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# ABSTRACT

# Are Universities Important for Explaining Unequal Participation in Student Mobility? A Comparison between Germany, Hungary, Italy and the UK*

Policies supporting international student mobility prepare young people for the challenges of global and multicultural environments. However, disadvantaged students have lower participation rates in mobility schemes, and hence benefit less from their positive impacts on career progression. Therefore, policy makers aim to make mobility programmes more inclusive. Nevertheless, it is far from clear how policy design can achieve this aim. This study investigates factors driving unequal mobility uptake. It goes beyond existing research by not only focusing on individual choices but also on university characteristics, like university segregation, excellence and student support. In addition, the study is novel in comparing rich graduate survey and administrative data merged with university level ETER data across four countries. Multilevel regression results show consistently across all countries that disadvantaged students do not only lose out on mobility experience due to their background but also due to them being clustered in universities with lower mobility opportunities. Universities' support and excellence while important for explaining mobility uptake do not appear to mitigate unequal uptake in any of the countries examined.

**JEL Classification:** I23, I24, D63, D02

**Keywords:** international student mobility, Erasmus+, unequal uptake, inequality, segregation, student support, university excellence, Germany, Hungary, Italy, UK

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## 1 Introduction

International student mobility (ISM), a temporary study abroad during enrolment in a higher education degree programme at a home university, has become popular during the last three decades. In Europe, the most famous programme fostering learning mobility is Erasmus+ which was inaugurated in 1987. In 2015/16, the most recent data available, more than 300,000 students participated in Erasmus+. In Germany and Italy, it was more than 35,000, in the UK about 15,000 and in Hungary about 5,000 students (European Commission 2018a). The current Erasmus+ student numbers for the UK and Germany reflect about 50% of all ISM mobilities and more than 80% for Hungary and Italy (European Commission 2018b, Figure 44; Schnepf and Colagrossi 2020).

Reasons for constantly rising student mobility are its generally positive effects on i.e. participants' improvement of language skills (Sorrenti 2017), labour market perspectives (Parey and Waldinger 2011, Schnepf and d'Hombres 2018) and international and cultural adaptation (Souto-Otero et al 2013). ISM policies serve therefore as a social investment to prepare young people for the challenges they face in today's globalised and multicultural environment.

Nevertheless, it is well known, that students with lower socio-economic background are less likely to take part in mobility abroad schemes (i.e. Hauschildt et al 2015). Given this socio-economic gap in uptake, it is mainly the better-off who benefit from ISM policies. Hence, ISM policies could contribute to existing social stratification in Europe (Netz and Finger 2016) which stands completely in contrast to the intention of policy makers. To counteract, policy makers emphasise the need of the Erasmus+ programme to widen the access of ISM mobility especially for the disadvantaged students (European Commission 2017). However, it is far from clear how policy design can achieve this aim.

One precondition for effective policy design is to understand the mechanisms driving the unequal ISM uptake. Exploiting rich graduate data merged with European Tertiary Education Register (ETER) data for four European countries (Germany, Hungary, Italy and the UK), this study investigates the determinants of the socio-economic gap in ISM cross-nationally and thereby contributes to existing literature twofold.

Existing literature explains unequal uptake predominantly by focusing on individuals' characteristics thereby indicating that mostly individuals' choices 'cause' unequal uptake. However, students' mobility uptake depends on opportunities provided at universities (Bilecen and Van Mol 2017). The first value added of this study is to examine besides individual factors the importance of university characteristics like social segregation, ability selection and proxies for student support and university excellence. Second, existing studies generally focus only on single countries. By comparing four European countries, this study explores whether factors associated with the gap are similar across countries which would justify an intergovernmental policy approach. In case of differences between countries, country specific policies would be more successful in mitigating the socio-economic uptake gap.

The remainder of the study is as follows: Section 2 reviews existing literature and discusses possible determinants of unequal uptake. Section 3 describes the data and methodology employed. Section 4 presents the study's results and Section 5 concludes.

## 2 International student mobility, literature review and possible determinants of unequal uptake

*International student mobility*

In Italy and Hungary 80% and in the UK and Germany about 50% of ISM are funded by Erasmus+ which justifies a closer look at the organisation of this programme. Universities

that offer Erasmus+ ISM must have signed the Erasmus Higher Education Charter which stipulates fair and equitable opportunities for participants including those with lower socio-economic background (European Commission 2016). Having signed the charter, universities can apply to the National Agencies responsible for Erasmus mobility to receive Erasmus+ grants each year. The agencies distribute the grants for the next years' student cohorts across universities and the mechanism of this distribution are not always clear. It is important to state though that as far as student mobilities to European countries are concerned, the Erasmus+ programme does not set any merit-based requirements for the distribution of grants to universities (European Commission 2016). However, once universities know the number of grants they receive, they generally distribute grants to students on the basis of student performance. Students can only visit those faculties of host universities with which their university has signed an inter-institutional agreement of student exchange. (This is likely to be the case not only for Erasmus+ but all ISM.) More prestigious universities are likely to be more successful in negotiating these agreements and attracting renown exchange universities. In general, Erasmus grants which cover mobilities between three and 12 months aim to only provide additional living expenses associated with living abroad and are around 300 Euro per month but can increase by between 100 and 200 Euro for students from poorer socio-economic backgrounds (i.e. European Commission 2020; British Council 2017).

Other than Erasmus+, ISM are generally organised at the university, so that these programmes are more heterogeneous and differ between education institutions and countries. Given that mobility abroad programmes are popular among students, it is in the interest of universities to offer them. In addition, universities benefit by providing mobility opportunities since this indicates a universitiy's international orientation towards teaching. Mobility uptake therefore is also one indicator taken up in the international university ranking called 'U-multirank'. At least as far as Erasmus+ mobility is concerned, the positive

reputation associated with offering ISM can be gained without costs, since exchange students go on paying their tuition fees to their home university as long as they study less than 12 months abroad.

*Literature*

Existing literature attributes the socio-economic gap in uptake of mobility generally to students' choices, indicating that lower socio-economic background students are less likely to opt for mobility than their more advantaged peers. However, not much is known about the importance of university characteristics for explaining the gap. In addition, current literature is generally country specific, so that possible country differences in determinants of unequal uptake are not known. All three levels (individual, university and country) are clearly of importance for understanding the socio-economic gap in ISM, since they determine the focal point of future mitigating policy design.

*Individual characteristics*

*Students' choice*

Theories explaining the socio-economic mobility gap are very well developed and described in existing literature (i.e. Netz and Finger 2016). In short, rational choice theory (i.e. Breen and Goldthorpe 1997) predicts that students with a lower socio-economic background have to bear higher costs for participation in ISM than better-off students. This is confirmed by research showing i.e. that the disadvantaged evaluate studying abroad as less beneficial than their advantaged counterparts (Loerz et al 2016), which might well be due to especially underprivileged students receiving less financial support by their parents (Hauschildt et al 2015). As Orr et al (2011) shows, many more disadvantaged than advantaged students

perceive lack of finances to cover additional costs of mobility as one of the most important barriers to participate in a mobility programme.

In addition, theories discussing differences in the social and cultural capital (i.e. Bourdieu 1986, Netz and Finger 2016) between disadvantaged and advantaged students help explaining the socio-economic mobility gap. For example, advantaged students have a higher social capital by having more access to information on mobility schemes since i.e. their parents are more likely to have been living abroad (Wiers-Jenssen 2011) or their language skills are higher than that of their disadvantaged peers (Loerz et al 2016). Together with better economic resources this facilitates privileged students' decision to study abroad.

It is however important to remember, that universities are likely to select students into mobility programmes by their ability. Underprivileged students perform on average worse than their privileged counterparts. Hence, even if disadvantaged students decide to take part in mobility against their odds, their chances of being selected into programmes by universities are lower. Other individual characteristics might be associated with the unequal uptake, like gender, migration status, age and most importantly the field of study. Advantaged students are more likely to enrol into those field of studies that provide more mobility opportunities in the UK (Schnepf and Colagrossi 2020).

*University characteristics*

Recently, the focus to explain unequal mobility uptake entirely with individual characteristics and choices has been criticised (Van Mol 2017). To the knowledge of the authors, up to now only one study obliges and examines the importance of universities (Schnepf and Colagrossi 2020). Universities are likely to matter from three perspectives: first, universities differ in terms of mobility opportunities they offer as will be shown later. This unequal distribution of mobilities between universities would not matter for unequal uptake, if students with

different backgrounds were randomly distributed across these universities. However, in the UK, disadvantaged students tend to enrol in universities with lower prestigious status and mobility uptake (Schnepf and Colagrossi 2020). As a consequence, clustering of disadvantaged students in universities with less mobility opportunities is likely to impact on the socio-economic gap in mobility uptake. However, the authors consider the UK as an extreme case, since the UK tertiary education system is considered as one of the mostly socially segregated in Europe. The question therefore arises, whether we find similar results in other European countries.

Second, higher education institutes could also gain importance for explaining the unequal uptake due to the support they provide to students. Taking part in mobility programmes generally requires application processes, which are more difficult to complete successfully for students with lower socio-economic background (Piaz 2017). Disadvantaged students depend on universities providing encompassing support during the ISM application process.

Third, universities with high reputation in terms of excellence could be focusing more on research quality than student experiences thereby not investing into ISM opportunities. Since it is less likely of disadvantaged students to attend renown universities (see above), this mechanism if found would not contribute to the socio-economic gap in mobility uptake.

*Country specific characteristics*

Existing literature is generally based on single country analyses. This study is novel in comparing results for four European countries. Besides disponing of unique data sources, the four countries under analysis cover different regional locations: Italy could be seen as representative for Southern, Germany for Western, the UK for Northern and Hungary for Central Eastern Europe. Moreover, according to common welfare state classifications (i.e. Esping-Andersen 1990; Fenger 2007), they represent distinct welfare regimes as they differ consistently in the degree of stratification they produce in society.

It is not the scope of this research to explain specific country differences resulting from the analyses. This is because potential country determinants of unequal uptake are many more than our small sample of four countries for which we have in-depth rich and comparable graduate data available. However, as discussed above, the importance of university segregation for unequal uptake is likely to depend on its extent in the specific country. Currently, no coherent literature is available comparing segregation at tertiary education levels across countries (Croxford and Raffe 2013). However, our data allows us to proxy segregation for the four countries we examine. We calculate the percentage of disadvantaged graduates in all universities (see Table 2) and then estimate the coefficient of variation (CV) as measure of social segregation for our four countries (see Table A2.2 in the appendix). Results indicate that social segregation is – not surprisingly – highest in the UK as a market based tertiary education system (Dobbins and Knill 2014) with a CV of 0.29 and lowest in Italy with a CV of 0.16, while Hungary (0.27) and Germany (0.20) lie in between. A similar picture appears if we focus on ability segregation across universities (Table A2.3 in the Appendix). This pattern could suggest that in the UK and Hungary segregation in the higher education system has greater explanatory power for unequal uptake.

Second, the tertiary education expansion of the last two decades differed greatly between European countries. For example, while 25% of 25 to 34 year-olds were holding tertiary education in Italy in 2015 (the most recent graduate cohort we examine), it is around 30% in Germany and Hungary and as many as 50% in the UK (OECD 2016). This has several implications. In countries with a small share of tertiary education graduates (like Italy), those disadvantaged students who manage to enter higher education might be much more positively selected than i.e. in the UK. This could lead to a smaller gap in mobility uptake as well as lower power of individual and university characteristics for explaining the gap in countries

with lower compared to those with higher education expansion: greater positive selection of the disadvantaged leads to lower differences in social capital between students.

In addition, in countries with high levels of tertiary education, competition between students for prestigious jobs in the labour market are high. As a consequence, it is likely that especially high-status students try to find other routes for preserving their societal position (Goldthorpe, 1997); one of those could be participation in ISM (Triventi 2013, Netz and Finger 2016) since for example its completion can serve as a positive signal for employers (Petzold 2017). However, especially in the UK context, the country with highest tertiary enrolment, the university system is highly segregated, so that advantaged students can sufficiently preserve their prestigious position by enrolling in the most renown universities. As a consequence, especially in the UK conditioning on the reputation of universities could contribute to explaining the socio-economic gap in uptake.

While Hungary is a country in the middle in terms of social segregation and tertiary education uptake, it is important to note, that the unequal uptake gap in this country might already be higher than in other countries, since Hungary has relatively low living standard costs associated with European wide low purchase power parity. This drives financial costs of mobility abroad, a mechanism that is likely to deter mostly disadvantaged students with low family income to opt for mobility. As a consequence, in this country it is unlikely that much of the unequal gap can be explained.

## 3 Data and methodology

*Data*

Given the absence of a European wide graduate survey, four country specific graduate data sources with very similar variable coverage are exploited for this study: the Deutsche Zentrum fuer Hochschul- und Wissenschaftsforschung (DZHW) Graduate Panel (Baillet et al 2017), the Hungarian Graduate Career Tracking System (HGCTS) (EDUCATIO 2015), the

Italian National Institute of Statistics (*ISTAT*) survey on University Graduates Vocational Integration (ISTAT 2016) and the UK Higher Education Statistics Agency (HESA) graduate administrative data (HESA 2014). Table 1 summarises the main characteristics of the data sources in comparison. For the UK, data quality is highest given the use of administrative data on all graduates. Representative graduate surveys are used for Germany and Italy. While German data collection employs a two stage cluster sampling at university and graduate level, the Italian ISTAT survey uses a sampling frame comprising all graduate students from which it randomly samples. In Hungary, universities could voluntarily participate in the survey. Universities that opted in cover 90% of the graduate population. Graduate response rate is high in Italy with 70%, but very low in Germany and Hungary with just around 20%. Results presented adjust for non-response bias with weights, but given high non-response we cannot claim that our data in these two countries are representative. Item non-response of graduates is negligible (below 2%) in all countries but Hungary and the UK. In Hungary 6% and in the UK 20% of graduates miss information on parental education. These graduates are not taken into account for the analyses. In addition, 6% of graduates miss information on age in Hungary and 21% graduates on upper secondary school results in the UK. A mean imputation is used together with a dummy variable indicating non-response. These dummy variables are insignificant for all models but one (Hungary for age, see Tables A4.2 and A4.4 in the Appendix).

All four data sources are unique, since they include university identifiers making it possible to take clustering of students in universities into account and country specific university type. In addition, it is possible to derive simple segregation measures like the percentage of students with low ability and parental background attending each university. We calculate these measures only for universities with 100 or more sampled students. It is important to note that these university statistics based on student survey data (as it is the case for

Germany, Hungary and Italy) and used as an explanatory variable in a regression design are subject to sampling variation. This leads to a measurement error. As a result, we expect the estimated university group coefficient to be biased towards zero (Green 1993, Hausman 2001).

However, the graduate data does not include any in-depth information on universities' student support or excellence. We derive proxies for support (like teaching load, student fees and number of students at university) and excellence (research focus) from merging our data with 2014 European Education Tertiary Register (ETER), which provides European wide university level information (Daraio et al. 2017). (We also add to our data the Shanghai ranking of universities.) In the UK eleven, in Hungary one and in Italy two smaller universities are not covered in ETER. These graduates are not considered for the analysis. Furthermore, small universities with less than 100 sampled students are not considered for the analysis. For Germany only, this leads to a considerably decline in the university number covered (around 50%) and graduates number (around 10%). As a consequence, especially in Germany and Hungary big universities are considerably overrepresented in the data sets.

The final sample covers 7,634 graduates in 71 universities in Germany, 22,300 graduates in 30 universities in Hungary, 90,943 graduates in 76 universities in Italy and 214,240 universities in 151 universities in the UK.

*Methodology*

In order to investigate the association with unequal uptake of ISM, we first run single level logistic regressions not taking university level into account.

Let $y_i$ denote the student mobility *i*:

$$y_i = \begin{cases} 1 & \text{student uptake Erasmus mobility} \\ 0 & \text{student does not uptake Erasmus mobility} \end{cases}$$

Then the probability of student mobility by a logistic model for mobility participation $p_i = \Pr(y_{i=1})$ can be written as:

$$logit(p_i) = b^T x_i$$

where $x_i$ is a vector of individual level covariates and b is a vector of regression coefficients. Single level logistic regression results provide an estimated association of socio-economic background with mobility unconditional and conditional on individual level characteristics. This approach is in line with the predominant literature not taking university level factors into account.

In order to investigate the importance of university characteristics, we then employ a multilevel approach which takes account of the clustering of students within higher education institutes. This approach also allows to estimate the variance partition coefficient (VPC), which provides the proportion of variation in the underlying student mobility propensity that is due to differences between higher education institutes. The multilevel model can be written as follows:

Let $y_{ij}$ denote the student mobility *i* in university *j* coded:

$$y_{ij} = \begin{cases} 1 & \text{student uptake Erasmus mobility} \\ 0 & \text{student does not uptake Erasmus mobility} \end{cases}$$

Then the probability of student mobility by a general two-level random coefficients logistic model for mobility participation can be $p_{ij} = \Pr(y_{ij=1})$ written as:

$$logit(p_{ij}) = b^T x_{ij} + u_j^T w_{ij}$$

where $\boldsymbol{x}_{ij}$ is a vector of student and university level covariates and $\boldsymbol{w}_{ij}$ is a subset of student-level components of $\boldsymbol{x}_{ij}$ with random coefficients $\boldsymbol{u}_j$ at the university level.

Table A2.1 in the Appendix describes the variable definitions and Table 2 provides descriptive statistics by country.

## 4 Results

Advantaged students are defined as those having at least one parent with a tertiary degree completed and disadvantaged as those whose both parents did not study at university. On average, around 70% of Italian, 50% of German and Hungarian and 40% of UK graduates are disadvantaged following this definition (see Table 2).

How big is the differences in mobility uptake between advantaged and disadvantaged students? Figure 1 focuses on the levels of mobility for both groups, but it is also important to keep its ratio in mind. Mobility uptake is greatest in Germany with around 30% and smallest in the UK with 8%. As expected, the socio-economic gap is considerably large in all four countries. In Italy and the UK, graduates with at least one parent holding tertiary education are about twice as likely to have taken part in mobility schemes compared to graduates with lower educated parents. In Hungary, the disadvantaged are even worse off while the relative gap is smallest in Germany. It is this gap that leads to the literature stating that ISM could conserve social stratification by distributing mobility advantages predominantly to the better-off students.

So how can this gap be explained besides focusing on individual choices? As discussed above, one possibilitiy for universities to matter is that disadvantaged students could cluster especially in those universities where mobility opportunities are lower. Figure 2 sheds light on this distributional pattern. It displays on the y-axes the percent of mobile students in universities. Obviously, within countries, universities greatly differ in the share of students they send abroad. For example, in Germany mobility uptake varies as much as between 5% and 60% and in the UK between 0% and 30% depending on the universities students attend. (See Table 2 for mean and standard deviations of mobility uptake in universities.) This can indicate both, different university policies in fostering ISM as well as their varying success in bidding for mobility grants. It is however obvious that more prestigious higher education

institutes (here defined as those named in the academic ranking of universities called 'Shanghai ranking' as being among the top 500 universities in the world and indicated in orange) tend to offer more mobility opportunities than their counterparts.

The x-axis presents the percentage of disadvantaged students (as defined before) in universities. Results are surprisingly similar across all four countries: universities attended by a higher share of disadvantaged students have lower average mobility uptake. The correlation coefficient is -0.83 for Hungary, -0.47 in the UK, -0.46 in Italy and -0.34 in Germany.

This negative correlation between universities' average student mobility and social segregation remains significant even conditional on a variety of university characteristics (see Appendix Table A3).

The pattern remains also robust, if we change the focus from social segregation to ability segregation (calculating the percentage of students with low upper secondary school results enrolled in universities, see Table A2.3 for descriptives). This variable (not available for Hungary) correlates with mobility uptake for the UK with -0.50, Germany with -0.37 and for Italy with -0.30 (result not shown).

Given that disadvantaged students tend to study in universities with lower mobility uptake, it is quite likely that this overall unequal student distribution to universities drives some part of the overall socio-economic gap in mobility uptake. However, other university variables might be of interest, too, conditional on individual level factors (descriptives of variables used are provided in Table 2).

To examine these associations nested logistic (multilevel) regressions are applied with the dependent variable of student mobility (coded as 1 if students were mobile). A selection of coefficients is displayed in Table 3 which are drawn from full model results provided in Appendix A4 for all countries. Coefficients for all models presented refer to average marginal

effects from which we can derive the percentage point change in ISM uptake if the explanatory variables change by one unit. All continuous variables are scaled as proportions.

*Table 3 about here*

*Individual level*

Models L1 to L3 refer to logistic regressions not taking information on universities into account thereby focusing on the association of individual factors with mobility only. Model L1 includes as only explanatory variable graduates' socio-economic status (proxied by a dummy that is equal to 1 if students are disadvantaged). As expected, the marginal effects are therefore close to the unconditional gap of mobility uptake previously presented in Figure 1. In Hungary, about 10, in Germany 9, in Italy 6 and in the UK 4 percentage points less disadvantaged than advantaged students are studying abroad. We refer to this gap as the socio-economic gap in mobility uptake. It is important to keep in mind that marginal effects refer to level differences: a 4 percentage point gap means for the UK that disadvantaged students have only half the chance of their advantaged counterparts to take part in ISM. In contrast, for Germany, a much bigger gap of 9 percentage points translates into 'only' a reduced chance of one quarter to participate in mobility for the disadvantaged.

Lower mobility uptake by the disadvantaged might be due to their on average lower ability. For Italy and Germany, those students below the 25$^{th}$ percentile of the continuous upper secondary school degree and in the UK those students not achieving one A mark for their A-levels are defined to have lower ability. L2 conditions on these upper secondary school results.

Clearly, ability is a very important factor for explaining participation in ISM. It seems also generally to be more important than socio-economic status. In Germany, those with lower

upper secondary school results have a 13 percentage point lower chance of taking part in mobility (which is about one third of overall mobility in this country). In Italy, the less able are around 3 percentage points (compared to 9 percent overall mobility in this country) and in the UK 6 percentage points less likely (8 percent overall mobility) than their counterparts with better school results. In Hungary, graduates' school results are not available, but a variable likely to proxy ability by indicating whether graduates attended lower reputation schools (non-elite, 4-year comprehensive or vocational upper secondary schools). Results indicate, that in line with the other three countries this crude proxy for lower ability is also negatively associated with mobility participation (see Table 4).

Conditioning on ability declines the coefficient for parental lower education for all countries, even though only significantly for the UK. This indicates that ability selection has the potential to contribute to the mobility gap.

Model L3 conditions also on graduates' gender, age cohort, their citizenship and their field of studies. In all four countries, mobility differs greatly across field of studies with language subjects generally having higher mobility uptake (results not shown). In addition, consistently across countries older students and foreign students (variable only available for Germany and Italy) are less likely to be mobile (see Table 4). Conditioning on these additional factors, significantly decreases the association of socio-economic status with mobility by more than one percentage points in Hungary, Italy and the UK.

How important are individual characteristics covered in our data sets for explaining the gap? With the exception of the UK, not even half of the gap in mobility uptake is accounted for conditional on individual variables.

*University characteristics*

Do university characteristics matter beyond these individual characteristics? This is examined by switching to multilevel models. The model 'MLO' denotes the null model, a model not

including any explanatory variables but measuring the random effects of universities. The variance partition coefficient (VPC) shows that around 40% of the variance in mobility uptake stems from the variation between universities in the UK, around 20% in Italy and only around 10% in Germany and Hungary. This indicates that while universities are very important for explaining ISM for all countries, their explanatory power varies greatly between countries.

Do universities also matter for explaining the socio-economic uptake gap? Model ML1 includes the same individual level characteristics like the logistic regression model L3, but takes clustering of students in universities into account (coefficients of ML1 are very similar to coefficients based on L3 but adding also university fixed effects, not shown). Comparing both models, the gap declines by about 1 percentage point in Hungary and the UK, but this decline is only significant in the UK where it represents about one quarter of the total uptake difference between advantaged and disadvantaged students.

As discussed above, if disadvantaged students are predominantly clustered in universities with lower mobility uptake, then segregation of universities could be of great importance for explaining unequal uptake. This is tested in model ML2 which in addition to the previous model captures the proportion of disadvantaged (as presented in Figure 2) as well as the proportion of low ability students in universities. Clearly, social and ability segregation in universities is sizable and significant for explaining mobility uptake. In Germany, a one standard deviation (12.3 percentage points, see Table A2.3) increase in the percentage of students with lower ability attending university decreases the universities' percentage of ISM opportunities by as much as 5 percentage points. In Hungary, Italy and the UK, a university with a 12 percentage points higher share of disadvantaged students (around one standard deviation, see Table A2.2) will on average have an around 1 percentage point lower mobility uptake. Clearly, a 1 percentage point change in mobility matters given that overall mobility in

these three countries is 10% or less (see Figure 1). It is important to remember, that the estimated associations for all countries but the UK are likely to be biased towards zero (see Section 3), since university segregation is calculated with sample data.

Mobility uptake as well as university segregation could be associated with other university characteristics. Disadvantaged students are likely to receive access to on average less prestigious universities which could be less successful in attracting funding for mobility schemes and inter-institutional arrangements. Universities of applied sciences might neglect efforts on ISM in order to priorities teaching and learning support. As a consequence, it is important to condition on the reputation of universities. We proxy reputation by universities' rank in terms of excellence (i.e. being named as a top university in the Shanghai ranking) and research output (high citation record using Leiden ranking).

Table 4 presents a model without country specific variables allowing direct country comparisons and excerpts of the full models behind ML3. Conditional on segregation measures, students in universities ranked being among the top 500 in the Shanghai ranking have an about 2 percentage point lower probability to take part in mobility in Italy. Otherwise university excellence measures are negligible.

This result could be due to too crude international measures on excellence. We therefore explore also country specific indicators for prestigious universities. In Germany, students attending generally less renown university of applied sciences have an about 17 percentage point lower probability to be mobile, a figure very high given that it is conditional on social segregation and field of study. On the contrary, attendance of Hungarian universities of applied sciences ("főiskola") does not diminish students' mobility chances. Given their high ability student intake, high status Russell universities have on average lower than expected mobility uptake in the UK, a result rather surprising. For Italy, private universities do not

matter (not shown). In sum, university excellence proxies show varying importance and different associations with mobility.

Student support might matter as well. The latter is proxied with the following variables: number of students enrolled in university, since more students could mean economies of scales for offering support on mobility; the annual students' fees in Euros collected by universities, since more fees allow to buy in more support staff; the teaching load (number students per academic staff), since lower tasks for academic staff could translate into more support for extra-curricular support activities.

Similar to university excellence, also student support proxies do not display a direction common across all four countries. For the UK and Italy, a higher student number increases the probability of mobility uptake. However, bigger universities in Germany and Hungary seem to perform slightly worse instead.

The significant and negative coefficients on high teaching load (here defined as total enrolled students of ISCED 5 to 7 divided by academic staff/1000; see Table A2.1) might indicate that more teaching crowds out staff support for students' mobility in Italy and the UK. However, oddly, the reverse is the case in Hungary and teaching load is insignificant in Germany. University fees do not matter in any country. Neither the proportion of foreign staff nor foreign language students in a university matter for the UK, the only country for which this information is available.

Even though there is no common pattern on how university excellence and student support impact on mobility uptake in general, can the inclusion of these university variables explain to some degree the unequal uptake of ISM? Comparing model ML3 with previous models (Table 3) show some interesting results: first, the socio-economic gap (measured by the coefficient for students' lower parental education) does not decline in any of the countries, indicating that these additional university characteristics cannot help in explaining it. The

application of random slope models investigating whether socio-economic background association with mobility differs by university characteristics did not yield any significant and sizable results for any of the countries (results not shown). Second, the VPC declines for all countries by almost one half including our university variables. Only in the UK, a substantial part of variance in mobility explained by university variation (18%: VPC of ML3) could not be accounted for.

*Country level*

In sum, are there some similar country patterns helping to explain the unequal uptake of ISM?

First, across all countries, lower socio-economic background is highly associated with less ISM participation. Second, in addition, university attended by relatively high shares of students with lower socio-economic background or lower ability have on average less students participating in mobility. Both, the significant negative association of university segregation and of lower socio-economic background with mobility uptake, demonstrate the double burden disadvantaged students face for enrolling into mobility programmes. They are not only less likely to study abroad due to their socio-economic background but as well due to their higher chance to attend a university with lower mobility opportunities.

Third, for all country models universities do matter considerably for explaining mobility uptake, indicating that a key for future graduate data collection is keeping track of the universities attended by students.

Fourth, other communalities, like the unimportance of students' fees and young age for mobility uptake, only marginally explain the socio-economic gap in ISM.

Instead, many country differences appear when comparing the unconditional socio-economic background coefficient (model L1) with our most sophisticated model in terms of controls (ML3). Most obvious is the different explanatory power of individual and university level

variables for explaining the unequal gap in mobility uptake. In the UK, only about one third of the gap remains un explained (crudely calculated by dividing the remaining conditional gap of model ML3 (0.015) by the unconditional gap of L1 (0.043), Table 3). In contrast, in Hungary 70%, Italy 80% and Germany even 90% of the gap cannot be accounted for. As discussed above, this could be explained by a more positive selection of disadvantaged students into universities in those countries (like Italy, Germany and Hungary) with low tertiary education uptake. For example, if only disadvantaged students with high ability are admitted to universities, it is not surprising that in our models conditioning on ability does not shrink the socio-economic uptake gap. In the UK, with tertiary education enrolment of close to 50% ability instead has considerable explanatory power. However, as discussed above, in Hungary a considerable part of the unexplained unequal mobility uptake could be due to the additional financial constraints students face if they study in countries where living costs are considerably higher.

University characteristics are of considerable importance for explaining the socio-economic mobility gap in the UK and Hungary. Conditioning on university characteristics decreases the association of graduates' lower status with mobility uptake in the UK (by about 25%) and Hungary (by around 10%). As discussed above, this greater importance of universities in both countries could be due to higher segregation of the tertiary education systems in UK and Hungary.

## 5 Conclusions

Policies supporting popular and constantly rising international student mobility are a social investment to prepare young people for the challenges they face in global and multicultural environments. However, given that disadvantaged students lose out in this opportunity, student mobility policies are sometimes discussed as preserving societal inequalities (Netz and Finger 2016). While policy makers aim to improve inclusiveness of mobility

programmes, it is far from clear which policy design could be successful. This study goes beyond existing research by not only focusing on individual level but, as recent literature suggests, also on university characteristic, like university segregation, student support and university excellence for explaining the socio-economic mobility gap. In addition, the study is novel in comparing rich graduate survey and administrative data merged with university level ETER data across four countries (Germany, Hungary, Italy and the UK), in order to examine whether there are country communalities which could be addressed by intergovernmental policy design.

Results show that consistently across all countries, disadvantaged students do not only lose out on mobility experience due to their background but also due to them being clustered in universities with lower mobility opportunities. For example, an Italian student enrolled in a university attended by 83% disadvantaged students (mean + one standard deviation university) has an about 2 percentage point lower mobility probability (compared to 8% overall mobility) than a student attending a university attended only by 72% disadvantaged students (mean university). A similar result is found for all countries conditional on individuals' socio-economic background and ability. Social and/or ability university segregation is therefore a key for explaining unequal mobility uptake. If mobility opportunities were distributed equally across universities independent of their intake of disadvantaged and low ability students, the socio-economic gap in mobility uptake would be likely to be smaller.

In addition, mobility uptake is associated with students' ability, which again links to socio-economic background. Merit-based selection of students is therefore a potential factor contributing in addition to lower mobility chances by the disadvantaged.

While universities display a considerably high importance for explaining mobility uptake *per se*, indicating the need to take university factors into account for any research on this topic,

results of our proxies on universities' support and excellence suggest that policies targeting these factors would be rather unsuccessful for mitigating unequal uptake in any of the countries examined. These variables are associated with mobility uptake in different ways for different countries (i.e. in Germany attendance of a *Fachhochschule* decreases mobility probability by as much as 17%), but they don't seem to matter much for explaining the lower uptake of mobility by the disadvantaged. In all countries, conditional on individual and university factors, student fees' neither matter for mobility uptake nor for its unequal distribution.

It is interesting, that the variation in the percent of the socio-economic uptake gap that can be explained by the variables we examine is huge between countries. In the UK, about 60%, in Hungary 30%, in Italy 20% and in Germany only 10% of the socio-economic gap is accounted for by individual and university characteristics, indicating that mechanisms driving the gap are likely to differ considerably across European countries. Explanations for these country differences could lie in varying levels of upper secondary school graduates' selection into higher education and of segregation of universities.

How can policy design achieve more equal uptake of student mobility abroad?

Given country similarities regarding the results on segregation of universities and ability, intergovernmental policies could first aim at distributing grants and mobility opportunities more equally across all universities (independent of who attends them) and second consider whether selection predominantly based on ability is the right approach for distributing mobility grants. Given huge country differences in terms of the explanatory power of other individual and university level variables, country specific policies could further try to mitigate the gap answering to country specific mechanisms of unequal mobility uptake.

It is concerning, that even with four rich comparable graduate data sources merged with university information from ETER, especially in Germany, Hungary and Italy a great part of

the socio-economic gap in mobility uptake remains unexplained. This could be due to the fact, that our proxies of student support and university excellence are of limited quality. Future ISM research would therefore benefit from access to European wide graduate data (increasing our limited country sample), that first can provide information on universities attended by students to allow university level analyses as conducted in this study and second have an in-depth coverage of individual characteristics like students' perceptions on the advantages and disadvantages of mobility experiences and universities' strategies on student support and ISM.

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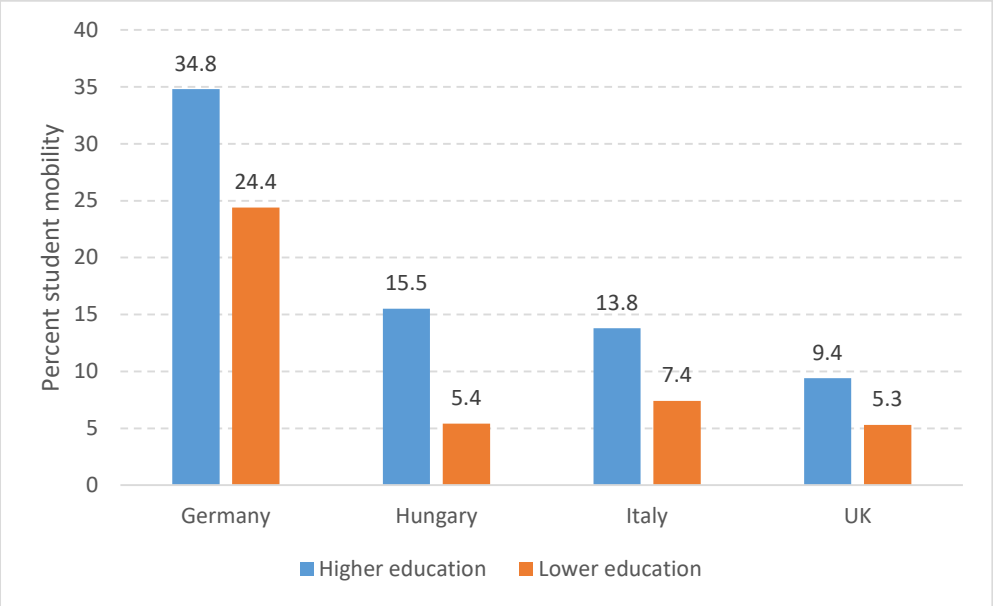
# Figures and Tables

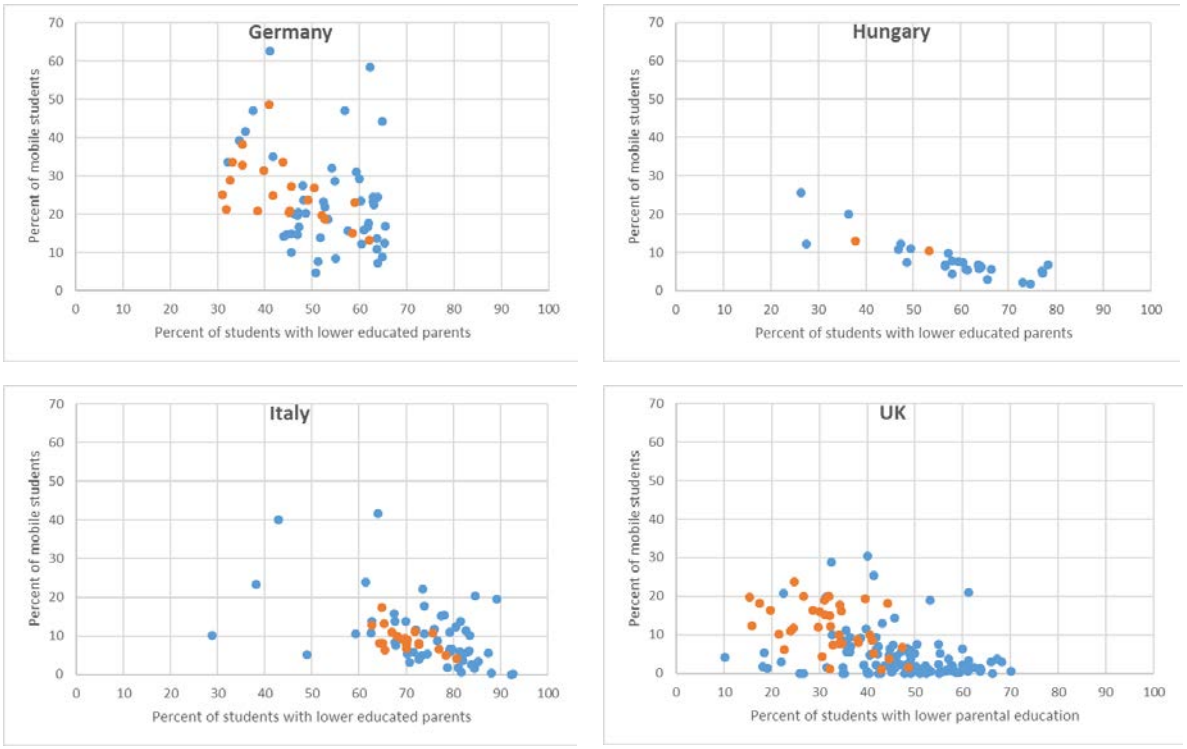
**Figure 1: Student mobility by parental education and country**




Source: authors' calculations using country specific graduate data.

Note: higher parental education refers to at least one parent having completed tertiary education. Standard errors of the percentage of mobility uptake are around 2 for Germany and lower than 0.4 for Hungary, Italy and the UK. Percentage of mobility uptake in the overall student population equals to 29.6% in Germany, 10.4% in Hungary, 9.3% in Italy and 7.6% in the UK.

**Figure 2: Percent of ISM and percent of students with lower parental education by universities and country**




Source: authors' calculations using country specific graduate data.

Note: Universities represented with an orange circle are among the top 500 world universities based on the Shanghai ranking in 2014; blue circles refer to other universities. In Germany, the correlation for all universities is –0.34, and –0.54 for Shanghai ranked and -0.28 for non Shanghai ranked (-0.61 in general universities and 0.18 in universities of applied science). In Hungary, only two universities are among the top 500 world universities based on the Shanghai ranking. The correlation coefficient for the overall sample is -0.83. In Italy, the correlation for all universities is -0.46 and -0.59 for Shanghai ranked and -0.48 for non Shanghai ranked universities. This corresponding figures in the UK are -0.47, -0.45 and -0.26,

**Table 1: Graduate data sources by country**

| | Germany | Hungary | Italy | UK |
|---|---|---|---|---|
| **Name of data sources** | DZHW Graduate Panel | Hungarian Graduate Career Tracking System | ISTAT University Graduates Vocational Integration | UK Higher Education Statistics Agency graduate data |
| **Organiser data collection** | German Centre for Higher Education Research and Science Studies (DZHW) | Education Public Services Non-profit LLC (at the Ministry of National Development) | Italian National Institute of Statistics (ISTAT) | UK Higher Education Statistics Agency |
| **Graduate data type** | Representative survey | Survey without random sampling | Representative survey | Population data |
| **Target universities for analysis** | Universities with more than 30 students sampled | Universities with more than 100 students sampled. | | All universities included |
| **Target graduates for analysis** | First degree graduates only | | | First degree graduates (only bachelors) |
| **Graduate cohort** | 2009 | 2012, 2013, 2014 | 2007 and 2011 | 2015 |
| **University level** | Representative random sample | No random selection | All universities covered | All universities covered |
| **Graduate response rate** | 20% | 20% | 70% | Administrative data |
| **Universities not covered in ETER** | none | 1 (deleted) | 2 (deleted) | 11 (deleted) |
| **Item non-response university level greater than 2%** | University fees + share graduate students missing for 20 universities (imputed) | none | none | none |
| **Item non-response graduates greater than 2 %** | None | 6% parental education (deleted); 6% age at graduation (imputed) | none | 20 % parental education (deleted). 21% ability (imputed) |
| **Final number graduates** | 7,634 | 22,300 | 90,943 | 214,240 |
| **Final number universities** | 71 | 30 | 76 | 149 |

**Table 2: Descriptive statistics**

| | | Germany | | Hungary | | Italy | | UK | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean or % | Std | Mean or % | Std | Mean or % | Std | Mean or % | Std |
| Survey data | **INDIVIDUAL LEVEL** | | | | | | | | |
| | Percent mobile students | 27.3 | | 10.4 | | 9.3 | | 7.6 | |
| | Percent students with lower educated parents | 48.8 | | 51.6 | | 71 | | 43.3 | |
| | Percent lower ability students | 27.8 | | na | | 27.4 | | 63.8 | |
| | Percent Master students | 36.1 | | 58.6 | | 48.2 | | na | |
| | Percent male | 36.7 | | 38.0 | | 44.5 | | 41.5 | |
| | Percent graduation age <=22 | 7.3 | | 12.1 | | 12.8 | | 69.6 | |
| | Percent graduation age 23-25 | 28.7 | | 31.7 | | 32.1 | | 17.2 | |
| | Percent graduation age 25-29 | 55.2 | | 32.4 | | 44.1 | | 6.9 | |
| | Percent graduation age 30+ | 8.8 | | 23.9 | | 11.1 | | 6.3 | |
| | Percent foreigners | 2.9 | | na | | 2.0 | | na | |
| Survey data | **UNIVERSITY LEVEL** | | | | | | | | |
| | Mean of university % mobility participation | 24.4 | 11.9 | 10.2 | 5.1 | 9.7 | 7.5 | 6.3 | 6.8 |
| | Mean university % students whose parents have lower education | 50.5 | 10.2 | 50.9 | 13.8 | 71.6 | 11.1 | 43.2 | 12.7 |
| | Mean of university % lower ability students | 30.9 | 12.3 | na | Na | 28.4 | 8.7 | 68.7 | 27.1 |
| | Students studying languages, % (Survey) | na | na | na | na | na | na | 5.8 | 6.0 |
| | Percent of country specific university type | 33.8 | | 50.0 | | 13.0 | | 15.9 | |
| ETER data | Mean number of students at ISCED 5-7 levels | 14403 | 9868 | 9626 | 8225 | 22645 | 21 | 13320 | 858 |
| | Mean student fees in Euro | 378.4 | 247.0 | 234.7 | 428.3 | 1792.5 | 1757.3 | 9299.7 | 3526.9 |
| | Teaching load | 7.8 | 2.6 | 17.3 | 7.6 | 20.8 | 15.2 | 147.7 | 181.2 |
| | Percent universities with high research excellence | 7.5 | | 6.7 | | 7.0 | | 7.8 | |
| | Mean university % postgraduate students | 20.8 | 0.1 | 11.1 | 8.0 | 48.9 | 11.2 | 12.2 | 9.0 |
| | Percent universities with involvement in EU projects | na | | 50.0 | | 84.2 | | 13.2 | |
| | Mean of university % foreign academic staff | na | na | na | na | na | na | 30.6 | 18.8 |
| Shanghai | Percent universities ranked high in Shanghai Ranking | 32.4 | | 6.7 | | 27.6 | | 25.2 | |
| Observations in surveys | Number of universities without student mobility | 0 | | 0 | | 0 | | 14 | |
| | Number of universities | 71 | | 30 | | 76 | | 151 | |
| | Number of students | 7,634 | | 22,300 | | 90,943 | | 214,240 | |

Note: ETER variables refer to year 2014 in Germany, Italy and the UK and to year 2013 in Hungary. Country specific university type refers to 'Fachhochschule' (university of applied sciences) in Germany, to college ('főiskola') in Hungary, to private universities in Italy and universities in the Russell Group in the UK.

**Table 3: Selection of logistic and multilevel regression coefficients (marginal effects) for different nested regression models by country. Dependent variable: students' ISM uptake.**

| | MODELS | Variables | GERMANY | HUNGARY | ITALY | UK |
|---|---|---|---|---|---|---|
| L1 | **Logistic:** low education single determinant | Parental lower education | **-0.088** (0.010) | **-0.105** (0.005) | **-0.058** (.002) | **-0.043** (0.001) |
| L2 | **Logistic:** L1+ low ability | Parental lower education | **-0.081** (0.010) | na | **-0.056** (.003) | **-0.034** (0.001) |
| | | Low ability | **-0.127** (0.012) | na | **-0.03** (0.002) | **-0.059** (0.001) |
| L3 | **Logistic:** L2 + individual level characteristics | Parental lower education | **-0.073** (0.010) | **-0.083** (0.005) | **-0.043** (0.002) | **-0.021** (0.001) |
| | | Low ability | **-0.132** (0.01) | na | **-0.009** (0.002) | **-0.027** (0.001) |
| ML 0 | **Multilevel:** null model | VPC | 0.12 | 0.07 | 0.22 | 0.39 |
| ML 1 | **Multilevel:** variables like L3 | Parental lower education | **-0.077** (0.0146) | **-0.071** (0.006) | **-0.042** (0.003) | **-0.013** (0.001) |
| | | Low ability | **-0.101** (0.019) | na | **-0.012** (0.003) | **-0.011** (0.001) |
| | | VPC | 0.11 | 0.03 | 0.12 | 0.32 |
| ML 2 | **Multilevel:** ML1 variables + university variables: social segregation and ability segregation in uni | Parental lower education | **-0.077** (0.015) | **-0.073** (0.006) | **-0.043** (0.003) | **-0.014** (0.001) |
| | | Low ability | **-0.010** (0.020) | na | **-0.013** (0.003) | **-0.011** (0.001) |
| | | Uni: social segregation SES | 0.341 (0.228) | ***-0.134*** (0.047) | ***-0.142*** (0.072) | ***-0.124*** (0.041) |
| | | Uni: ability segregation | **-0.416** (0.167) | na | -0.082 (0.106) | *-0.042* (0.020) |
| | | VPC | 0.10 | 0.01 | 0.11 | 0.26 |
| ML 3 | **Multilevel:** M2 + all other university variables (including country specific) | Parental lower education | **-0.078** (0.014) | **-0.073** (0.005) | **-0.044** (0.003) | **-0.015** (0.001) |
| | | Low ability | **-0.010** (0.019) | Na | **-0.013** (0.003) | -0.003 (0.003) |
| | | Uni: social segregation SES | -0.058 (0.230) | ***-0.340*** (0.102) | 0.094 (0.078) | -0.016 (0.055) |
| | | Uni: ability segregation | -0.271 (0.198) | na | ***-0.190*** (0.082) | **-0.121** (0.036) |
| | | VPC | 0.04 | 0.00 | 0.05 | 0.18 |

Note: the table reports marginal effects of logistic/multilevel logistic regressions with the dependent variable: mobility uptake. Models with the prefix L refer to logistic regression models; models with the prefix ML refer to multilevel models. Model L1 includes as only explanatory variable students' parental education (equal to 1 if both parents do not have completed tertiary education). Model L2 adds a dummy variable equal to 1 if students upper secondary school results were low. Model L3 includes individual level characteristics, which are whether the students are Master students (not for UK where all students are Bachelor graduates), gender, age cohort, foreigner (only for Italy and Germany) and field of study fixed effects. Model ML0 is the null model. Model ML1 uses the same explanatory variables like L3, but includes university random effects with a multilevel model. ML2 adds two university level variables: percent of students with lower educated parents and percent of students with lower upper secondary school certificate in universities. ML3 adds further university level variables (see Table 3). Coefficients significant at the 1 % level are printed bold, at the 5% level are bold and in italics and at the 10% level in italics. Standard errors are in parentheses. Complete regression results are reported in Tables A4 in the Appendix.

**Table 4: Selection of multilevel regression coefficients (marginal effects)**

| | VARIABLES | GERMANY | | HUNGARY | | ITALY | | UK | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Same country coeff.** | **ML3 country specific** | **Same country coeff.** | **ML3 country specific** | **Same country coeff.** | **ML3 country specific** | **Same country coeff.** | **ML3 country specific** |
| **Individual level characteristics** | Parental lower education | -0.077*** (0.014) | -0.078*** (0.015) | -0.073** (0.005) | -0.073*** (0.005) | -0.044*** (0.003) | -0.044*** (0.003) | -0.016*** (0.001) | -0.015*** (0.001) |
| | Lower ability (ind.) | -0.010*** (0.020) | -0.010*** (0.020) | - - | - - | -0.013*** (0.003) | -0.013*** (0.003) | -0.012*** (0.002) | 0.003 (0.003) |
| | Master student (ind.) | 0.102*** (0.029) | 0.097*** (0.029) | 0.067*** (0.009) | 0.065*** (0.08) | 0.074*** (0.005) | 0.074*** (0.005) | - - | - - |
| | Male | -0.014 (0.016) | -0.014 (0.017) | 0.004 (0.005) | 0.003 (0.005) | 0.012*** (0.004) | 0.012*** (0.004) | -0.006*** (0.001) | -0.006*** (0.001) |
| | Age 23-25 | -0.026 (0.037) | -0.025 (0.038) | 0.012 (0.008) | 0.012 (0.008) | -0.012 (0.008) | -0.012 (0.008) | 0.035*** (0.003) | 0.035*** (0.003) |
| | Age 25-29 | 0.060 (0.037) | 0.063* (0.037) | 0.018+ (0.011) | 0.020+ (0.010) | -0.033*** (0.008) | -0.033*** (0.008) | 0.004+ (0.002) | 0.004* (0.002) |
| | Age 30+ | -0.089** (0.037) | -0.085** (0.037) | -0.051*** (0.009) | -0.047*** (0.009) | -0.098*** (0.008) | -0.098*** (0.008) | -0.026*** (0.003) | -0.026*** (0.003) |
| | Foreign student | -0.036 (0.031) | -0.035 (0.031) | - - | - - | -0.026** (0.013) | -0.026** (0.013) | - - | - - |
| **Individual level: Proxies ability** | Comprehensive upper secondary | | | | -0.013+ (0.007) | | | | |
| | Vocational upper secondary | | | | -0.032*** (0.008) | | | | |
| **University characteristics: Segregation** | Prop. Students with lower educated parents | -0.074 (0.243) | -0.058 (0.230) | -0.208** (0.065) | -0.340*** (0.102) | 0.093 (0.077) | 0.094 (0.076) | -0.016 (0.057) | -0.016 (0.055) |
| | Prop. Students with lower ability | -0.314* (0.188) | -0.271 (0.198) | - - | - - | -0.182** (0.083) | -0.190** (0.082) | -0.123*** (0.036) | -0.121*** (0.036) |
| **University characteristics: factors associated with university excellence and student support** | Top Shanghai university | 0.029 (0.039) | 0.034 (0.039) | 0.015+ (0.009) | 0.018+ (0.010) | -0.024** (0.011) | -0.024** (0.011) | -0.013 (0.014) | -0.003 (0.014) |
| | Research excellence | -0.143 (0.121) | -0.224** (0.096) | 0.260 (0.310) | 0.161 (0.359) | -0.171 (0.164) | -0.140 (0.145) | -0.014 (0.092) | -0.077 (0.093) |
| | Number of students (isced 5-7, /1000) | -0.003** (0.002) | -0.004** (0.002) | -0.002* (0.001) | -0.002+ (0.001) | 0.0004* (0.000) | 0.0004* (0.000) | 0.002** (0.001) | 0.003*** (0.001) |
| | Proportion postgraduates | 0.380 (0.314) | 0.117 (0.323) | 0.139 (0.188) | 0.073 (0.029) | 0.097 (0.083) | 0.116 (0.070) | -0.165** (0.093) | -0.205** (0.095) |
| | Teaching load (/1000) | 6.241 (10.08) | 8.049 (9.106) | 2.202** (0.850) | 2.876* (1.154) | -3.149*** (0.735) | -3.198*** (0.729) | -0.615** (0.297) | -0.598** (0.285) |
| | University fees (/ 1000) | -0.092 (0.076) | -0.058 (0.074) | -0.004 (0.013) | -0.002 (0.011) | 0.002 (0.006) | 0.002 (0.006) | 0.001 (0.002) | 0.003 (0.002) |
| | Prop. foreign staff | | | | | | | | -0.009 (0.031) |
| | Prop. foreign language students | | | | | | | | 0.135 (0.084) |
| **University level: Proxy of university prestige** | University of applied science | | -0.165** (0.075) | | 0.003 (0.025) | | | | |
| | Russell university | | | | | | | | -0.036** (0.018) |
| **Data and model statistic** | Observations | 7,634 | 7,634 | 22,300 | 22,300 | 90,943 | 90,943 | 213,770 | 213,770 |
| | Number universities | 71 | 71 | 30 | 30 | 76 | 76 | 150 | 150 |
| | VPC | 0.05 | 0.04 | 0.004 | 0.003 | 0.06 | 0.05 | 0.20 | 0.18 |

Note: this table reports a greater selection of regression coefficients (marginal effects) of model ML3 (of which some coefficients were already reported in Table 3) and a similar model excluding country specific variables for comparison reasons. Complete results of the regression are provided in the Appendix A4. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

# Appendix

## Appendix A: Description of data sets

### A1.1 Germany

The DZHW Graduate Panel 2009 is part of the DZHW Graduate Survey Series carried out by The German Centre for Higher Education Research and Science Studies (DZHW) and funded by the Federal Ministry of Education and Research (BMBF), which compiles information on study, career entry, career development and further qualifications of higher education graduates using standardised surveys (Baillet et al 20017). The population of the Graduate Panel 2009 comprises all higher education graduates who completed their degree at a state approved higher education institution in the Federal Republic of Germany in the winter semester of 2008-09 or in the summer semester of 2009, excluding higher education graduates of German Armed Forces universities, technical universities of administration, vocational academies and distance learning universities.

The design was implemented by drawing basic random samplings. The 'primary sampling units' from the cluster samplings is defined on the basis of the higher education institution and the area of study. The 'secondary sampling units' are higher education graduates from the 2009 academic year within these clusters. The samples are layered according to the type of degree obtained, i.e. traditional degree or bachelor degree, and to the geographic region. Traditional degrees take a longer time to complete and by European standards are equivalent to master degrees.
The aim within the respective layers of the random samplings was to achieve a distribution proportionate to the population. Distortion arising from the survey design are counterbalanced by using the appointed calibrated design weights.
In the absence of a cluster (e.g. in the event of refusal of participation at higher education institution or faculty level) the most similar cluster as possible was sought as a substitute. In the event of multiple clusters with similar characteristic combinations, the biggest cluster was chosen. The data was collected between February 2010 and January 2011, the net sample size was of 10,494 with a response rate of 20%.

We dropped from this sample those students who were not in their first degree and who took more than 5 years to complete their bachelor or more than 8 years to complete master/traditional degrees.
Moreover, universities with less than 30 sampled students were removed from the analysis to obtain a consistent number of students within each cluster for multilevel modelling, losing 10% of the students and 50% of the universities.
University level segregation variables, i.e. share of students with low educated parents and share of students with low ability, were computed on the individual level survey variable pooling together 3 waves of the survey (2005, 2009 and 2013) to increase the sample size per university, and we built the indicator on universities with at least 100 sampled students. Universities without indicator for segregation have been then removed from the sample.
The survey has been merged with the ETER database in which we had 20 missing values at the university level for student fees and share of postgraduates for which the mean value was imputed.

The final sample size is of 7634 students in 71 universities.

### A1.2 Hungary

The Hungarian Graduate Career Tracking System (HGCTS) was set up in 2011 to regularly and centrally monitor the labour market outcomes of higher education. Data collection was carried out by Educatio Public Services Non-profit LLC which is an organisation that belongs to the Ministry of National Development. Each year, graduates (both bachelor and master) six months, three years and five years after graduation are approached with an online questionnaire. Both institutions and graduates participate on a voluntary basis. In the various years, graduates from 30-34 higher education institutions in Hungary participated - their student population representing around 90% of the total population.

HGCTS suffers from very low graduate response rates of around 20% in the various years (Horváth, 2016; Veroszta, 2013, 2016). To reduce sampling bias in HGCTS and to better adjust sample-distributions to distributions in the population, post-stratification weighting is applied. To this, population-distributions taken from register data (Higher Education Information System) along four variables are taken into account including field of study, form of study (full time / other), gender and year of graduation.

The nature and the extent of the non-response bias in HGCTS can best be assessed by taking advantage of the integrated administrative data system that links individual-level data from various administrative sources providing anonymised information about some of the recent graduate cohorts in Hungary. Extracting graduates from 2009/2010 and 2011/2012 from this database, Horváth (2016) compared the distributions of the 2013 HGCTS to this administrative data along a range of graduate characteristics. The analyses and a series of simulation studies lead to the conclusion that the HGST sample is self-selected given systematically differences between the population and the sample. However, two-way associations both between the socio-economic variables and the labour market outcomes and between the institutional factors and the labour market outcomes show identical patterns in the two datasets.

Although the data is rich both in demographic and in educational information, it has no proxy for students' ability level. To compensate for this shortage, in the national variation of the model we introduce measures on the type of secondary school attended. The majority of pupils in Hungary enter higher education from a "traditional" comprehensive secondary school that lasts for 4 years. A small proportion however leaves primary school earlier and complete a highly competitive, "elite" academic secondary school that lasts for 6 or 8 years. Finally, others go through a secondary vocational track that also provides them with the A-levels necessary for entering higher education. Research shows that students with higher abilities and higher grades tend to opt for the general academic track rather than the vocational one (Keller, 2018), and the "reform", or elite secondary schools cherry pick the highest achieving primary school pupils (Schiltz és mtsai., 2019). In the country specific models information on secondary school type was added both at the individual and the university level.

For the purposes of the current paper, data from surveys in 2013, 2014 and 2015 are used considering only the most recent graduates (i.e. graduates in 2012, 2013 and 2014). After deletions, the sample covers 22,300 students in 30 universities. Cases were deleted if information was missing on mobility experience of the graduate (600 cases) or parental education (1331 cases) and type of study (masters or bachelor: 74 cases). Universities with less than 100 observations were also dropped from the sample including Moholy-Nagy Művészeti Egyetem, Andrássy Gyula Budapesti Német Nyelvű Egyetem and Szolnoki Főiskola.

For the variables gender (205 cases), age (1,277 cases), field of study (233 cases) and type of secondary school (211 cases) imputation was applied with the value of the variable set to its mean for missing cells and an additional "data imputed" variable entered into the models which is equal to 1 if data were imputed (and 0 otherwise). The coefficient for the imputations variables was not statistically significant in any of the cases but once for age (see Table A4.2).

Sipos N. (2018). Nemzetközi pályakövetési gyakorlatok és a magyar pályakövetési rendszer– A Diplomás Pályakövető Rendszernek az Állami Adminisztratív Adatbázisok Integrációjával való egyezőségének vizsgálata. Doktori értekezés Pécsi Tudományegyetem, Közgazdaságtudományi Kar, Gazdálkodástani Doktori Iskola DOI: 10.13140/RG.2.2.22730.06088

Horváth Á. (2016). *Önszelekciós mechanizmusok és torzító hatások vizsgálata a magyarországi diplomás pályakövetési kutatásokban*. Eötvös Loránd Tudományegyetem.

Keller, T. (2018). Mighty oaks from little acorns? The role of self-assessment in educational transitions: mediation and moderation effects. *Research Papers in Education*, *33*(1), 1–23. https://doi.org/10.1080/02671522.2016.1225792

Schiltz, F., Mazrekaj, D., Horn, D., & De Witte, K. (2019). Does it matter when your smartest peers leave your class? Evidence from Hungary. *Labour Economics*, *59*, 79–91. https://doi.org/10.1016/j.labeco.2019.04.001

Veroszta, Zs. (2013). *Frissdiplomasok 2012. Kutatási zárótanulmány*. Educatio Nonprofit Kft. Felsőoktatási Osztály.

Veroszta, Zs. (2016). *Frissdiplomások 2015. Kutatási zárótanulmány*. Oktatási Hivatal Felsőoktatási Elemzési Főosztály.

## A1.3 Italy

The Italian survey on University Graduates Vocational Integration is carried out by the Italian National Institute of Statistics (ISTAT), including information on students' employment, as well as academic career, mobility and family background, four years after graduation.

The data stem from two different surveys conducted in 2011 for graduates of 2007, and in 2015 for graduates of 2011. The survey of 2011 was conducted using a computer assisted telephone interview (C.A.T.I) while the 2015 survey combines C.A.T.I with Computer-assisted web interviewing (C.A.W.I). The response rate for both surveys is around 70%.
The surveys include bachelor and master students, as well as traditional degrees students. Students are clustered into faculties and universities, and have been sampled using the university census as reference to represent the actual student population. All Italian universities are included in the sample. The original sample included 62,000 students in 2007 and 58,400 students in 2011.

As for Germany, we dropped from the sample those students who were not in their first degree and who took more than 5 years to complete their bachelor or more than 8 years to complete master/traditional degrees. Moreover, we dropped students for which both parents' education was missing, representing 0.64% of the sample.
University level indicators of social segregation have been computed from the survey individual level variables for universities with at least 100 sampled students. Universities with less than 100 students were dropped from the analysis, losing 190 students and 5 universities. Merging with the ETER database, we lost 2 more universities which were not included in the latter.

The final sample includes 90,943 students clustered in 76 universities.

### A1.4 UK

The analysis in this paper relies on unique administrative rather than graduate survey data as commonly used in the literature and in this study for Germany, Hungary and Italy. Data derive from the UK Higher Education Statistics Agency's (HESA) Student Record Data (copyright Higher Education Statistics Agency Limited), which covers information on the entire population of students registered in all UK higher education institutes each year. For this study, HESA extracted the population of all UK domiciled full-time first-degree graduates studying a degree with an expected length of study of at least 3 years (bachelor students), excluding graduates who were not on the same course at the same higher education provider in the two years prior to the graduation year. This target population covers 70% of the entire population of graduates for the 2015 graduation cohort which is the focus of this study.

Like the other three country graduate surveys, the data comprise information on university from which the students graduated. At the university level, the data are merged with ETER data, whereby eleven small universities covering 3% of the graduate population are not covered in ETER and therefore dropped. One additional university covering less than 0.1% of the graduate population was dropped due to lacking information on students' upper secondary school results.

The data are rich in the information collected. They provide information about socio-economic background, which are collected during students' application process for a place at a university through the Universities and Colleges Admissions Service (UCAS). Students report whether at least one of their parents completed tertiary education. However, this information is missing for 20% of the graduates. These students were not included in the analysis.

The data are also rich by providing information on upper secondary school results. We define graduates with lower ability school results as those, who did not achieve one A mark in their A-level results. This information is missing for 8% of the graduates. For these students, mean imputation is applied. In addition, a dummy variable indicating non-response is used in the regression design. This variable called 'Ability variable missing' (shown in Table A5.4) is insignificant for all the models run.

The final sample size covers 214,240 students in 151 universities.

## Appendix A2

### Table A2.1: Definitions of variables by data source

| VARIABLES | GERMANY | HUNGARY | ITALY | UK |
|---|---|---|---|---|
| **INDIVIDUAL LEVEL** | | | | |
| Parental education | Same definition all data sources: both parents did not complete tertiary education coded as 1, otherwise 0 | | | |
| Low ability | Secondary school final grade in the bottom 25% percentile ( >2.7/4) coded as 1, otherwise 0 | not available | Secondary school final grade in the bottom 25% percentile( <75/100) coded as 1, otherwise 0 | Graduate did not achieve an A grade for any of his A levels in upper secondary school coded as 1, otherwise 0. |
| Age at graduation | Same definition all data sources. Dummies for the following age groups category:<23, 23-24, 25-29 and 30+. Control group is age cohort <23 year-olds. | | | |
| Male | Same definition all data sources: male coded as 1, 0 otherwise. | | | |
| Master | Traditional degrees and state exams coded as 1, 0 refers to bachelors | Masters, and long degrees coded as 1, 0 refers to bachelors and college students | Masters and long degrees coded as 1, 0 refers to bachelors | Only 3 year programmes considered. Therefore no dummy variable. |
| Foreign | 1 if student is not German, 0 otherwise. | not available | 1 if student is not Italian, 0 otherwise. | not available |
| **UNIVERSITY LEVEL** ***Survey level data*** | | | | |
| Proportion of students with low parental education in university | Calculated from individual level variable (low parental education) exploiting survey data from 2005, 2009, 2013 (100 students sampled per uni minimum) | Calculated from individual level variable (low parental education) exploiting survey data from 2013, 2014, 2015 (100 students sampled per uni minimum) | Calculated from individual level variable (low parental education) (100 students sampled per uni minimum) | Calculated from individual level variable (low parental education) based on administrative data |

| VARIABLES | **GERMANY** | **HUNGARY** | **ITALY** | **UK** |
|---|---|---|---|---|
| Proportion of students with low ability | Calculated from individual level variables (low ability) exploiting survey data from 2005, 2009, 2013 (100 students sampled per uni minimum) | not available | Calculated from individual level variables (low ability) (100 students sampled per uni minimum) | Calculated from individual level variable (low ability) taking only those students per university into account, for who the information is not missing. |
| Proportion of students studying languages | not available | not available | not available | Proportion of students studying languages in uni |
| University type | 1=Fachhochschule (university of applied sciences), 0=university | 1=főiskola, 0=university | not available | 1=Russell Group university (prestigious), 0=otherwise |
| % of students from traditional general sec. school | not available | Calculated from individual level variable (attended a traditional general secondary school) exploiting survey data from 2013, 2014, 2015 (100 students sampled per uni minimum) | not available | not available |
| % of students from vocational-general sec. schools | not available | Calculated from individual level variable (attended a vocational-general secondary school) exploiting survey data from 2013, 2014, 2015 (100 students sampled per uni minimum) | not available | not available |
| **ETER VARIABLES** | | | | |
| Total number of students / 1000 | Number of students enrolled at the beginning of the academic year (last day of the first month of the winter semester academic year) divided by 1000 | | | |
| Teaching load/1000 | Total enrolled students (ISCED 5-7) / total academic staff divided by 1000 | | | |

| VARIABLES | **GERMANY** | **HUNGARY** | **ITALY** | **UK** |
|---|---|---|---|---|
| Student fees in Euros/1000 | Single student average yearly fees for survey year divided by 1000 | | | |
| Research excellence | Measure of publication quality: proportion of papers published by university staff that are included in the 10 10% most cited. | | | |
| Proportion post-graduate students | Proportion of students enrolled in universities, who are post-graduates. | | | |
| Collaboration of university in an EU project | not available | Dummy equal to 1 if the university took part, otherwise 0 | not available | |
| Proportion foreign staff | not available | not available | not available | Proportion foreign staff |
| Proportion foreign undergraduates | not available | not available | not available | Proportion foreign undergraduates |
| Proportion foreign post-graduates | not available | not available | not available | Proportion foreign postgraduates |
| **SHANGHAI RANKING** | University is included in the Shanghai ranking coded as 1, 0=otherwise | | | |
| **REGIONAL DATA** (from survey) | Lander (Nuts 1) | 1=Budapest, 0=otherwise | North, Centre, South and islands | England, Wales, Scotland and Northern Ireland |

**Table A2.2: Distribution of students whose both parents did not complete tertiary education (parents with lower education), university level.**

| | Germany | Hungary | Italy | UK |
|---|---|---|---|---|
| Mean | 50.5 | 50.9 | 71.6 | 43.2 |
| Median | 50.7 | 55.9 | 72.5 | 44.2 |
| $10^{th}$ percentile | 35.2 | 27.7 | 61.4 | 25.8 |
| $25^{th}$ percentile | 43.9 | 37.6 | 65.5 | 34.5 |
| $75^{th}$ percentile | 60.4 | 60.9 | 79.8 | 52.4 |
| $90^{th}$ percentile | 63.6 | 63.9 | 83.3 | 60.0 |
| Standard deviation | 10.2 | 13.9 | 11.0 | 12.7 |
| Coefficient of variation (sd/mean) | 0.20 | 0.27 | 0.16 | 0.29 |
| Number of universities | 69 | 30 | 76 | 151 |

Note: this table shows that ie. in the UK an average university has 43 % of students whose parents both did not complete tertiary education. The distribution of those students into universities differs between countries. The coefficient of variation provides a unit independent measure of this social segregation of universities by parental education background. Social segregation of universities appears to be highest in the UK and lowest in Italy.

**Table A2.3: Distribution of students with lower upper secondary school leaving marks across universities**

| | Germany | Italy | UK |
|---|---|---|---|
| **Mean** | 30.9 | 28.4 | 68.7 |
| **Median** | 29 | 28.5 | 81.0 |
| **10th percentile** | 16.9 | 18.7 | 22.9 |
| **25th percentile** | 20.4 | 22.9 | 41.7 |
| **75th percentile** | 39.4 | 34.4 | 90.1 |
| **90th percentile** | 49.5 | 39.6 | 94.5 |
| **Standard deviation** | 12.3 | 8.7 | 27.1 |
| **Coefficient of variation (std/mean)** | 0.40 | 0.31 | 0.39 |
| **Number of universities** | 69 | 76 | 151 |

Note: In the UK, students with lower upper secondary school leaving mark are those who did not have one single A level marked with the highest level, 'A'. In Italy and Germany, its defined as the 25th bottom percentile of the total distribution. The variable is not available for Hungary.

## Appendix 3: University level regression

## Table A3: Selected regression coefficients of OLS regression with dependent variable ln mobility at the university level

| | GERMANY | | | HUNGARY | ITALY | | UK | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | Country specific | No ability | (1) | (1) | No ability | (1) | (2) |
| Share of students with low SES | -2.544*** | -2.491*** | -2.957*** | -0.395** | 0.593 | -0.928 | -0.039 | -0.047 |
| | (0.809) | (0.760) | (0.726) | (0.154) | (1.026) | (0.944) | (0.055) | (0.052) |
| Share of students with low ability | -0.950 | -0.697 | | | -3.017*** | | -0.119*** | -0.108*** |
| | (0.832) | (0.787) | | | (1.006) | | (0.033) | (0.031) |
| Number students / 1000 | 0.001 | -0.001 | 0.000 | -0.002 | 0.004 | 0.003 | 0.002*** | 0.002*** |
| | (0.008) | (0.008) | (0.008) | (0.001) | (0.004) | (0.004) | (0.001) | (0.001) |
| Shanghai ranked | 0.101 | 0.127 | 0.126 | 0.007 | -0.357* | -0.360* | 0.003 | -0.004 |
| | (0.177) | (0.167) | (0.176) | (0.016) | (0.181) | (0.192) | (0.014) | (0.014) |
| High citation score | -1.029 | -1.295* | -1.180* | 0.248 | -4.817*** | -2.751* | 0.036 | -0.045 |
| | (0.709) | (0.673) | (0.699) | (0.481) | (1.584) | (1.510) | (0.088) | (0.087) |
| Teaching load / 1000 | 8.519 | 13.721 | 0.372 | 2.109 | -19.988*** | -17.717*** | -0.285 | -0.303 |
| | (32.253) | (30.356) | (31.553) | (1.314) | (4.288) | (4.469) | (0.235) | (0.224) |
| Share of postgraduate students | 0.579 | -0.576 | 0.739 | 0.255 | 1.746** | 2.441*** | -0.080 | -0.109 |
| | (1.204) | (1.209) | (1.200) | (0.398) | (0.781) | (0.789) | (0.072) | (0.069) |
| Student fees / 1000 | -0.390 | -0.245 | -0.333 | -0.007 | 0.029 | -0.004 | -0.000 | -0.000 |
| | (0.355) | (0.337) | (0.352) | (0.026) | (0.050) | (0.052) | (0.002) | (0.002) |
| REGIONAL VARIABLES | | | | | | | | |
| Northern Ireland | | | | | | | 0.064** | 0.073** |
| | | | | | | | (0.029) | (0.028) |
| Scotland | | | | | | | 0.068*** | 0.069*** |
| | | | | | | | (0.020) | (0.019) |
| Wales | | | | | | | 0.014 | 0.008 |
| | | | | | | | (0.018) | (0.018) |
| Italian region: centre | | | | | -0.224 | -0.004 | | |
| | | | | | (0.143) | (0.052) | | |
| Italian region south | | | | | -0.739*** | -0.004 | | |
| | | | | | (0.152) | (0.052) | | |
| NUTS1 (Länder) | yes | yes | yes | | | | | |
| | | | | - | | | | |
| COUNTRY SPECIFIC | | | | | | | | |
| % language students in uni | | | | - | | | | 0.281*** |
| | | | | - | | | | (0.074) |
| Uni of applied science | | -0.724*** | | | | | | |
| | | (0.269) | | | | | | |
| Constant | 4.785*** | 4.999*** | 4.790*** | 0.336*** | 2.764*** | 2.521** | 0.131*** | 0.122*** |
| | (0.636) | (0.602) | (0.638) | (0.128) | (1.013) | (1.069) | (0.039) | (0.038) |
| Observations | 71 | 71 | 71 | 30 | 76 | 76 | 150 | 150 |
| Adjusted R-squared | 0.328 | 0.407 | 0.324 | 0.706 | 0.604 | 0.556 | 0.449 | 0.498 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. In the UK, the following country specific university variables are not significant: proportion foreign staff in university, EU project participation and Russel group university. In Italy, EU project participation not significant and share of foreign staff not available. In Hungary institutions located in Budapest, type of institution (university vs college) share of students from a reform / a technical secondary school; EU project participation ;

## Appendix A4: Student level logistic (multilevel) models for each country (marginal effects)

### Table A4.1: Germany

| | (1) L1 | (2) L2 | (3) L3 | (4) ML0 | (5) ML1 | (6) | (7) ML2 | (8) | (9) ML3 |
|---|---|---|---|---|---|---|---|---|---|
| VARIABLES | . | . | . | . | . | . | . | . | . |
| **INDIVIDUAL** | | | | | | | | | |
| Low parental SES | -0.088*** | -0.081*** | -0.073*** | | -0.077*** | -0.077*** | -0.077*** | -0.077*** | -0.078*** |
| | (0.010) | (0.010) | (0.010) | | (0.014) | (0.015) | (0.015) | (0.014) | (0.015) |
| Low ability | | -0.127*** | -0.132*** | | -0.101*** | -0.101*** | -0.010*** | -0.010*** | -0.010*** |
| | | (0.012) | (0.012) | | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) |
| Master | | | 0.073*** | | 0.088*** | 0.088*** | 0.086*** | 0.102*** | 0.097*** |
| | | | (0.011) | | (0.026) | (0.028) | (0.028) | (0.029) | (0.029) |
| Male | | | 0.003 | | -0.013 | -0.013 | -0.013 | -0.014 | -0.014 |
| | | | (0.011) | | (0.017) | (0.017) | (0.017) | (0.016) | (0.017) |
| Age 23-25 | | | 0.013 | | -0.021 | -0.021 | -0.020 | -0.026 | -0.025 |
| | | | (0.020) | | (0.038) | (0.038) | (0.038) | (0.037) | (0.038) |
| Age 25-29 | | | 0.094*** | | 0.070* | 0.070* | 0.072* | 0.060 | 0.063* |
| | | | (0.020) | | (0.038) | (0.037) | (0.037) | (0.037) | (0.037) |
| 30+ | | | -0.048** | | -0.080** | -0.080** | -0.078** | -0.089** | -0.085** |
| | | | (0.024) | | (0.039) | (0.038) | (0.038) | (0.037) | (0.037) |
| Foreigner | | | -0.053* | | -0.032 | -0.032 | -0.032 | -0.036 | -0.035 |
| | | | (0.031) | | (0.032) | (0.032) | (0.032) | (0.031) | (0.031) |
| Field of study | | | Yes | | Yes | Yes | Yes | Yes | Yes |
| **UNIVERSITY** | | | | | | | | | |
| Share low ses | | | | | | 0.002 | 0.341 | -0.074 | -0.058 |
| | | | | | | (0.195) | (0.242) | (0.243) | (0.230) |
| Share low ability | | | | | | | -0.416** | -0.314* | -0.271 |
| | | | | | | | (0.167) | (0.188) | (0.198) |
| Total students/1000 | | | | | | | | -0.003** | -0.004** |
| | | | | | | | | (0.002) | (0.002) |
| Lander (nuts1) | | | | | | | | Yes | Yes |
| Shanghai Ranking | | | | | | | | 0.029 | 0.034 |
| | | | | | | | | (0.039) | (0.039) |
| Research excellence | | | | | | | | -0.143 | -0.224** |
| | | | | | | | | (0.121) | (0.096) |
| Teaching_load/1000 | | | | | | | | 6.241 | 8.049 |
| | | | | | | | | (10.08) | (9.106) |
| Student fees/1000 | | | | | | | | -0.092 | -0.058 |
| | | | | | | | | (0.076) | (0.074) |
| Share of postgradua | | | | | | | | 0.380 | 0.117 |
| | | | | | | | | (0.314) | (0.323) |
| **COUNTRY SPECIFIC** | | | | | | | | | |
| Fachhochschule (uni of applied sciences) | | | | | | | | | -0.165** |
| | | | | | | | | | (0.075) |
| Constant | | | | 0.285*** | | | | | |
| | | | | (0.016) | | | | | |
| VPC | | | | 0.12 | 0.11 | 0.11 | 0.10 | 0.05 | 0.04 |
| Number of groups | | | | 71 | 71 | 71 | 71 | 71 | 71 |
| Observations | 7,634 | 7,634 | 7,634 | 7,634 | 7,634 | 7,634 | 7,634 | 7,634 | 7,634 |

Note: standard errors in parentheses + p<0.1, * p<.05, ** p<.01, *** p<.001

## Table A4.2: Hungary

| | (1) L1 | (2) L3 | (3) ML0 | (4) ML1 | (5) | (6) ML2 | (7) ML3 |
|---|---|---|---|---|---|---|---|
| **INDIVIDUAL** | | | | | | | |
| Low parental SES | -0.105*** | -0.083*** | | -0.071*** | -0.073*** | -0.073*** | -0.069*** |
| | (0.005) | (0.005) | | (0.006) | (0.006) | (0.005) | (0.005) |
| Master | | 0.075*** | | 0.065*** | 0.067*** | 0.067*** | 0.065*** |
| | | (0.005) | | (0.009) | (0.009) | (0.008) | (0.008) |
| Male | | -0.003 | | -0.004 | -0.004 | -0.004 | -0.003 |
| | | (0.005) | | (0.005) | (0.005) | (0.005) | (0.005) |
| Gender imputed | | -0.033 | | -0.006 | 0.011 | 0.004 | 0.011 |
| | | (0.028) | | (0.027) | (0.023) | (0.026) | (0.023) |
| Age 23-25 | | 0.011 | | 0.012 | 0.012 | 0.012 | 0.012 |
| | | (0.008) | | (0.007) | (0.008) | (0.008) | (0.008) |
| Age 25-29 | | 0.017+ | | 0.017+ | 0.018+ | 0.018+ | 0.020+ |
| | | (0.009) | | (0.010) | (0.011) | (0.011) | (0.010) |
| 30+ | | -0.056*** | | -0.049*** | -0.051*** | -0.051*** | -0.047*** |
| | | (0.008) | | (0.008) | (0.009) | (0.010) | (0.009) |
| Age imputed | | 0.035*** | | 0.001 | 0.002 | 0.001 | 0.002 |
| | | (0.008) | | (0.009) | (0.009) | (0.008) | (0.008) |
| Year of grad. 2013 (Ref: | | 0.005 | | 0.004 | 0.004 | 0.005 | 0.004 |
| 2012) | | (0.005) | | (0.004) | (0.003) | (0.004) | (0.004) |
| Year of grad. 2014 | | 0.001 | | 0.000 | 0.000 | 0.001 | 0.006 |
| | | (0.005) | | (0.004) | (0.004) | (0.004) | (0.004) |
| Field of study | | yes | | yes | yes | yes | yes |
| **UNIVERSITY** | | | | | | | |
| Share low SES | | | | | -0.134** | -0.208** | -0.340*** |
| | | | | | (0.047) | (0.065) | (0.102) |
| Total students/1000 | | | | | | -0.002* | -0.002+ |
| | | | | | | (0.010) | (0.001) |
| Budapest | | | | | | -0.021 | -0.015 |
| | | | | | | (0.016) | (0.014) |
| Shanghai Ranking | | | | | | 0.0150+ | 0.018+ |
| | | | | | | (0.009) | (0.009) |
| Research excellence | | | | | | 0.260 | 0.161 |
| | | | | | | (0.310) | (0.359) |
| Teaching_load/1000 | | | | | | 2.202** | 2.876* |
| | | | | | | (0.850) | (1.154) |
| Student fees/1000 | | | | | | -0.004 | -0.002 |
| | | | | | | (0.013) | (0.011) |
| Share of postgraduates | | | | | | 0.139 | 0.073 |
| | | | | | | (0.188) | (0.234) |
| **COUNTRY SPECIFIC** | | | | | | | |
| EU project participation | | | | | | | 0.029 |
| | | | | | | | (0.028) |
| College (ref: university) | | | | | | | 0.003 |
| | | | | | | | (0.025) |
| Student from trad. sec. school | | | | | | | -0.013+ |
| | | | | | | | (0.007) |
| Student from tech. sec. school | | | | | | | -0.032*** |
| | | | | | | | (0.008) |
| Share of students from classical sec. school | | | | | | | 0.212 |
| | | | | | | | (0.178) |
| Share of students from technical sec. school | | | | | | | 0.272 |
| | | | | | | | (0.197) |
| Constant | | | -2.501*** | | | | |
| | | | (0.096) | | | | |
| Observations | 22,300 | 22,300 | 22,300 | 22,300 | 22,300 | 22,300 | 22,300 |
| VPC | | 0.025 | 0.074 | 0.025 | 0.012 | 0.004 | 0.003 |
| Log pseudo like | | -5773.4 | -6180.3 | -5773.4 | -5767.8 | -5763.6 | -5748.7 |

Note: standard errors in parentheses + p<0.1, * p<.05, ** p<.01, *** p<.001

**Table A4.3: Italy**

| | (1) L1 | (2) L2 | (3) L3 | (4) ML0 | (5) ML1 | (6) | (7) ML2 | (8) ML3 |
|---|---|---|---|---|---|---|---|---|
| **INDIVIDUAL** | | | | | | | | |
| Low parental SES | -0.058*** | -0.056*** | -0.043*** | | -0.042*** | -0.043*** | -0.043*** | -0.044*** |
| | (0.002) | (0.002) | (0.002) | | (0.003) | (0.003) | (0.003) | (0.003) |
| Low ability | | -0.03*** | -0.009*** | | -0.012*** | -0.013*** | -0.013*** | -0.013*** |
| | | (0.002) | (0.002) | | (0.003) | (0.003) | (0.003) | (0.003) |
| Master | | | 0.078*** | | 0.071*** | 0.073*** | 0.074*** | 0.074*** |
| | | | (0.003) | | (0.006) | (0.005) | (0.005) | (0.005) |
| Male | | | 0.010*** | | 0.012*** | 0.012*** | 0.012*** | 0.012*** |
| | | | (0.002) | | (0.004) | (0.004) | (0.004) | (0.004) |
| Age 23-25 | | | -0.019*** | | -0.012 | -0.012 | -0.012 | -0.012 |
| | | | (0.004) | | (0.008) | (0.008) | (0.008) | (0.008) |
| Age 25-29 | | | -0.038*** | | -0.031*** | -0.032*** | -0.032*** | -0.033*** |
| | | | (0.005) | | (0.008) | (0.008) | (0.008) | (0.008) |
| 30+ | | | -0.103*** | | -0.095*** | -0.098*** | -0.099*** | -0.098*** |
| | | | (0.005) | | (0.009) | (0.009) | (0.009) | (0.008) |
| Foreigner | | | -0.015** | | -0.024** | -0.025** | -0.025** | -0.026** |
| | | | (0.008) | | (0.012) | (0.012) | (0.012) | (0.013) |
| Survey year 2015 | | | 0.011*** | | 0.007*** | 0.007*** | 0.007*** | 0.008*** |
| (Ref. 2011) | | | (0.002) | | (0.003) | (0.003) | (0.003) | (0.003) |
| Field of study | | | Yes | | Yes | Yes | Yes | Yes |
| **UNIVERSITY** | | | | | | | | |
| Share low ses | | | | | | -0.178** | -0.142** | 0.093 |
| | | | | | | (0.073) | (0.072) | (0.078) |
| Share low ability | | | | | | | -0.082 | -0.182** |
| | | | | | | | (0.106) | (0.083) |
| Total students/1000 | | | | | | | | 0.0004* |
| | | | | | | | | (0.000) |
| Region: centre | | | | | | | | -0.013 |
| | | | | | | | | (0.012) |
| Region: south | | | | | | | | -0.04*** |
| | | | | | | | | (0.012) |
| Shanghai Ranking | | | | | | | | -0.024** |
| | | | | | | | | (0.011) |
| Research excellen | | | | | | | | -0.171 |
| | | | | | | | | (0.164) |
| Teaching_load/1000 | | | | | | | | -3.149*** |
| | | | | | | | | (0.735) |
| Student fees/1000 | | | | | | | | 0.002 |
| | | | | | | | | (0.006) |
| Share of postgradua | | | | | | | | 0.097 |
| | | | | | | | | (0.083) |
| Constant | | | | 0.102*** | | | | |
| | | | | (0.00829) | | | | |
| Sigma u2 | | | | 0.951*** | 0.448*** | 0.395*** | 0.395*** | 0.191*** |
| | | | | (0.285) | (0.111) | (0.095) | (0.092) | (0.040) |
| Log likelihood | | | -25543 | -136132 | -125247 | -125242 | -125242 | -125212 |
| VPC | | | | 0.22 | 0.12 | 0.11 | 0.11 | 0.06 |
| Number of groups | | | | 76 | 76 | 76 | 76 | 76 |
| Observations | 90,943 | 90,943 | 90,943 | 90,943 | 90,943 | 90,943 | 90,943 | 90,943 |

Note: Models 2-8 controlled for imputation for individual ability missing; standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

## Table A4.4: UK

| VARIABLES | (1) L1 | (2) L2 | (3) L3 | (4) ML0 | (5) ML1 | (6) | (7) ML2 | (8) | (9) ML3 |
|---|---|---|---|---|---|---|---|---|---|
| **INDIVIDUAL** | | | | | | | | | |
| Low parental SES | -0.043*** | -0.034*** | -0.021*** | | -0.013*** | -0.013*** | -0.014*** | -0.016*** | -0.015*** |
| | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Low ability | | -0.059*** | -0.027*** | | -0.011*** | -0.011*** | -0.011*** | -0.012*** | -0.012*** |
| | | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) | (0.002) | (0.002) |
| Ability missing dummy | | 0.003 | 0.003 | | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| | | (0.003) | (0.003) | | (0.002) | (0.002) | (0.002) | (0.003) | (0.003) |
| Male | | | -0.005*** | | -0.005*** | -0.005*** | -0.006*** | -0.006*** | -0.006*** |
| | | | (0.001) | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Age 23-25 | | | 0.034*** | | 0.030*** | 0.031*** | 0.032*** | 0.035*** | 0.035*** |
| | | | (0.002) | | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Age 25-29 | | | -0.001 | | 0.004+ | 0.004+ | 0.004+ | 0.004+ | 0.004+ |
| | | | (0.002) | | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| 30+ | | | -0.030*** | | -0.022*** | -0.023*** | -0.023*** | -0.026*** | -0.026*** |
| | | | (0.002) | | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Field of study | | | YES | | YES | YES | YES | YES | YES |
| **UNIVERSITY** | | | | | | | | | |
| Share low ses | | | | | | -0.177*** | -0.124** | -0.016 | -0.016 |
| | | | | | | (0.035) | (0.041) | (0.057) | (0.057) |
| Share low ability | | | | | | | -0.042* | -0.123*** | -0.121*** |
| | | | | | | | (0.020) | ((0.036) | ((0.036) |
| Total students/1000 | | | | | | | | 0.002*** | 0.003*** |
| | | | | | | | | (0.001) | (0.001) |
| Region: Northern Ireland | | | | | | | | 0.092+ | 0.249* |
| | | | | | | | | (0.054) | (0.106) |
| Region: Scotland | | | | | | | | 0.136** | 0.153** |
| | | | | | | | | (0.044) | (0.047) |
| Region: Wales | | | | | | | | 0.017 | 0.015 |
| | | | | | | | | (0.020) | (0.018) |
| Shanghai Ranking | | | | | | | | -0.010 | -0.005 |
| | | | | | | | | (0.054) | (0.062) |
| Research excellence | | | | | | | | -0.014 | -0.077 |
| | | | | | | | | (0.091) | (0.093) |
| Teaching_load/1000 | | | | | | | | -0.615* | -0.600* |
| | | | | | | | | (0.297) | (0.285) |
| Student fees/1000 | | | | | | | | 0.001 | 0.003 |
| | | | | | | | | (0.002) | (0.002) |
| Proportion of postgraduate | | | | | | | | -0.165+ | -0.205* |
| | | | | | | | | (0.093) | (0.095) |
| Dummy imput prop postgrad | | | | | | | | 0.015 | 0.090** |
| | | | | | | | | (0.017) | (0.031) |
| **COUNTRY SPECIFIC** | | | | | | | | | |
| Russel university | | | | | | | | | -0.037* |
| | | | | | | | | | (0.018) |
| Collaboration EU project | | | | | | | | | -0.007 |
| | | | | | | | | | (0.012) |
| Proportion foreign staff | | | | | | | | | -0.010 |
| | | | | | | | | | (0.031) |
| Proportion enrolled in language courses | | | | | | | | | 0.134 |
| | | | | | | | | | (0.084) |
| Proportion foreign undergraduates | | | | | | | | | 0.016 |
| | | | | | | | | | (0.021) |
| Proportion foreign post-graduates | | | | | | | | | -0.084** |
| | | | | | | | | | (0.030) |
| Constant | | | | 0.069*** | | | | | |
| | | | | (0.007) | | | | | |
| Sigma u2 | | | | 1.453 | 1.229 | 1.099 | 1.074 | 0.909 | 0.882 |
| Log likelihood | | | | -51247 | -40297 | -40287 | -40282 | -40213 | -40210 |
| VPC | | | | 0.391 | 0.315 | 0.280 | 0.259 | 0.201 | 0.191 |
| Number of groups | | | | 151 | 151 | 151 | 151 | 150 | 150 |
| Observations | 214,240 | 214,240 | 214,240 | 214,240 | 214,240 | 214,240 | 214,240 | 213,770 | 213,770 |

Note: standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.