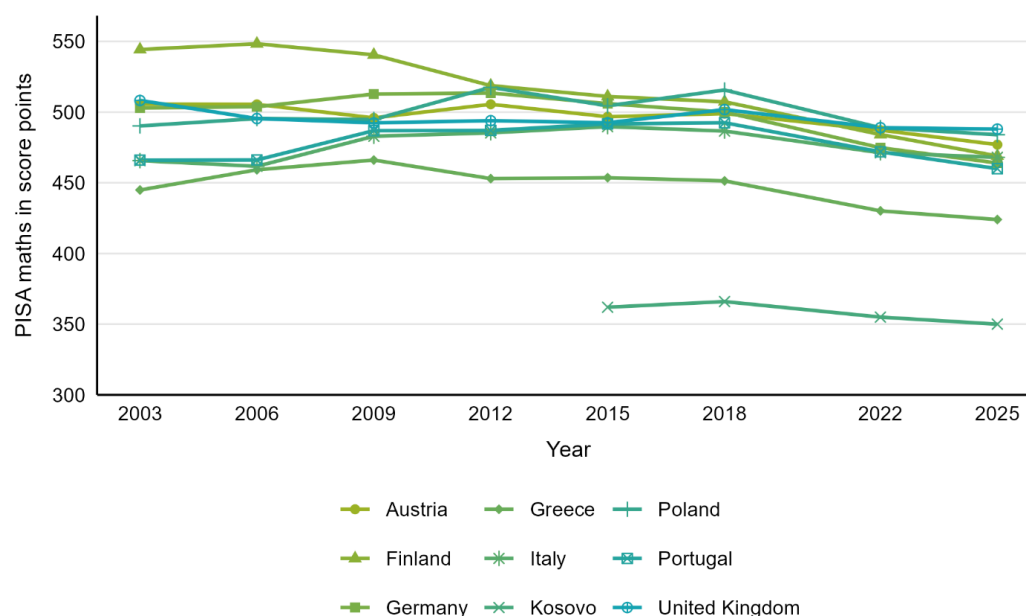
The first transition field concerns how young people come to enter a specific educational pathway and the inequalities that this sorting embodies. Achievement in compulsory school is not itself a pathway choice, but it is the proximate determinant of the choices that follow, and its socioeconomic, migration and gender gaps

are the clearest measurable expression of the WP1 determinants at this stage of the trajectory. The chapter draws on PISA, which covers all nine partner countries.

5.1 Achievement levels and long-run trends

Since the PISA harmonised data only include waves 2015 to 2022, the longer trend in the partner countries in Figure 1 is based on the country means published by the OECD (OECD, 2026a; OECD, 2026b).

Figure 1. Mathematics performance in PISA, partner countries, 2003–2025



Note: Country mean scores in mathematics. Values for 2003–2022 from the PISA International Data Explorer (OECD, 2026b); values for 2025 from PISA 2025 Results (Volume I) (OECD, 2026a), Table I.B1.2a.3. Data points are shown only for the cycles in which a country participated.

At the start of the observation period Finland leads the partner countries by a wide margin, at around 545 points. In the following decade the partner countries converged, with Portugal and Italy gradually catching up and Poland becoming one of the best-performing countries; Kosovo entered PISA in 2015 at around 360 points. The dominant feature of the most recent period is common to all of the partner countries: between 2018 and 2022 mathematics scores fell by 27 points in Poland, 25 in Germany, 23 in Finland, 21 in Greece and 21 in Portugal, and by 11 to 15 points in Italy, the United Kingdom, Austria and Kosovo. The most recent PISA release saw scores stabilise in only a few countries.

At the end of primary schooling, PIRLS reading fell between 2016 and 2021 in every partner country with data, whereas TIMSS grade-4 mathematics moved in both directions between 2019 and 2023 ([full report](#), Section 5.1). As PIRLS 2021 was fielded during the pandemic and TIMSS 2023 afterwards, the setback appears to have begun to recede at grade four, but not yet among fifteen-year-olds.

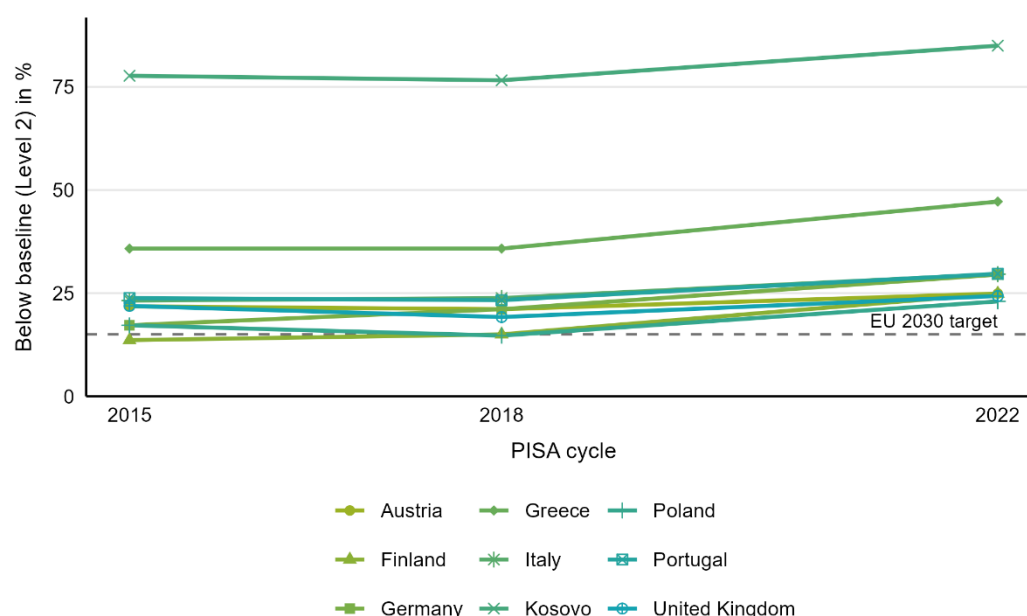
5.2 Low performers

Average scores conceal how many young people leave compulsory schooling without basic competence, and it is this group that is most exposed to difficult transitions later on. Figure 2 shows the share of fifteen-year-olds performing below the PISA baseline (Level 2) in mathematics, the level the OECD regards as the minimum for full participation in modern society. In 2022 the share ranged from 23 per cent in Poland and 24–25 per cent in the United Kingdom, Finland and Austria to around 30 per cent in Germany, Italy and Portugal, 47 per cent in Greece and 85 per cent in Kosovo.

The share changed little between 2015 and 2018 but rose in every partner country between 2018 and 2022, by between 4 points in Austria and 11 points in Greece. Under the EU-level target of the European Education Area, the share of low-achieving fifteen-year-olds should fall below 15 per cent by 2030 (Council of the

European Union, 2026). The target applies to the EU as a whole rather than to individual countries, but it provides a benchmark. In mathematics, every partner country was above it in 2022. Finland in 2015 and Poland in 2018 had been below it, but the rise since 2018 has moved every partner country further away, and even Poland, the closest, is now 8 points above it.

Figure 2. Low performers in mathematics (% below baseline), 2015–2022



Note: Weighted share of fifteen-year-olds below proficiency Level 2 in mathematics, by country and PISA cycle, estimated with the final student weights and all ten plausible values. The dashed line marks the EU-level target of 15 per cent for 2030 (Council of the European Union, 2026).

5.3 Socioeconomic, immigrant and gender gaps

Three adjusted inequalities summarise how background is associated with achievement at the point where pathway choices are made: the socioeconomic gradient, that is, the achievement advantage associated with one standard deviation of the PISA ESCS index, the immigrant gap and the gender gap. All three come from the same design-based regression of mathematics on ESCS, immigrant status and gender, estimated for each country. Each gap therefore compares students who are alike in the other two characteristics, and all three are measured on the same scale and sample (Table 3).

Table 3. Adjusted socioeconomic gradient and achievement gaps in mathematics, PISA 2022 (score points)

Country	SES gradient (per 1 SD of ESCS)	Immigrant gap (immigrant – native)	Gender gap (girls – boys)
Austria	38.8	–24.4	–18.0
Finland	36.2	–42.4	+2.3
Germany	35.3	–31.9	–11.2
Greece	29.4	–13.2	–8.4
Italy	34.2	–2.0	–20.6
Kosovo	17.1	–17.7	–2.4
Poland	41.2	–45.4	–7.5
Portugal	33.2	–24.7	–11.2
United Kingdom	37.0	+11.7	–14.9

Note: All three coefficients come from the same country-level regression of mathematics on ESCS, immigrant status and gender, PISA 2022. The gradient is measured per standard deviation of ESCS; the two gaps are differences in score points

between the groups named. The Polish and Kosovan immigrant-gap estimates rest on small immigrant samples and are imprecisely estimated.

In 2022 the **socioeconomic gradient** ranges from 17.1 points per standard deviation of ESCS in Kosovo to 41.2 in Poland. It is steepest in Poland and Austria, while the United Kingdom, Finland, Germany, Italy and Portugal form a middle group (Table 3). The lower gradients of Greece and especially Kosovo should be read with care, since where performance is low and compressed near the floor of the scale the measured gradient is mechanically attenuated. Pooled across the nine countries, the gradient is 36.3 points, so moving from one standard deviation below to one above the mean is associated with roughly seventy points, the equivalent of some three school years on the OECD's benchmark of about 20 score points per year of schooling. The pooled gradient was 33.2 points in 2015 and 34.9 in 2018. Among the countries, it increased most in Italy (+4.8), Poland (+4.1) and Austria (+2.8), while Kosovo is the only country where it flattened (−3.7).

The **immigrant achievement gap** is largest in Poland and Finland, at more than 40 score points, followed by Germany, Portugal and Austria, and smaller in Kosovo and Greece; in Italy it is negligible. The United Kingdom is the clear exception, with immigrant-background students out-performing comparable native peers by about 12 points. The Polish and Kosovan estimates rest on small immigrant samples and are imprecise. Distinguishing first- and second-generation students in a pooled model, the adjusted gap is large for the first generation (−32.3 points) but small and statistically indistinguishable from zero for the second (+0.2 points). Once socioeconomic status is taken into account, the immigrant achievement penalty is thus overwhelmingly a first-generation phenomenon. Section 12.1 complements this by decomposing the raw gap, taking home possessions and home language into account as well.

The **gender gap** favours boys in every partner country but one, most strongly in Italy (−20.6 points), Austria (−18.0) and the United Kingdom (−14.9). Finland is the exception, where girls hold a small nominal advantage of +2.3, and in Finland and Kosovo the data do not establish any gender difference at all. Averaged across the nine countries the gap is about 10 score points, roughly a third of the socioeconomic gradient.

A country's position on one of the three measures says little about its position on the other two. Italy has the smallest immigrant gap in the partner set and the largest gender gap; Finland has one of the largest immigrant gaps and no gender gap at all; Kosovo combines the shallowest socioeconomic gradient with a middling immigrant gap. Across the nine countries none of the three associations predicts either of the others, so no system is uniformly equitable and no single policy lever addresses the three at once.

The full report also presents the TIMSS and PIRLS series by country, the socioeconomic gradient for every PISA cycle and the mechanisms behind the three gaps ([full report](#), Chapter 5).

6 Progress and completion of pathways

The second transition field concerns how far young people progress through the pathways they enter and complete them, and how unequally. The chapter follows three stages, each observed in a different data source: grade repetition up to age fifteen in PISA (Section 6.1), access to and conditions of study in higher education in EUROSTUDENT (Section 6.2), and completed attainment among young adults in PIAAC and the ESS (Section 6.3).

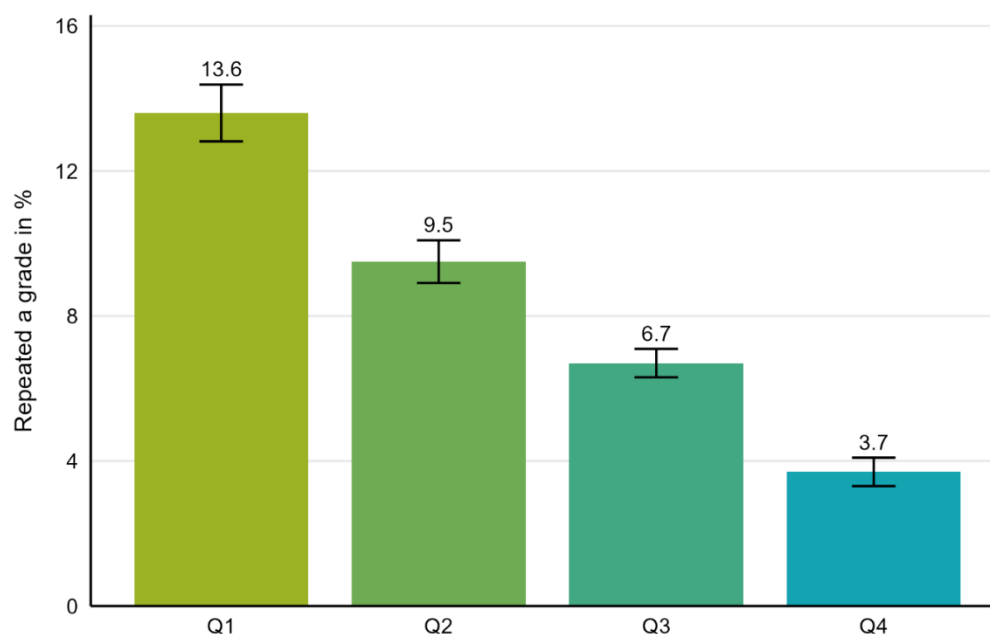
6.1 Grade repetition: levels, trends and the socioeconomic gradient

Grade repetition is the earliest visible sign that a student has fallen behind, and it varies enormously across the partner countries. In 2022 the rate was highest in Germany with 19.2 per cent, followed by Portugal and Austria with still over 15 per cent. By contrast, five countries had repetition rates below 5 per cent, with the lowest rates observed in the United Kingdom (2.1 per cent) and Finland (2.7 per cent). Between 2015 and 2022 the rates changed little in most countries but fell strongly in Italy and Portugal. The fall in Portugal, from 31.2 per cent in 2015 to 17.2 per cent in 2022, is examined as a policy case study in Section 11.2.

Grade repetition falls disproportionately on socioeconomically disadvantaged students (Figure 3). On average across the partner countries in 2022, 13.6 per cent of students in the lowest quarter of their country's ESCS distribution had repeated a grade, against only 3.7 per cent in the highest, a near four-fold difference.

Design-based logistic models estimated separately for each country point in the same direction in every partner country: the ESCS odds ratio lies below one in all nine. In the same models, girls repeat less often than boys in eight of the nine countries, and students with an immigrant background repeat more often in eight of the nine countries.

Figure 3. Grade repetition by socioeconomic quartile, PISA 2022



Note: Share of students who report having repeated at least one grade, by quartile of the PISA index of economic, social and cultural status (ESCS), with 95% confidence intervals based on the study's replication weights. Quartiles are defined within each country; values are averages of the nine country estimates.

6.2 Access to and conditions of higher education

Access to higher education and the conditions of study are observed in EUROSTUDENT, the European survey of the social and economic conditions of student life. The data are confidential and available only under a written data use agreement with the data provider. Wave 8 (fieldwork 2021–2024) covers Austria, Finland, Germany and Poland. Because the data carry a single design weight but no replicate weights or design variables, the estimates are accompanied by robust rather than design-based standard errors.

Higher education recruits heavily from tertiary-educated families. The share of students with at least one tertiary-educated parent is 54 per cent in Austria, 62 per cent in Germany, 50 per cent in Poland and 69 per cent in Finland (Table 4). Against the share of all 25–34 year-olds with at least one tertiary-educated parent, students from tertiary-educated families are over-represented in every partner country, but to very different degrees: by a factor of about 1.5 in Germany, 1.9 in Austria, 2.3 in Finland and 5.0 in Poland. Because the benchmark cohort is somewhat older than today's students, the factors are upper bounds; the ranking of the countries is the more robust result of this exercise.

Table 4. Share of students and of 25–34 year-olds with at least one tertiary-educated parent (%), by country

Country	Students (EUROSTUDENT 8)	25–34 year-olds (OECD 2025)	Ratio
Austria	54	28	1.9
Finland	69	30	2.3
Germany	62	40	1.5
Poland	50	10	5.0

Note: Share with at least one parent holding a tertiary qualification (ISCED 5–8). Values for 25–34 year-olds from Education at a Glance 2025 (OECD, <https://stat.link/vur4y1>), Table A1.4, based on PIAAC 2023. The ratio divides the student share by the cohort share.

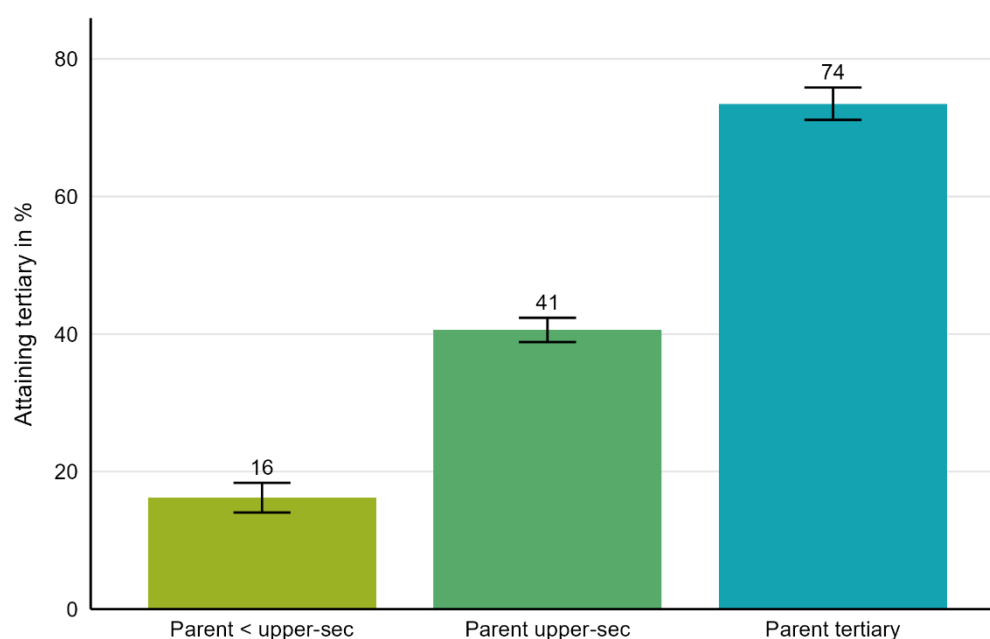
Social origin also shapes how students reach and pursue higher education. In every partner country, students from non-tertiary families more often enter higher education more than two years after leaving school, more often report financial difficulties and more often work more than twenty hours a week alongside their studies. In a linear probability model that compares students within the same country, having tertiary-educated parents is associated with a 9.5 percentage-point lower probability of reporting financial difficulty, and being female and having a migration background with probabilities higher by 5.0 and 13.4 points, so the disadvantages accumulate. Students with a health impairment report financial difficulties more often, by between 15 and 21 percentage points, without working more to compensate.

6.3 Completion of education

Completed attainment is observed in PIAAC for the six partner countries whose public-use files record exact age. In the most recent cycle, tertiary attainment among 25 to 34 year olds is highest in the United Kingdom (England; 54.3 per cent) and Finland (46.5) and lowest in Italy (27.6), with Poland and Portugal in between. Measured against the EU-level target of at least 47 per cent of 25- to 34-year-olds with tertiary attainment by 2030 (Council of the European Union, 2026), only the United Kingdom (England) was above it in Cycle 2, and Finland was just below it. Poland and Portugal were about 8 to 9 points below, and Italy about 19 points. In Poland the share was close to the target in Cycle 1 and has since fallen ([full report](#), Figure 17).

The most striking feature of completion is how strongly it is inherited (Figure 4). Among young adults, the share holding a tertiary qualification rises from 16 per cent when neither parent completed upper-secondary education, to 41 per cent when at least one parent holds an upper-secondary qualification, to 74 per cent when at least one parent holds a tertiary degree, a more than four-fold difference across the range of parental education. Having a tertiary-educated parent also cuts the odds of not completing upper-secondary education to less than a fifth. The ESS, which also covers Austria and Germany, corroborates this persistence from an independent source: among adults aged 30–59, 73 per cent of those with at least one tertiary-educated parent had themselves attained tertiary education, against 28 per cent of those without.

Figure 4. Tertiary attainment by parental education, ages 25–34



Note: Share of 25–34 year-olds with tertiary attainment, by the highest educational attainment of either parent, with 95% confidence intervals, pooled over the six partner countries and both PIAAC cycles and estimated using the study's

replication weights. Austria and Germany are not included because the PIAAC public-use files do not record respondents' exact age.

The full report additionally examines grade repetition over time by country and, for 2022, by gender and migration background, delayed entry, impairment and field of study in EUROSTUDENT against the European average, low attainment by country, and urban–rural differences in the ESS ([full report](#), Chapter 6).

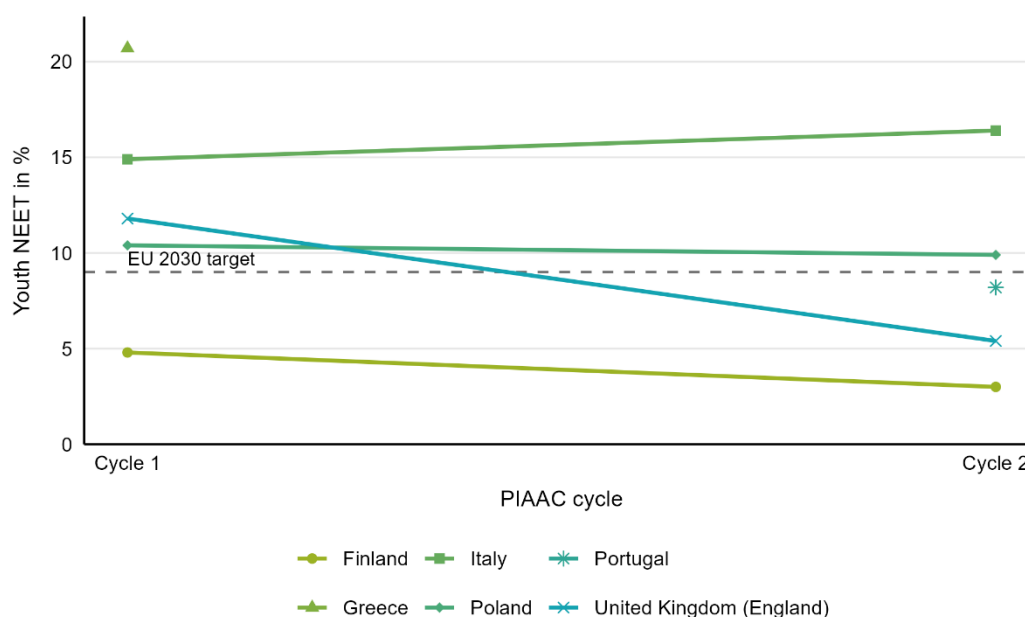
7 From general education to the labour market

The third transition field concerns the move from education into the labour market: whether young people enter employment, how strongly their chances of work depend on the education they have obtained, and what that education is worth in earnings. The natural data source is PIAAC, the only programme in the harmonised holdings that measures adults' employment status, earnings and qualifications together with their measured skills. Because PIAAC suppresses respondents' exact age in the Austrian and German public-use files, the age-restricted analyses of this chapter rest on Finland, Greece, Italy, Poland, Portugal and the United Kingdom.

7.1 Youth disengagement

The NEET rate, the share of young people who are neither in employment nor in education or training, captures disengagement from both education and work. In the most recent PIAAC cycle it is highest in Italy (16.4 per cent), followed by Poland (9.9) and Portugal (8.2), and lowest in the United Kingdom (England; 5.4) and Finland (3.0) (Figure 5). Greece, observed in the first cycle only, then had the highest rate of all partner countries at 20.7 per cent. Measured against the EU-level target of at most 9 per cent NEET among 15- to 29-year-olds by 2030 (European Commission, 2021), Finland, the United Kingdom (England) and Portugal are below it, Poland is just above, and Italy exceeds it clearly.

Figure 5. Youth NEET rate (16–29) by country, PIAAC Cycle 1 and Cycle 2



Note: Share of 16–29 year-olds not in employment, education or training, estimated from the PIAAC microdata using the study's replication weights. Cycle 1 fieldwork took place in 2011–12 in Finland, Italy, Poland and the United Kingdom and in 2014–15 in Greece; Cycle 2 fieldwork took place in 2022–23. Greece is observed in Cycle 1 only and Portugal in Cycle 2 only. Values for the United Kingdom refer to England in both cycles. Austria and Germany are not included because the PIAAC public-use files do not record respondents' exact age. The dashed line marks the EU-level target of at most 9 per cent NEET by 2030, which refers to 15- to 29-year-olds.

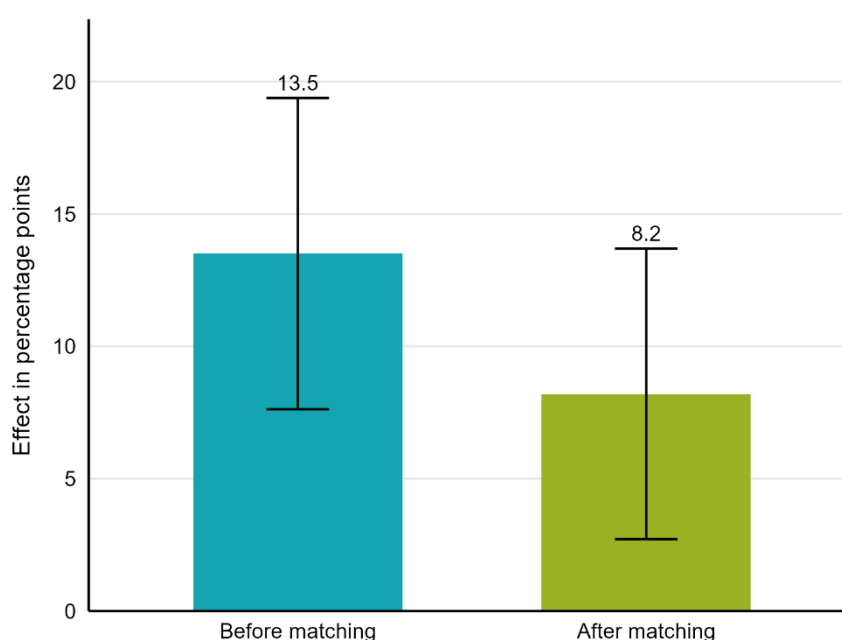
To see who becomes NEET within a country, a design-based logistic model relates NEET status to individual characteristics, comparing young people aged 16–34 within the same country and cycle (Rahmani and Groot,

2023). Tertiary education is associated with odds of NEET status 63 per cent lower than at upper-secondary level, less than upper-secondary education with odds about one half higher, and each standard deviation of literacy with odds about 45 per cent lower. The odds are more than twice as high for young women as for young men, although young women are less likely to leave education without an upper-secondary qualification, a pattern consistent with caregiving and family formation. Net of education and literacy, an immigrant background is associated with odds about a quarter lower.

7.2 The employment returns to education

Among adults aged 25–64, the employment rate rises from 54.6 per cent for those with less than upper-secondary education to 71.8 per cent at upper-secondary level and 85.2 per cent at tertiary level. The tertiary employment premium over below-upper-secondary adults is largest in Poland (43 percentage points) and Finland (36) and smallest in Greece (24) and Portugal (21). Because those who reach tertiary education differ in family background and other ways from those who do not, the effect of tertiary attainment on employment is also estimated by propensity score matching on age, gender, migration background, parental education, country and cycle. Before matching, the employment gap between tertiary and upper-secondary adults is 13.5 percentage points. After matching, the average treatment effect on the treated falls to 8.2 percentage points (Figure 6). Selection on the observed characteristics thus accounts for about two-fifths of the raw gap, while the larger part remains associated with the qualification itself. The estimate assumes that, conditional on the matched characteristics, tertiary attainment is as good as randomly assigned. A sensitivity analysis indicates that an unobserved characteristic would have to increase the odds of attaining tertiary education by about 85 per cent before the employment advantage of tertiary education would lose statistical significance.

Figure 6. Effect of tertiary education on employment before and after matching, PIAAC, ages 25–64



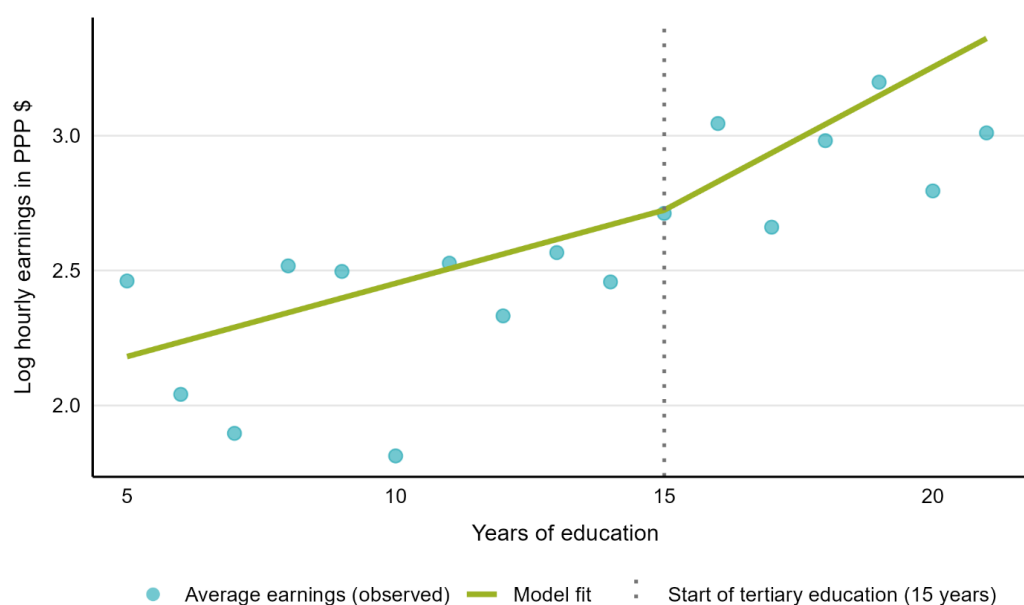
Note: Difference in employment rates between tertiary-educated and upper-secondary adults before matching and after matching (average treatment effect on the treated), in percentage points, with 95% confidence intervals from the replication weights. Matching is exact by country, with a propensity score based on age, gender, migration background, parental education and cycle. Austria and Germany are not included because the PIAAC public-use files do not record respondents' exact age.

7.3 The earnings returns to education and the tertiary threshold

Employment is one side of the return to education; the other is what those in work earn. Among employed adults, hourly earnings rise with education, and the rise is steeper beyond about 15 years of schooling, the point at which tertiary education typically begins (Figure 7). A regression of log hourly earnings on years of

education, allowing the return to differ below and above 15 years and controlling for age and its square, gender, migration background and country-by-cycle fixed effects, quantifies this pattern. Below the bend, each additional year of education is associated with about 5.4 per cent higher hourly earnings; above it, with about 10.6 per cent. A year of tertiary education is thus associated with roughly twice the earnings gain of a year of schooling before it, and the difference is precisely estimated. Since access to tertiary education is itself strongly socially graded (Section 6.3), a labour market that pays its largest per-year gains at the tertiary level amplifies the inequalities accumulated earlier in the trajectory.

Figure 7. Earnings returns to education: a threshold model, PIAAC, ages 25–64



Note: The dots show the average log hourly earnings (PPP-adjusted) of employed adults aged 25–64 at each year of education, without adjustment. The line shows the earnings predicted by the model for an adult of average age, gender, migration background, country and cycle, so that it varies only with years of education; the dotted line marks the bend at 15 years. Both PIAAC cycles pooled. Austria and Germany are not included because the PIAAC public-use files do not record respondents' exact age.

The full report also gives employment rates by education level and country, the full NEET model and the balance and sensitivity checks of the matching analysis ([full report](#), Chapter 7).

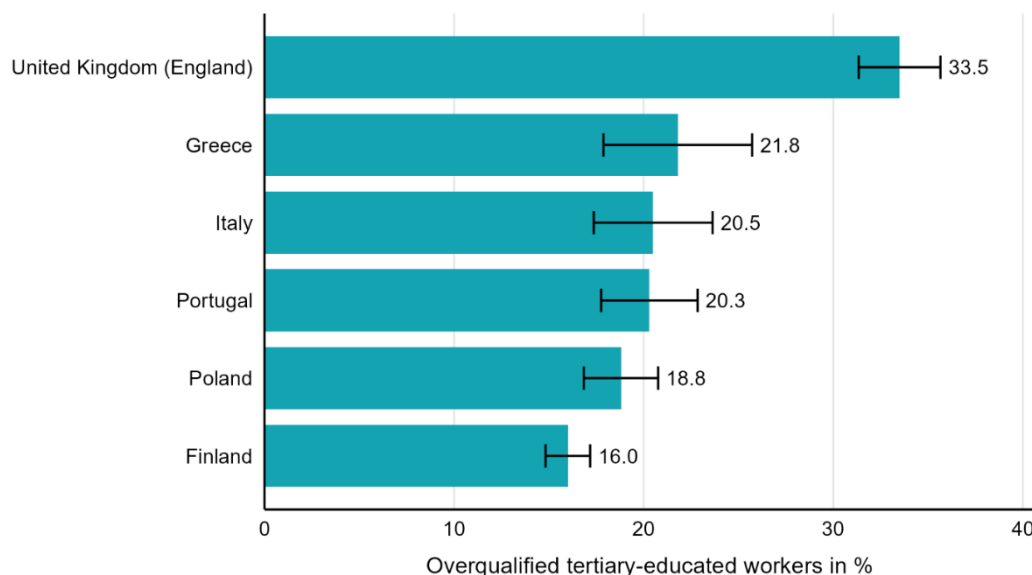
8 Qualification and the labour market

Chapter 7 followed the transition into employment; this chapter asks whether the job obtained matches the qualification held. Overqualification, meaning work that requires a lower level of education than the one held, is measured from respondents' own assessment of the level of education their job requires (Quintini, 2011). PIAAC provides this measure with design-based inference for all employed tertiary-educated adults aged 25–64 in six partner countries (Figure 8). The United Kingdom (England) has by far the highest share, at 33.5 per cent: about one in three tertiary-educated workers is in a job that does not require a tertiary qualification. Finland has the lowest share, at 16.0 per cent, and Poland, Portugal, Italy and Greece lie close together between 19 and 22 per cent.

For recent higher-education graduates, EUROGRADUATE adds evidence that includes Austria and Germany, which the PIAAC public-use files cannot cover. In the 2018 pilot, the share of overqualified graduates is highest in Greece, at 30 per cent, and about a fifth in Austria (21 per cent) and Germany (20 per cent) ([full report](#), Figure 30). Women are overqualified more often than men, by about 5 percentage points also at equal field of study, country and age at graduation, and overqualification is most common with a degree in arts and humanities (34 per cent).

Graduates may also work outside their field: in the 2022 wave, 10 per cent of employed graduates in Germany and 17 to 18 per cent in Austria and Portugal work in a job unrelated to their field of study.

Figure 8. Overqualified tertiary graduates by country (PIAAC).



Note: Weighted shares of employed tertiary graduates aged 25–64 who report that their job requires less than a tertiary qualification, with 95% confidence intervals from replicate weights; Cycles 1 and 2 pooled. United Kingdom estimates refer to England only. Austria and Germany are not included because the PIAAC public-use files do not record respondents' exact age; Kosovo did not take part in PIAAC.

The full report analyses overqualification among recent graduates by social origin, gender, country of birth and field of study, and mismatch between field of study and job ([full report](#), Chapter 8).

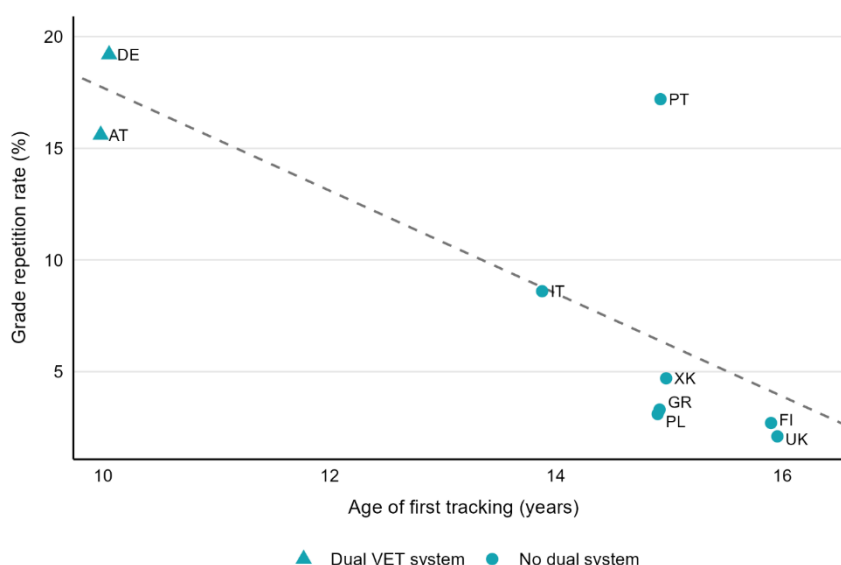
9 Education systems and cross-country differences

The fifth research-question cluster asks how transitions differ across education-and-training systems, and in particular how the age at which systems sort students into tracks, the strength of their vocational pathways and the presence of a dual (apprenticeship) system relate to the outcomes documented in the preceding chapters. These institutional features were compiled from OECD Education at a Glance, Eurydice and Cedefop as country-level indicators and merged with the country estimates obtained in this project. With nine partner countries at most, the analysis is descriptive. Each association is summarised by the Pearson coefficient r and the rank-based Spearman coefficient ρ , and is described as robust only if it remains statistically significant when each country is omitted in turn.

9.1 Tracking and progression

The clearest systemic pattern in the data concerns the age of first tracking and grade repetition. The two are strongly and negatively associated (Pearson $r = -0.78$, Spearman $\rho = -0.83$; Figure 9). In the two systems that sort students into separate school types at age ten, Austria and Germany, 16 to 19 per cent of fifteen-year-olds have repeated a grade; in Finland and the United Kingdom, which defer selection to age sixteen, only 2 to 3 per cent have. Portugal is the exception: it selects at fifteen but has a repetition rate close to that of the early-tracking systems. Average achievement in the early-tracking systems is broadly similar to that of the comprehensive systems, so their far higher repetition rates are unlikely to reflect lower learning alone. The pattern is consistent with grade repetition being to a large degree an institutional practice of early-tracking systems (Hanushek and Wößmann, 2006), although a cross-country correlation cannot settle why the two go together.

Figure 9. Age of first tracking versus grade repetition

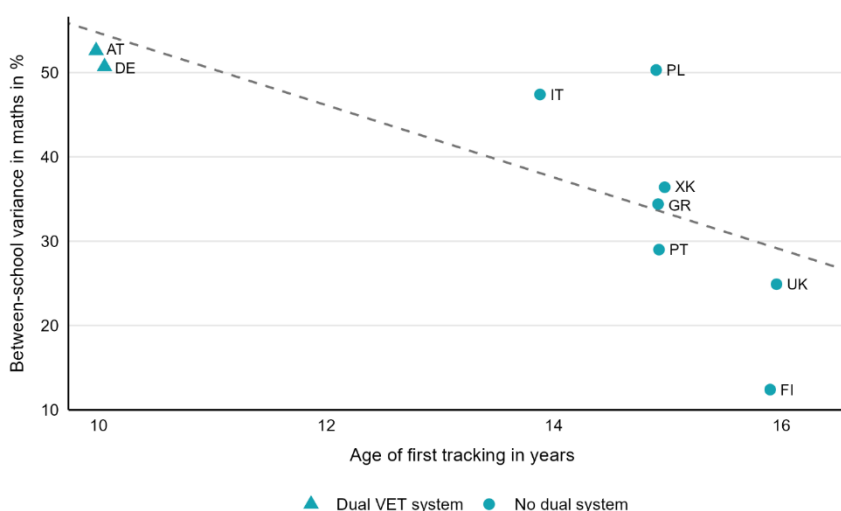


Note: Each point is one partner country ($n = 9$). Grade repetition is the share of fifteen-year-old students who report having repeated at least one grade, PISA 2022 (Section 6.1). The age of first tracking and the dual-system classification are compiled from OECD Education at a Glance, Eurydice and Cedefop. The dashed line is a least-squares fit. Pearson $r = -0.78$; Spearman $\rho = -0.83$.

9.2 Between-school segregation

A second measure of how far a system sorts students is the share of the total variance in achievement that lies between schools rather than within them (Jenkins, Micklewright and Schnepf, 2008). Estimated from PISA 2022, this between-school share ranges from about 12 per cent in Finland and 25 per cent in the United Kingdom to roughly half in Austria (53 per cent), Germany (51 per cent) and Poland (50 per cent). The between-school share falls with the age of first tracking (Pearson $r = -0.72$, Spearman $\rho = -0.91$; Figure 10). Poland is the main exception, with segregation at the level of the early-tracking systems despite selecting at fifteen. The association remains strong when Austria and Germany are removed ($r = -0.81$), so it is not driven by the two early-tracking countries alone.

Figure 10. Between-school share of variance in PISA mathematics versus the age of first tracking, 2022



Note: Each point is one partner country ($n = 9$). The between-school share is the proportion of the total variance in mathematics achievement that lies between schools, PISA 2022, estimated with the final student weights on the average of the ten plausible values. The age of first tracking and the dual-system classification are compiled from OECD Education at a Glance, Eurydice and Cedefop. The dashed line is a least-squares fit. Pearson $r = -0.72$; Spearman $\rho = -0.91$.

9.3 Robustness of the cross-country correlations

The associations of tracking age with grade repetition and with between-school segregation are the only two that remain robust when each country is omitted in turn ([full report](#), Section 9.4). The comparative literature would also lead one to expect earlier tracking to go together with a steeper socioeconomic gradient, but in this sample the association is weak (Pearson $r = -0.22$, Spearman $\rho = -0.01$). A higher vocational share of upper-secondary education is associated with somewhat lower youth NEET across eight countries ($r = -0.41$, $\rho = -0.18$) and with a larger tertiary employment premium across six ($r = +0.64$, $\rho = +0.71$). Neither association is robust, so both indicate a direction only ([full report](#), Section 9.2). The premium comparison, moreover, lacks Austria and Germany, the two dual-system countries.

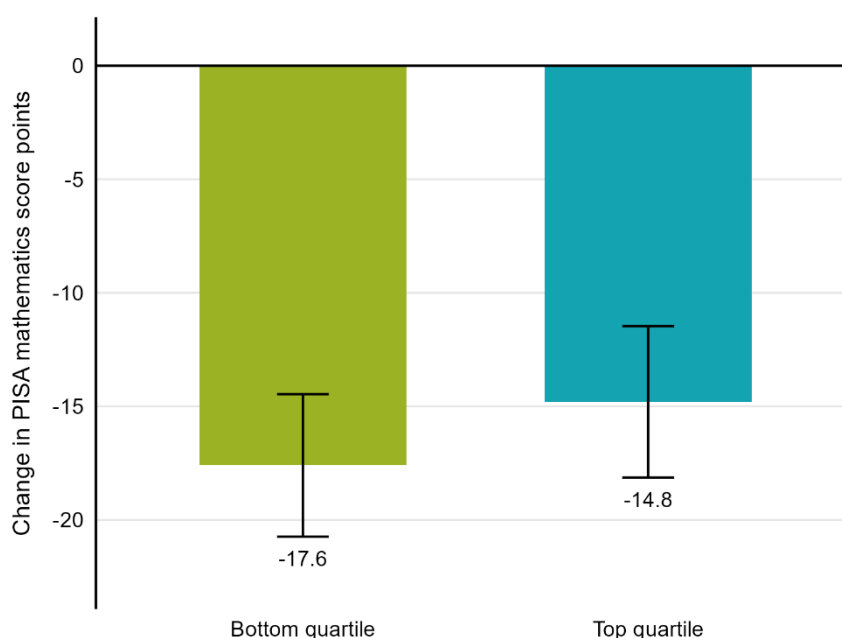
The full report shows each of the presented associations in detail, together with the results of the robustness check ([full report](#), Chapter 9).

10 Economic crises

The seventh research-question cluster asks how economic and societal crises affect young people's pathways and transitions, and whether their effects fall unevenly. This chapter focuses on the COVID-19 pandemic, which is captured for all nine partner countries by the comparison of PISA 2018 and 2022.

Mathematics performance fell in every partner country between 2018 and 2022 (Figure 1). The losses were largest in Poland, Germany and Finland (23 to 27 score points) and smallest in Austria, the United Kingdom and Kosovo (11 to 13 points); across the partner countries, the average decline was 18.6 points, close to one school year on the OECD benchmark of about 20 score points per year of schooling. The decline occurred across education systems that differ widely in structure and performance, which suggests a common cause in the disruption of schooling during the pandemic; a meta-analysis of studies from many countries likewise finds substantial learning deficits over this period (Betthäuser, Bach-Mortensen and Engzell, 2023). The other PISA domains, reading and science, declined as well, though by less: 13.9 and 5.9 points on average.

Figure 11. Change in PISA mathematics performance by socioeconomic quartile, 2018 to 2022



Note: Change in mean mathematics score in the bottom and top quartile of the PISA index of economic, social and cultural status; quartiles are weighted and formed within each country and survey year. Unweighted average of the nine partner countries, with 95% confidence intervals based on replicate weights and plausible values.

Whether the pandemic widened existing inequalities matters as much as the size of the average loss, because students who were already behind may have had fewer resources at home to compensate for lost schooling.

Figure 11 compares the change in the bottom and the top socioeconomic quartile, averaged across the partner countries. The bottom quartile lost 17.6 points and the top quartile 14.8, so the socioeconomic gap widened by about 3 points on average, a change that is small relative to the sampling uncertainty. The gap widened most in Austria (14.8 points), Finland (8.8) and Germany (6.6), and narrowed in Kosovo, Greece and Portugal; only the widening in Austria is clearly statistically significant. The gap between students with and without an immigrant background shows no change distinguishable from zero, while girls lost about three points more than boys.

The full report presents the COVID-19 changes in the immigrant and gender gaps and across the three PISA domains in more detail, as well as exploratory evidence on the financial and eurozone crisis of 2008–2013 from the contrast between the two PIAAC cycles ([full report](#), Chapter 10).

11 Policy programmes and investment

The eighth research-question cluster asks whether policies and investments improve youth transitions. The policy landscape and the investment figures are drawn from WP2's Deliverable D2.1. It identifies integrated support structures, targeted programmes for disadvantaged youth and strong vocational pathways as the recurring ingredients of effective youth-transition systems, and early investment, coordinated funding, robust evaluation and work-based learning as those of efficient ones. A central finding of D2.1 is that investment does not map neatly onto outcomes: Italy and Greece record high youth NEET despite large ESF+ envelopes.

11.1 Investment and outcomes

The quantitative indicators bear out D2.1's caution. Higher public expenditure on education as a share of GDP shows only a weak positive association with achievement (Pearson $r = 0.32$, Spearman $\rho = 0.54$), consistent with the conclusion in the economics of education that how money is spent matters more than how much is spent (Hanushek, 2003). Higher active-labour-market spending goes together with lower youth NEET ($r = -0.53$, $\rho = -0.41$), and larger ESF+ envelopes with somewhat higher youth NEET ($r = 0.42$, $\rho = 0.32$). None of these associations is robust to the omission of individual countries ([full report](#), Section 11.2). The ESF+ pattern follows from how the fund is allocated, since envelopes are larger where labour-market problems are greater, so it says nothing about whether the investment works. The spending and investment indicators therefore describe how the partner countries differ, but do not support conclusions about the effects of spending.

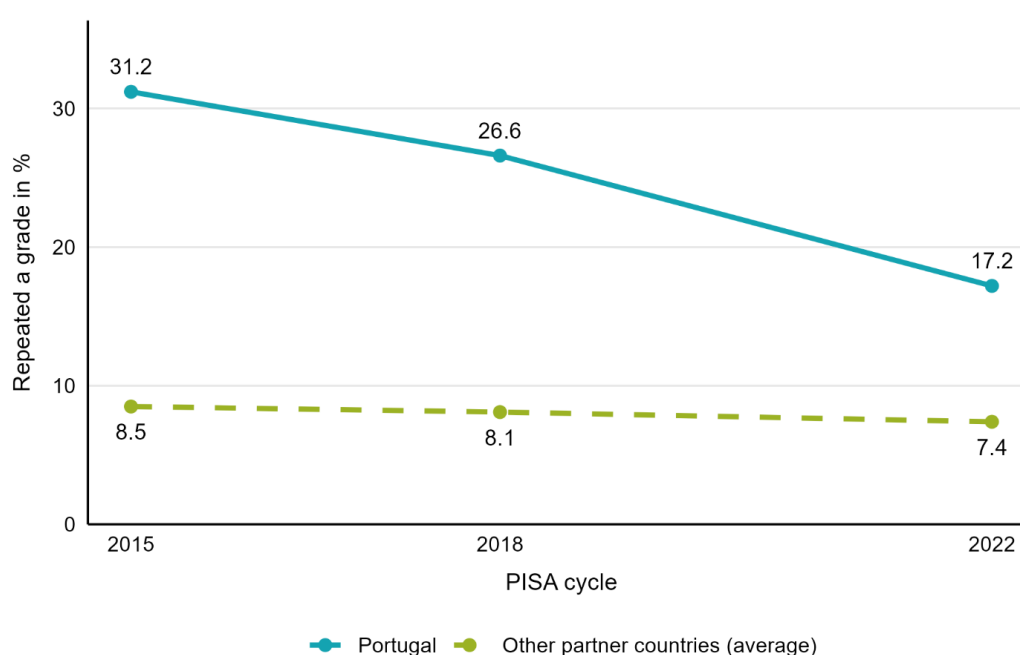
The joint WP2–WP3A policy-effectiveness matrix sets, for each partner country, the system and policy inputs from D2.1 and from Chapters 9 and 11 alongside the outcomes documented in this deliverable. It is provided as a standalone file on the EDU-LAB Dashboard (https://dashboard.edu-lab-project.eu/app/wp3a-method;WP3A_D32_Policy_Effectiveness_Matrix.xlsx).

11.2 A reform case study: Portugal's anti-repetition policy

Portugal offers a rare case in which a policy change is sharp enough, and visible enough in the data, to support a quasi-experimental reading. In 2016 the country launched a national programme to reduce grade repetition. Its grade-repetition rate fell rapidly from 31.2 per cent in 2015 to 17.2 per cent in 2022, while the average of the other partner countries changed little (from 8.5 to 7.4 per cent). The difference-in-differences, Portugal's additional reduction relative to the other partner countries, is 12.9 percentage points and statistically significant (Figure 12).

The comparison has clear limits. With a single treated country and three PISA cycles, other concurrent changes cannot be ruled out, and a falling repetition rate may also partly reflect changed promotion standards rather than improved learning. Portugal's mathematics performance moved with the partner-country average over the same period (Section 5.1), which speaks against a collapse of standards. Within these limits, the timing and size of the decline are consistent with the reform having reduced grade repetition substantially within a few years.

Figure 12. Grade repetition in Portugal and the other partner countries, PISA 2015–2022



Note: Share of fifteen-year-old students who report having repeated at least one grade, estimated with the final student weights. The comparison group is the unweighted mean of the other eight partner countries. The difference-in-differences between 2015 and 2022 is –12.9 percentage points (standard error 1.48).

The full report also documents the D2.1 policy landscape and investment figures, the cross-country associations of education, labour-market and ESF+ spending with outcomes, and the readings of the policy-effectiveness matrix ([full report](#), Chapter 11).

12 Deep dives

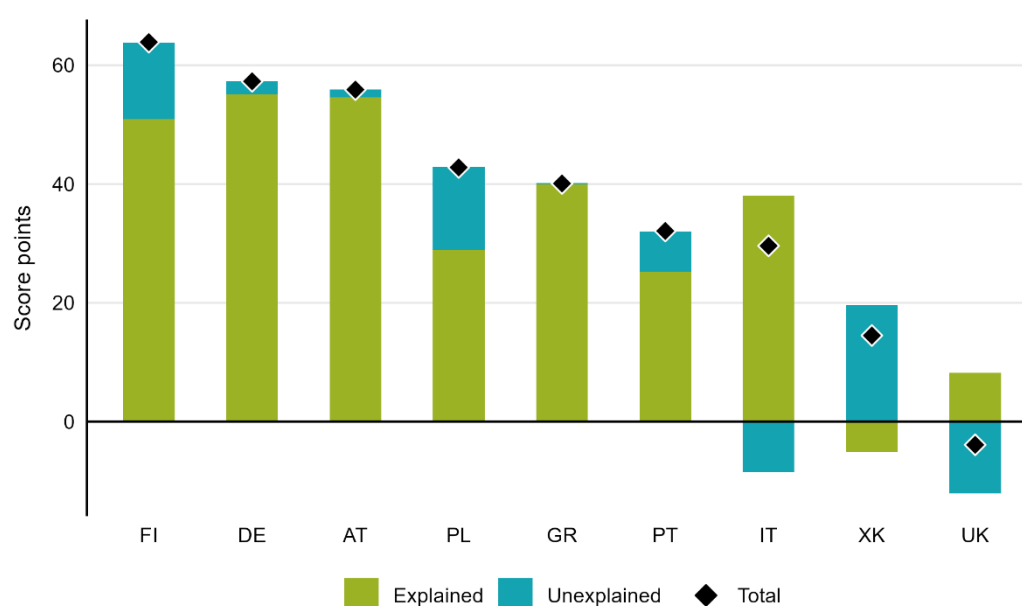
The full report contains seven deep dives ([full report](#), Chapters 12 to 18). This chapter summarises those results on which the synthesis and the conclusions rest: the decompositions of the immigrant, gender pay, socioeconomic and NEET gaps (Sections 12.1 to 12.3), the interaction and path models (Section 12.4), the socioeconomic gradient over the life-course (Section 12.5) and the employment returns to education by track (Section 12.6).

Sections 12.1 to 12.3 use the Oaxaca–Blinder method, which splits a gap into a part explained by differences in measured characteristics between the groups and an unexplained part. The unexplained part reflects characteristics not included and the possibility that the same characteristic is associated with different outcomes in the two groups. It is therefore not a measure of discrimination, and its size depends on which characteristics are included. Section 12.4 adds interaction and path models; the path models decompose associations under an assumed ordering of the variables and do not identify causal effects.

12.1 The immigrant achievement gap

The native–immigrant gap in PISA 2022 mathematics is decomposed separately for each country, using three characteristics: the ESCS index, the index of home possessions, and whether a language other than the test language is spoken at home (Figure 13). In seven of the eight countries where natives score higher, the three characteristics account for the greater part of the gap. They account for almost all of it in Austria, Germany and Greece (98, 96 and 100 per cent), for about four-fifths in Finland and Portugal (80 and 79 per cent), and for 68 per cent in Poland. In Italy the explained part (38.1 points) exceeds the total gap (29.6 points), so immigrant-background students score somewhat better than their characteristics would predict. In Kosovo, the two groups hardly differ in the three characteristics, so the gap is almost entirely unexplained. The only other country with a significant unexplained disadvantage is Finland (12.9 points).

Figure 13. Native–immigrant gap in mathematics: explained and unexplained parts, PISA 2022



Note: Difference in mean mathematics score between native and immigrant-background students, in score points, split by a two-fold Oaxaca–Blinder decomposition, estimated for each country with coefficients pooled over both groups, into the part explained by ESCS, home possessions and home language and an unexplained part; the diamond marks the total gap. Estimates based on plausible values.

12.2 The gender pay gap

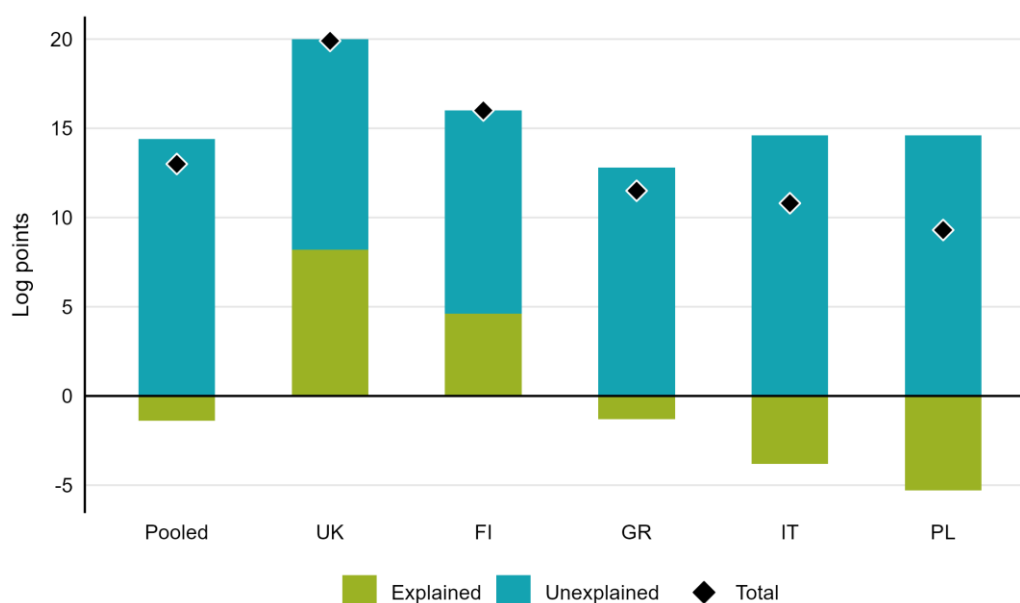
Among employed adults, men earn 13.0 log points¹ more per hour than women, pooled across the five partner countries with PIAAC earnings data: Finland, Greece, Italy, Poland and the United Kingdom. Given their education, literacy and age, employed women would be expected to earn slightly more than men, so the explained part is negative (–6.1 log points). Adding sector, weekly working hours, contract type, firm size and occupation raises the explained part to –1.4 log points, no longer significantly different from zero, and leaves an unexplained part of 14.4 log points that exceeds the gap itself.

Estimated separately for each country, the explained part is positive in Finland (4.6 log points) and the United Kingdom (8.2) only, and the unexplained part lies between 11.4 and 14.6 log points in all five countries (Figure 14). A year of education is associated with 5.8 log points higher hourly earnings for men and 7.1 for women, so the unexplained gap lies in the level of pay at given education, not in a lower return to education for women.

Among recent graduates in the EUROGRADUATE 2018 pilot (Austria, Germany and Greece), men earn 16.3 log points more than women. Field of study, parental tertiary education, migration background and age account for 9.5 log points (58 per cent) of this gap. Among graduates observed about five years after graduation in the 2022 wave, the median real increase in earnings between 2018 and 2022 was 40 per cent for men and 30 per cent for women, so the gender pay gap already present among recent graduates widens rather than narrows as careers progress.

¹ A difference of d log points corresponds to a percentage difference of $100 \times (e^{d/100} - 1)$. The gap of 13.0 log points thus means that men earn 13.9 per cent more per hour than women ($e^{0.130} - 1 = 0.139$). For small differences, log points and per cent are approximately equal.

Figure 14. Gender pay gap among employed adults: explained and unexplained parts, PIAAC Cycles 1 and 2



Note: Difference in mean log hourly earnings between employed men and women, in log points, split by a two-fold Oaxaca–Blinder decomposition, with coefficients pooled over men and women, into the part explained by education, literacy, age, sector, weekly hours, contract type, firm size and occupation (nine groups) and an unexplained part; the diamond marks the total gap. Country estimates are computed separately for each country; the pooled estimate covers all five countries with country-by-cycle fixed effects. Ages 25–64. Finland, Greece, Italy and the United Kingdom (England): Cycle 1; Poland: Cycles 1 and 2.

12.3 The socioeconomic and the NEET gaps

The same decomposition method applied to two further gaps sharpens the contrast. The gap in PISA 2022 mathematics between students in the top and the bottom ESCS quartile of their country amounts to 93.3 score points, pooled across the nine partner countries. Differences between the two quartiles in immigrant background, sex, home language and country account for 9.6 points, about 10 per cent, so the socioeconomic gap is hardly associated with the other background characteristics included. Its unexplained part contains all differences between the quartiles that these characteristics do not capture, such as the schools and tracks students attend, parental support with learning and prior achievement.

A final decomposition concerns the gender gap in NEET status. Among 16–34-year-olds, the NEET rate of women exceeds that of men by 7.0 percentage points. The explained part is negative (–0.9 points): given their years of education, literacy and age, women would be expected to have a slightly lower NEET rate than men. The unexplained part (7.9 points) therefore exceeds the total gap. As with the pay gap, the female NEET excess thus persists although young women's measured qualifications match or exceed young men's. It is consistent with caregiving and family formation, which the model does not include, rather than with a qualification deficit.

12.4 Beyond additive decompositions

The decompositions show how much of a gap measured characteristics account for. The intersectional framing of WP1 raises two further questions, which interaction and path models address.

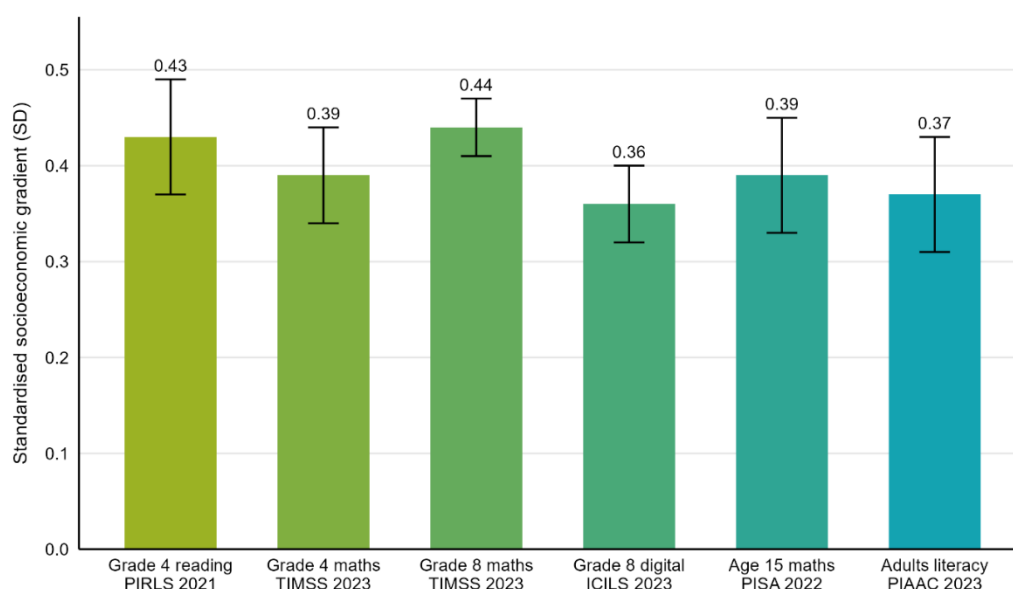
The first question is whether the socioeconomic gradient in achievement differs between groups. With an interaction between ESCS and immigrant background in a pooled PISA 2022 model of mathematics, the gradient is 36.0 points per standard deviation for native students and 26.8 points for immigrant-background students. Estimated separately for each country, the socioeconomic gradient is flatter for immigrant-background students in all nine partner countries ([full report](#), Section 12.5).

The second question is through which intervening variables socioeconomic background is associated with later outcomes. A path model of grade repetition shows that of the 3.8 percentage-point lower probability of having repeated a grade associated with one standard deviation higher ESCS, 2.3 points (60 per cent) run through mathematics achievement, while 1.5 points (40 per cent) remain among students with the same achievement. Among adults, the 8.2 percentage-point higher employment probability associated with a tertiary-educated parent runs almost entirely through the respondent's own education and literacy. Of the earnings advantage of 25.5 log points, however, a direct part of 10.4 log points, about two-fifths, is not accounted for by these characteristics ([full report](#), Sections 12.6 and 12.7).

12.5 The gradient over the life-course

Whether socioeconomic differences in competence grow, shrink or persist over the life-course can be examined by comparing the gradient across the surveys that observe successive stages, from grade four to adulthood. To place the surveys on a common scale, the gradient is expressed at each stage as a standardised association: the difference in achievement, in standard deviations, associated with one standard deviation of the socioeconomic measure available in that survey (Figure 15).

Figure 15. Standardised socioeconomic gradient from grade four to adulthood, partner-country averages



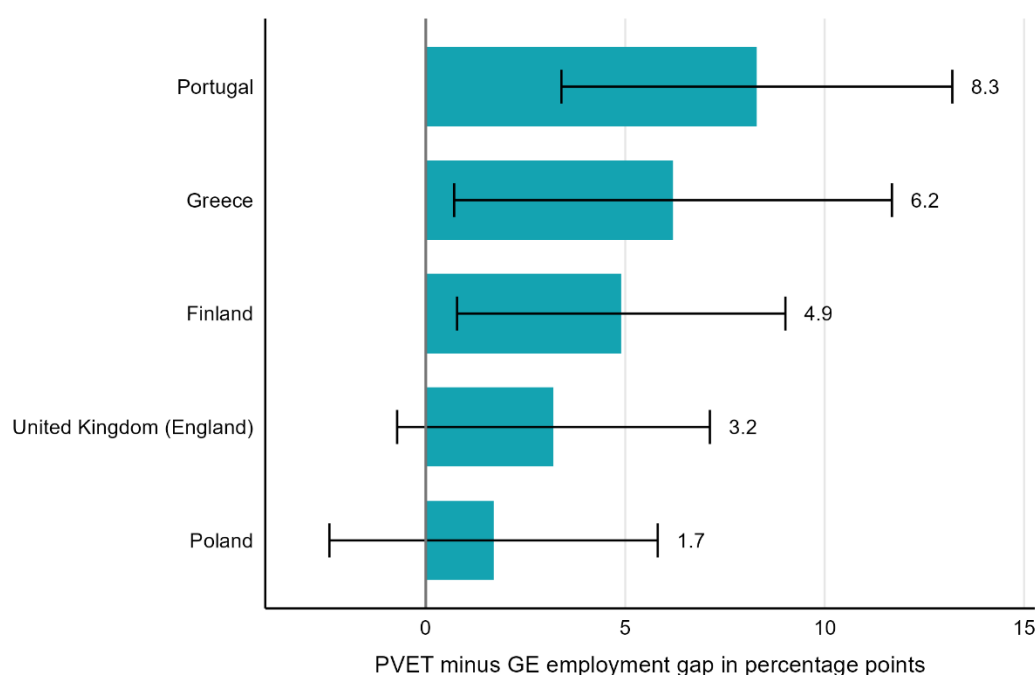
Note: Mean of the country-specific standardised gradients: the difference in achievement, in standard deviations, associated with one standard deviation of the socioeconomic measure of each survey, from bivariate weighted regressions without further controls. Whiskers show ± 1 standard deviation of the country gradients around the partner mean; they describe differences between countries and are not confidence intervals. Grade four: PIRLS 2021 reading (8 countries) and TIMSS 2023 mathematics (6), home learning resources. Grade eight: TIMSS 2023 mathematics (5), home learning resources; ICILS 2023 computer and information literacy (7), ICILS socioeconomic index. Age fifteen: PISA 2022 mathematics (9), ESCS. Adults aged 16–65: PIAAC Cycle 2 literacy (7), parental education.

At grade four, one standard deviation of home learning resources is associated with 0.43 standard deviations in reading and 0.39 in mathematics. The later stages lie in the same range: 0.44 in grade-eight mathematics, 0.36 in grade-eight computer and information literacy, 0.39 in mathematics at age fifteen and 0.37 in adult literacy, with little variation between the partner countries at each stage. In standardised terms, the socioeconomic gradient is therefore clearly established by grade four and of similar strength at every later stage, including among adults. Because the stages refer to different cohorts and the socioeconomic measures differ between surveys, the profile does not show whether individual stages of the education system reduce, reproduce or add to these differences.

12.6 Employment returns to education by track

Separating the general and vocational branches of upper-secondary education distinguishes the third and fourth transition fields of the D3.2 specification. In PIAAC, the vocational branch has the higher employment rate in all five partner countries where both branches can be compared, by between 1.7 percentage points in Poland and 8.3 in Portugal (Figure 16). In Finland, Greece and Portugal the gap is larger than its sampling uncertainty; in Poland and the United Kingdom it is not. The advantage is well below the 13 points by which tertiary-educated adults lead those with an upper-secondary qualification (Section 7.2), and it does not carry over into earnings: vocational workers earn about the same as general workers in Finland and Poland, and less in Greece and the United Kingdom (England) ([full report](#), Section 18.2). The vocational branch thus offers somewhat better chances of being in work but no higher pay, and tertiary education is the only track with a clear advantage on both margins.

Figure 16. Vocational minus general upper-secondary employment gap, by country (PIAAC)



Note: Difference between the employment rates of 25- to 64-year-olds with a vocational and a general upper-secondary qualification, in percentage points, with 95% confidence intervals from replicate weights; Cycles 1 and 2 pooled. Austria and Germany are not included because the PIAAC public-use files do not record respondents' exact age; Italy because the harmonised vocational indicator classifies virtually no upper-secondary qualification as general; Kosovo did not take part in PIAAC. United Kingdom estimates refer to England only.

Beyond the results summarised here, the deep dives of the full report cover digital skills, adult skills and lifelong learning, subjective outcomes of education, achievement gaps across domains and grades, the socioeconomic gradient in higher education and over time, and earnings and late completion by educational track ([full report](#), Chapters 12 to 18).

13 Triangulation with official European statistics

The analyses of the preceding chapters rest on harmonised survey microdata. This chapter checks their main patterns against aggregate statistics from Eurostat, the World Bank and the OECD. They are assembled in a standalone macro exhibit on the EDU-LAB Dashboard (<https://dashboard.edu-lab-project.eu/app/wp3a-method>; WP3A_Macro_Eurostat.xlsx), which records each value with its dataset code, query and retrieval date. The official series confirm three results of the microdata analyses. The vocational employment advantage of Section 12.6 reappears in the Eurostat series in six of the seven partner countries with data, and it is largest in Germany (12.0 percentage points), one of the two dual-system countries that the PIAAC

public-use files cannot reach. The tertiary earnings premium of Section 7.3 reappears in the OECD earnings distribution in all eight countries with data. Third, as in PIAAC, youth disengagement is highest in Italy and Greece (Section 7.1).

The official series also extend the evidence to recent years, to Kosovo and to unemployment duration, which the microdata analyses do not cover. NEET rates have fallen in most partner countries since 2018. Greece combines one of the lowest early-leaving rates in Europe (3.7 per cent) with high NEET and youth unemployment, and Kosovo shows a sharper version of this pattern, with youth NEET of 40.4 per cent and youth unemployment of 49.1 per cent in 2021 (ETF, 2022). This combination is consistent with labour demand rather than education supply being the binding constraint. Long-term unemployment, finally, is more common among the unemployed with below upper-secondary education than among the tertiary-educated in all eight partner countries with data.

The full report presents the official indicators in full, including NEET trends since 2018, long-term unemployment by education, earnings distributions, education expenditure and participation in adult learning ([full report](#), Chapter 19).

14 Country profiles

Table 5 brings together the key indicators for each partner country. The regime labels place each country in the D2.1 transition-regime typology, but they do not by themselves predict outcomes, since tracking age and vocational orientation cut across the regimes (Chapter 9). PIAAC labour-market indicators are unavailable for Austria and Germany, whose public-use files do not record exact age, and for Kosovo, which did not take part in PIAAC. The full scoreboard, which also includes low-performer shares and the digital-skills gradient, is provided as a separate file on the EDU-LAB Dashboard (<https://dashboard.edu-lab-project.eu/app/wp3a-method>; WP3A_D32_Country_Scoreboard.xlsx).

Table 5. Comparative scoreboard of the partner countries

Country	Regime	Track	PISA maths	SES grad.	Immig. gap	Repetition %	Youth NEET %	Tert. pre-mium
Austria	Continental	10	487.3	38.8	-24.4	15.6	–	–
Finland	Nordic	16	484.1	36.2	-42.4	2.7	3.0	36.2
Germany	Continental	10	474.8	35.3	-31.9	19.2	–	–
Greece	Southern	15	430.1	29.4	-13.2	3.3	20.7	23.5
Italy	Southern	14	471.3	34.2	-2.0	8.6	16.4	28.3
Kosovo	Transition	15	355.0	17.1	-17.7	4.7	–	–
Poland	Eastern	15	489.0	41.2	-45.4	3.1	9.9	42.8
Portugal	Southern	15	471.9	33.2	-24.7	17.2	8.2	20.7
United Kingdom	Liberal	16	489.0	37.0	+11.7	2.1	5.4	27.2

Note: Track is the age of first tracking. PISA 2022 mathematics mean score. SES gradient in score points per standard deviation of ESCS and immigrant gap (immigrant minus native) in score points, both from the same regression of mathematics on ESCS, immigrant status and gender (Table 3). Repetition: share of fifteen-year-olds who have repeated at least one grade, PISA 2022. Youth NEET: share of 16–29-year-olds, most recent PIAAC cycle (Greece: Cycle 1; other countries: Cycle 2). Tertiary employment premium: difference in the employment rate between tertiary-educated and below-upper-secondary adults aged 25–64, in percentage points, PIAAC Cycles 1 and 2 pooled. PIAAC values for the United Kingdom refer to England. Regime labels follow D2.1 (Section 2.3).

Read across the rows, Table 5 shows that the indicators do not line up into consistently strong or weak systems. Poland shares the highest mean score in mathematics with the United Kingdom, yet it also has the steepest socioeconomic gradient and the largest immigrant gap, although the Polish immigrant gap is imprecisely estimated. The United Kingdom combines the same mean score with a reversed immigrant gap

and the lowest grade repetition, and Finland pairs one of the largest immigrant gaps with the lowest youth NEET rate. Grade repetition separates the systems most sharply. Austria and Germany, which track at age ten, and Portugal record rates of 15.6 to 19.2 per cent, against 2.1 to 4.7 per cent in five of the other six countries (Section 9.1). In Portugal, the rate follows a fall from 31.2 per cent in 2015 (Section 11.2). On the labour-market side, youth NEET is highest in Greece, observed only in the crisis-era first PIAAC cycle, and in Italy, while the tertiary employment premium ranges from 20.7 percentage points in Portugal to 42.8 in Poland. Kosovo stands apart on the school-side indicators, with by far the lowest mean score and a shallow gradient that reflects low and compressed performance rather than equity (Section 5.3). Like Austria and Germany, it has no PIAAC-based labour-market evidence.

The full report also presents a profile of each partner country ([full report](#), Sections 20.2 to 20.10).

15 Mapping the findings to the research-question programme

This chapter reads the findings against the nine clusters of the EDU-LAB research-question programme. The companion coverage matrix on the EDU-LAB Dashboard (<https://dashboard.edu-lab-project.eu/app/wp3a-method>; WP3A_D32_RQ_Coverage_Matrix.xlsx) maps all thirty-four sub-questions and hypotheses of the programme to the estimate or dataset that addresses them, and classifies each one. Two sub-questions are covered by a direct estimate and seventeen in part. Four can be reached only at the macro level and five require data not held. Three could be answered with data already held but have not yet been analysed, and three belong mainly to WP3B and WP4.

The WP3A programme reaches the research questions most fully where individual-level outcomes are measured: in Cluster 4 on qualifications and labour-market success and Cluster 7 on economic crises, and on the determinants side of Cluster 1 on the selection of early pathways and Cluster 3 on progression and success. Clusters 5 and 8, on education systems and policy programmes, are reached through cross-country associations that rest on few countries, and Cluster 2, on sustained participation, through proxies and the tertiary evidence of EUROSTUDENT. Clusters 6 and 9, on regional issues and subjective transition experiences, are addressed through the ESS in the full report only and fall mainly to the WP4 case studies and the WP3B expert survey.

The full report discusses the evidence for each of the nine clusters in turn ([full report](#), Chapter 21).

16 Synthesis and discussion

This chapter reads the findings of the preceding chapters together. Section 16.1 traces the pattern of socioeconomic reproduction that runs through all four transition fields, and Section 16.2 shows how institutions and crises are associated with differences in its level. Section 16.3 contrasts the composition of the immigrant achievement gap and the gender pay gap. Sections 16.4 and 16.5 relate the results to the EDU-LAB model and draw the policy implications, and Sections 16.6 and 16.7 turn to the limits of secondary data and to the questions that WP3A hands to WP3B and WP4.

16.1 The thread of socioeconomic reproduction

Read across the chapters, the most important result of this deliverable is not a single estimate but a pattern that recurs in every field. Socioeconomic differences in competence are clearly established by grade four and are of similar standardised size at every later stage, including among adults (Section 12.5). At age fifteen, the socioeconomic gradient in mathematics is 36.3 points per standard deviation of ESCS, and it has widened since 2015 (Section 5.3). The same background differences reappear as a near four-fold difference in grade repetition between the bottom and top socioeconomic quartiles (Section 6.1), and as a more than four-fold difference in tertiary attainment by parental education (Section 6.3). The labour market adds a further step, because the earnings returns to education are about twice as high over the tertiary years as before them (Section 7.3), while access to tertiary education is socially graded. Across these stages, the association with

background does not become weaker at any point. Because the comparisons are between cohorts rather than within persons, however, they cannot show whether individual stages reduce, reproduce or add to it.

The decomposition and path analyses of Chapter 12 show that the pattern is not only a matter of achievement. About two-fifths of the socioeconomic association with grade repetition remains among students with the same achievement, and about two-fifths of the earnings advantage of a tertiary-educated parent is not accounted for by the respondent's own education and literacy (Section 12.4). And immigrant background, sex and home language account for only about a tenth of the socioeconomic achievement gap (Section 12.3).

16.2 How institutions and shocks modulate the pattern

Around this common pattern, institutions and shocks are associated with differences in outcome levels. The firmest systems-level findings concern early tracking. Systems that track earlier have markedly higher grade repetition and a larger share of achievement variance between schools. These are the only two cross-country associations that are statistically robust (Chapter 9). Early tracking is not, however, associated with a steeper socioeconomic gradient across the nine countries. Larger vocational sectors and higher active-labour-market spending go together with lower youth NEET, but neither association is robust, so both indicate a direction only (Sections 9.3 and 11.1).

The COVID-19 pandemic coincided with a decline in mathematics in every partner country. The socioeconomic gap widened slightly on average, but only in Austria to a statistically significant extent (Chapter 10).

The policy analysis cautions against a simple link between investment and outcomes. Education spending is only weakly associated with education outcomes, and EU structural funds are allocated to the systems with the greatest problems. Cross-country associations between investment volume and outcomes therefore say nothing about the effectiveness of investment in either direction (Section 11.1). More can be learned from specific reforms observed over time. In Portugal, the grade-repetition rate fell by 12.9 percentage points more than in the other partner countries after a national programme to reduce repetition, which suggests that a focused reform can coincide with a substantial change in the outcome it targets, although changed promotion standards may have contributed (Section 11.2).

16.3 Two gaps, two policy logics

The decompositions of Chapter 12 contrast two gaps: the immigrant achievement gap in school and the gender pay gap in the labour market. They are composed in opposite ways.

In seven of the eight countries where natives score higher in PISA mathematics, ESCS, home possessions and home language account for the greater part of the immigrant achievement gap, and for almost all of it in Austria, Germany and Greece. Only in Finland and Kosovo does a significant part remain unexplained (Section 12.1). The gender pay gap among employed adults is the opposite case. Given their education, literacy and age, employed women would be expected to earn slightly more than men. With job characteristics added, the explained part of the pay gap is close to zero, and the unexplained part (14.4 log points) exceeds the gap of 13.0; only in Finland and the United Kingdom is the explained part positive. Among recent graduates, by contrast, field of study and the other characteristics included account for 58 per cent of the pay gap, which widens in the first years after graduation (Section 12.2). Like the pay gap among all employed adults, the gender gap in NEET status is mostly unexplained (Section 12.3).

The explained parts describe how the gaps are composed, not what would happen if characteristics were equalised. Even so, they point to two policy logics. For the immigrant gap, the relevant margin lies in characteristics that immigrant-background students share with other disadvantaged students, so general support for socioeconomic disadvantage and home language reaches most of those concerned. For the gender pay gap, the margin lies beyond qualifications, in pay-setting, occupational structures and the combination of work and care, and among graduates also in the earlier choice of field.

16.4 Contribution to the EDU-LAB model

For WP1, the results supply comparable magnitudes for the determinants of the model across the partner countries. They distinguish determinants whose association is similar across countries, such as socioeconomic status and parental education, from those that vary with context, such as the immigrant gap and the gender gap in achievement, and they give the intersectional framing of WP1 an empirical form: the socioeconomic gradient is flatter for immigrant-background students in all nine countries (Section 12.4), and among students, gender and migration background add to social origin in financial difficulty, as does a health impairment (Section 6.2). For WP2, they provide outcome measures against which the policy mapping can be read, brought together in the joint policy-effectiveness matrix (Section 11.1). For WP3B and WP4, they identify the margins where expert and qualitative evidence would be most informative (Section 16.7).

16.5 Implications for policy

The findings of the analytical chapters point to several implications for policy. Because they rest on associations rather than identified effects, these implications indicate where policy might act, not what a given measure would achieve.

Socioeconomic differences in competence are already present by grade four and are no smaller at later stages (Section 12.5). Measures that reach children before and during primary school therefore address these differences where they are first observed, while later measures meet gaps that already exist.

Grade repetition is closely tied to early tracking, and the comprehensive systems of Finland and the United Kingdom combine very low repetition with achievement broadly similar to that of the early-tracking systems (Section 9.1). Systems that rely on repetition can therefore look to alternatives such as targeted support, all the more because disadvantaged students repeat more often even at equal achievement (Section 12.4).

Access to tertiary education is strongly graded by parental education, while tertiary education carries the highest earnings returns (Sections 6.3 and 7.3). Widening access to tertiary and high-quality vocational qualifications thus addresses a point at which background is associated with lasting differences in adult outcomes.

The immigrant gap is largely associated with socioeconomic background and home language, so support targeted at these characteristics reaches most of the students concerned (Section 12.1). In Finland, a disadvantage remains beyond them, and measures directed at the specific situation of immigrant-background students may be needed in addition.

Neither the gender pay gap nor the gender NEET gap is accounted for by women's qualifications (Sections 12.2 and 12.3). Both therefore point less to education and training for women than to pay-setting, occupational structures, childcare, parental leave and the availability of flexible work. Guidance on field of study addresses the part of the graduate pay gap associated with composition.

Investment volumes show no robust association with outcomes, while Portugal shows that a focused reform can coincide with a substantial change in its targeted outcome (Sections 11.1 and 11.2). Together this argues for the systematic evaluation of programmes, and for directing funds towards the integrated, early and well-targeted measures that D2.1 identifies as effective.

16.6 What secondary data can and cannot contribute

The division of labour between this quantitative programme and the other strands of EDU-LAB follows from what secondary data can do. Secondary analysis of international surveys establishes, comparably across countries and with known sampling uncertainty, the size and variation of the determinants and outcomes the surveys measure. It allows EDU-LAB to state, for example, that the socioeconomic gradient in mathematics widened from 33.2 to 36.3 points between 2015 and 2022, or that tertiary-educated adults are 8.2 percentage points more likely to be employed than adults with similar observed background. It is correspondingly weak on mechanisms, on lived experience, on regional and institutional detail, and on anything the surveys do not measure or do not follow over time.

16.7 Targeted hypotheses for WP3B and WP4

The mechanisms that secondary data can describe but not explain are handed to the WP3B expert survey and the WP4 case studies as a set of targeted questions, each anchored to a specific quantitative finding. The full set is provided as a standalone file on the EDU-LAB Dashboard (<https://dashboard.edu-lab-project.eu/app/wp3a-method>; WP3A_D32_Hypotheses_for_WP3B_WP4.docx).

Most of the questions concern the socioeconomic, migration and gender gaps: through which early-years, home and school processes socioeconomic differences arise before the end of primary school, and why disadvantaged pupils with the same achievement still repeat grades more often; how tracking and school allocation sort pupils between schools; why the socioeconomic gradient is flatter among immigrant-background students, and why part of the immigrant gap remains in Finland at equal background and language; which pay-setting, working-time and care-related mechanisms lie behind the gender pay and NEET gaps; and through which routes parental education remains associated with earnings at equal education and skills. Others address policy and institutions directly: which features of the Portuguese programme accompanied the fall in grade repetition, which demand-side measures matter where young people stay in education but do not find work, as in Greece and Kosovo, how school-to-work coupling operates in the dual systems of Austria and Germany, and what drives graduate overqualification.

17 Limitations

The questions handed to WP3B and WP4 in Section 16.7 mark what the secondary data cannot explain. This chapter sets out the general limits of the evidence itself, in line with the transparency the D3.2 specification requires, and how WP3A plans to address them in D3.3.

The first limit is coverage. PIAAC does not record exact age for Austria and Germany, which removes the two dual-system countries from the labour-market analyses. Kosovo is absent from PIAAC, the ESS and Eurostat, and the United Kingdom from ICILS and, after 2019, from the Eurostat series, so the set of countries differs between analyses. For D3.3, WP3A plans to apply for the PIAAC scientific-use files, which record exact age and so return Austria and Germany to the labour-market analyses, and for the EU Labour Force Survey (EU-LFS), which covers all EU partner countries with large samples.

The second limit is that almost all sources are cross-sectional. The deliverable can therefore describe how inequalities differ between stages and cohorts, but not how they develop within persons; drop-out, re-entry, scarring and income trajectories remain beyond its reach. The PIAAC scientific-use files and the EU-LFS narrow this gap in part, and the longitudinal component of the EU Statistics on Income and Living Conditions (EU-SILC), for which WP3A also plans to apply, follows individuals over several years.

The third limit concerns measurement. Parental expectations, ethnicity, teaching practice, caregiving and family formation, household income and regional conditions are measured poorly or not at all, so their associations are absorbed into the unexplained parts of decompositions and the direct parts of path models. EU-SILC and the EU-LFS would allow financial barriers, the caregiving context of young adults, job stability and regional differences to be examined more closely.

The fourth limit concerns the restricted-access sources. EUROSTUDENT and EUROGRADUATE are confidential scientific-use files released only under a written data use agreement. They cannot be harmonised with the partner-country files or distributed with this deliverable, and they cover only the partner countries that deposited microdata. Because they carry no replicate weights, their estimates are weighted and robust rather than design-based.

The fifth limit is methodological. All results describe associations. Regression coefficients, decompositions and path models depend on the characteristics included, and none of them identifies causal effects; the matching estimate does so only under the assumption of selection on observed characteristics. The cross-country analyses rest on nine countries at most, and only the two early-tracking associations are robust to the omission of individual countries (Chapter 9).

These limitations bound the strength of the system-, crisis- and policy-level claims. The central findings rest on the large design-based analyses of PISA, TIMSS, PIRLS and PIAAC.

18 Conclusions

This deliverable has assembled six harmonised international datasets for the nine EDU-LAB partner countries, complemented them with two restricted-access sources on the tertiary and graduate stages, and used them for a first comprehensive analysis of the four transition fields and of the systems, crisis and policy clusters. The evidence describes a consistent pattern: socioeconomic differences established by the end of primary school recur in progression, attainment and labour-market outcomes. Institutions and crises are associated with differences in its level, whereas the volume of investment is not robustly related to outcomes. Education carries a large employment and earnings premium, most of all at tertiary level. Grade repetition is closely tied to early tracking, as is between-school segregation, and these two associations are the firmest systems-level findings. Mathematics fell in every partner country over the pandemic period, with little change in socioeconomic gaps on average. The immigrant achievement gap is largely accounted for by socioeconomic background and home language, except in Finland and Kosovo, whereas the gender pay and NEET gaps are mostly unexplained. The determinants also do not simply add up: the socioeconomic gradient is flatter for immigrant-background students, and part of the socioeconomic association with repetition remains at equal achievement. All of these results describe associations rather than causal effects.

Together they give EDU-LAB a quantified and comparable baseline, against which the WP1 model, the WP2 policy assessment, the WP4 case studies and the WP3B expert survey can be developed. D3.3 will extend this baseline with the PIAAC scientific-use files, the EU Labour Force Survey and EU-SILC. These are planned to return Austria and Germany to the labour-market analyses, add regional, job-stability and income information, and allow individuals to be followed over time.

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