

# Student and Graduate Migration and its Effect on the Financing of Higher Education\*

Tina Haussen<sup>†</sup>  
University of Jena

Silke Uebelmesser<sup>‡</sup>  
University of Jena, CESifo

May 12, 2015

## Abstract

The number of foreign students has almost doubled in the last decade. In higher education systems that are partly tax-funded, a country's labor-force might not be willing to subsidize the education of foreign students who might move on after graduation. This paper analyzes how student mobility affects the governmental decision about the financing of higher education with data of 22 OECD countries for the period 2000-2011. Based on fixed effects estimations, we find a significant positive correlation. Supported by robustness checks and the use of an instrumental variable approach, this points into the direction that the larger the share of foreign students, the more a country shifts to private-based funding.

JEL-Classification: H52, F22, I22, I28

Keywords: Higher education, financing, international student mobility

---

\*The authors thank participants at the CESifo Public Sector Economics Conference in Munich, the IIPF Conference in Lugano, the CGDE Workshop in Leipzig and the JERW Seminar in Jena for helpful suggestions and comments.

<sup>†</sup>University of Jena, Carl-Zeiss-Str. 3, 07743 Jena, Germany, email: tina.haussen@uni-jena.de, Tel: +49 (0)3641 943235

<sup>‡</sup>University of Jena, Carl-Zeiss-Str. 3, 07743 Jena, Germany, email: silke.uebelmesser@uni-jena.de, Tel: +49 (0)3641 943230 (corresponding author)

# 1 Introduction

In all OECD countries higher education is financed by a mix of public contributions (i.e. income taxes levied on labor income) and private contributions (i.e. tuition fees paid by students). Often the public share clearly dominates. However, within the last two decades almost half of the countries have introduced or increased tuition fees. In the same period international student mobility rose rapidly. Whereas in 1990 1.3 million students were enrolled outside their country of citizenship worldwide, this number was 60% higher in 2000 and increased more than threefold until 2011 when more than 4.3 million students were internationally mobile (OECD 2013). The aim of this paper is, first, to investigate whether and how the mobility of students and graduates affects governmental decisions about the financial regime of higher education and, second, to study other possible determinants of this governmental decision.

In tertiary education systems that are partly publicly funded, there are two possible causal relationships between student mobility and the financing of higher education. First it may be that students react to the institutional framework of higher education. It is likely that the migration decision of students is affected by cost considerations. Students take the extent of private contributions, i.e. tuition fees, into account. While comparably high public contributions may attract students from abroad, high tuition fees can prevent young people from studying in a foreign country. There is some empirical evidence in favor of this hypothesis even though the results are not fully clear-cut (e.g. Dwenger et al. 2012; Bruckmeier et al. 2013; Beine et al. 2014).

This motivates us to analyze whether the second causal link – namely that student mobility induces changes in governmental policies – may (additionally) exist. This relationship is built on the following theoretical ideas: In tertiary education systems that are partly publicly funded, the country that “produces” human capital has to levy income taxes on the labor force to pay for the provision of higher education. Hence, the production principle applies (Gérard 2007). If students of one (home) country obtain tertiary education in another (host) country the labor force of the host country partly bears their education costs. Very likely not all students will later pay for their education (via taxes) as they might leave the country after graduation. One country then free rides on the education system of another country. If there is a considerably large share of (domestic or foreign) students who move abroad after graduation, this places a heavy financial burden on their

former host country. Consequently, one may expect that different mobility patterns of students and graduates affect the financing structure of higher education. Increasing student mobility and a comparably low stay rate of graduates may force a government to shift the financing more towards private contributions if it aims at a sustainable financing system of tertiary education (Demange et al. 2014).

Additionally this idea is motivated by the current political debate on whether and how to react to the considerably large inflow of foreign students in some OECD countries. As governments cannot be sure that all foreign students will stay in the host country after graduation, a possible way to reduce the costs of their education could be to impose fees on foreign students. However, this is not an option for all host countries. EU-countries cannot charge different fees from domestic students and foreign EU-citizen students as this violates the non-discrimination principle. But there are no such restrictions with respect to students from non-EU countries. Within the last decade, more and more EU countries decided to charge (higher) tuition fees from foreign non-EU students. E.g. Denmark charges no tuition fees for domestic students but up to 16.000 Euro per year from non-EU foreigners (OECD 2012). Similarly in 2012, the Finish parliament agreed to increase tuition fees for non-EU students on the grounds that Finish taxpayers are not willing to educate workers for the non-EU Anglo-Saxon countries' economies. By contrast the law's opponents argued that being able to attract international students is an advantage since Finland is such a small country (European Commission 2012a). On the contrary, Germany and France have not reacted to the inflow by demanding a larger private contribution from those students they can discriminate against. As the anecdotal evidence is mixed, an empirical analysis is needed for a more comprehensive picture.

The paper is organized as follows. Section 2 reviews the relevant empirical literature. Section 3 introduces the data of the regression analysis and some descriptive statistics. Section 4 presents the estimation strategy that is used to evaluate whether student and graduate mobility affects the financing of higher education. In Section 5, we provide our estimation results encompassing not only the benchmark regressions but also a number of robustness checks and instrumental variable regressions to address possible causality issues. Section 6 concludes.

## 2 Related empirical literature

Our paper combines two strands of empirical literature. First we complement the “student mobility”-literature by investigating if student and graduate mobility induces changes in governmental policies about the financial regime of higher education. Since there are various additional factors that determine the financing of higher education we will, second, refer to the “education spending”-literature that analyzes the socio-economic, political and institutional determinants of overall and tertiary public or private education spending.

So far the “student mobility”-literature concentrates on the question whether the financing structure, i.e. the amount of fees, is a determinant of student mobility, mostly taking micro data of one country. Hübner (2012) analyzes if the introduction of tuition fees in some but not all German federal states determines enrollment probabilities in Germany. With this natural experiment, he finds a significantly reduced probability of enrollment in those federal states that charge tuition fees. Similarly Bruckmeier et al. (2013) investigate the effects of tuition fees on enrollment of first-year students at German public universities taking the distance between a fee-imposing university and the nearest fee-free alternative into account. They conclude that there is a decrease in enrollment at universities that impose tuition fees and that are located close to fee-free universities. This decrease is twice as large as the decrease at universities that are located comparably far away from the next fee-free university. Beine et al. (2014) aim at identifying the most important factors of student mobility in a framework of student migration to 14 OECD countries between 2004 and 2007. Contrary to Hübner (2012) and Bruckmeier et al. (2013) they find a significant positive effect between fees and student immigration. Since it does not seem very plausible that students prefer higher fees to lower fees when universities are otherwise identical, Beine et al. (2014) interpret fees as a signal of quality.

These – somewhat – ambiguous results point towards the possibility of a (second) causal effect. Additionally to students reacting to the financing structure of higher education, a larger mobility of students (and graduates) may lead to higher private contributions for higher education. The first part of our analysis focuses on this.

As to the “education-spending”-literature, to our knowledge, there are no studies about the determinants of the public-private financing *share* of higher education finance. The literature investigates overall and tertiary (public or private) education spending and the economic, institutional, political and socio-economic factors contributing to it.

Regarding the economic factors, there is some evidence in the literature that GDP per capita, representing the level of economic development, is positively associated with public education spending as a percentage of GDP (Busemeyer 2007). Tandberg (2010), however, whose interest is in the determinants of state spending on higher education relative to total state spending in the US, finds a negative significant relationship between the gross state product per capita and relative state spending on higher education. Although Wagner’s law suggests that there is a positive relationship between economic development and public spending, a possible interpretation may be that there are relatively larger investments in other public areas (e.g. health care) as economies grow (Tandberg 2010). When looking at the change of per capita income, Potrafke (2011a) finds a negative relation.

Partisan theory suggests that left-wing parties (e.g. social-democrats) increase total public spending on education, whereas right-wing parties (e.g. conservatives) make more intensive use of private alternatives. Left-wing parties that aim at maximizing redistribution usually receive their constituencies’ support from working-class and low-income voters. By contrast, the electoral base of right-wing parties is typically located in the middle and upper income classes, who are interested in minimizing tax contributions (see e.g. Boix 1997; Busemeyer 2009). However, there is evidence that there are different incentives for parties to publicly spend money on different education levels. In an interesting study, Kauder and Potrafke (2013) use the introduction and subsequent incremental abolishment of tuition fees in some German federal states to examine how government ideology influences the tuition fees policies. In line with partisan theory, they find that right-wing governments actively introduced tuition fees, whereas left-wing parties abolished existing tuition fees.

In the second part of our analysis, we will follow the “education-spending”-literature and enlarge our analysis to include fiscal, political-economy and other factors as additional variables to explain the *share* of private contributions to higher education spending.

### **3 Data**

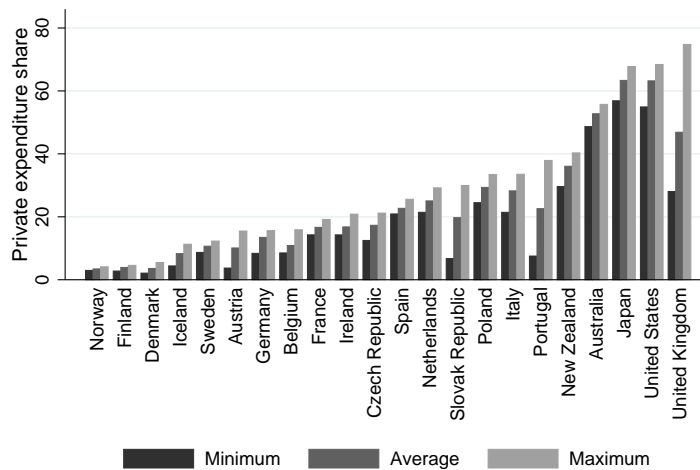
The empirical analysis focuses on 22 OECD countries for the time period 2000–2011. Unless otherwise stated, all data is taken from the Education at a Glance publications (OECD 2001-2014). A more detailed description of all variables and their sources is available in Tables A.1 and A.2 in the Appendix.

### 3.1 Expenditure on higher education

Our dependent variable is the private funding of tertiary education as a share of total, i.e. private and public, funding. While in most OECD countries the public funding share still constitutes the dominant part, private funding sources are becoming increasingly prominent.

Figure 1 illustrates country averages of the private financing share from 2000 to 2011. It shows that the share of private expenditure on tertiary education is lowest in the Nordic countries and highest in the Anglo-Saxon countries as well as in Japan. Figure 1 also displays the minimum and maximum levels of the private funding share for each country between 2000 and 2011. All countries exhibit variation over time in their private higher education funding. In some countries, the private share varies markedly, e.g. in the United Kingdom where the relative importance of private funding changed by more than 46 percentage points. This also holds – albeit to a smaller extent – for Portugal (30 percentage points) and the Slovak Republic (23 percentage points) as well as for the United States (13 percentage points), Italy (12 percentage points) and Austria (11 percentage points).<sup>1</sup>

Figure 1: Share of private expenditure on tertiary education (2000-2011)



Source: OECD (2001-2013).

Our dependent variable has the shortcoming that it does not display the absolute level of monetary expenses per tertiary student. E.g. in 2010, Australia’s private share equaled 53.5% of the overall expenditure of 15.142 \$US per student, while Austria spent nearly

<sup>1</sup> The change may also be due to rising tuition fees for non-EU students. In our regression analysis, we will take into account the share of incoming students who can be discriminated against.

the same amount of money per student (15.007 \$US) with a private share equaling 12.2%. To correct for this, one of our control variables will be the total annual expenditure for higher education as a percentage of GDP.

### 3.2 Student immigration

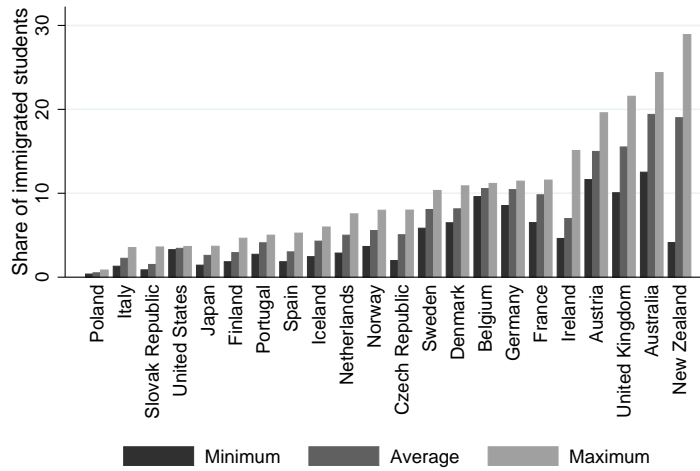
Our main independent variable refers to student migration. We use data on a country's share of immigrated foreign students among the total number of students. Data comes from the UNESCO-OECD-Eurostat (UOE) data collection on education statistics that provides online data on the number of students enrolled outside their country of birth or citizenship since 1998. Information is available about student migration from roughly 230 countries to individual OECD countries. A problem we face refers to the definition of the term *foreign student*. Until the year 2003 most countries reported the number of foreign students based on their citizenship. This definition not only encompasses students that migrate for education reasons, but also those who moved to another country before studying (e.g. for family reasons) without changing their citizenship. In 2004, the UOE agreed to only capture *international students*, who migrate for the purpose of education.<sup>2</sup> Because there is no data on international students before the year 2004 but data on non-citizen students, we will use data based on citizenship. However, in our sample there is a strong correlation (0.90) between the share of foreign students and the share of international students among the total number of students.

In Figure 2, the minima, maxima and average student immigration shares are displayed for each country. Again, especially the Anglo-Saxon countries Australia, New Zealand and the United Kingdom, but also Austria have the highest shares of international students among their tertiary enrolees with more than 19% on average. Those countries plus Ireland and the Czech Republic also record the largest changes within the period 2000 and 2011.

---

<sup>2</sup> If destination countries report data on international students, they do so either based on the residence status (since international students usually are not permanent residents of the country they study in) or when students acquired education prior to their studies outside the reporting country.

Figure 2: Share of immigrated students among the total number of students (2000-2011)



Source: OECD (2001-2013).

In most countries, national policies regulate tuition fees charged by public higher education institutions and how they may differ between groups of immigrated students. The perhaps most prominent example are the EU countries, which are not allowed to charge higher tuition fees from non-EU students than from domestic and other EU-students due to the principle of non-discrimination. However, EU countries are free to charge higher tuition fees from non-EU students, which, in 2011, 10 out of the 16 EU countries in our sample did.<sup>3</sup> Non-EU countries, on the contrary, can discriminate against all international students if there are no bilateral or multilateral agreements in place which impose different rules.<sup>4</sup> Whereas Norway does not treat domestic and international students in public institutions differently charging no fees from either group, Australia, New Zealand, Japan and the United States do charge higher tuition fees from all international students. To account for these differences, we will split the share of immigrated students into two groups as a robustness check, one group consisting of international students that can be discriminated against and the other group comprising international students that, due to policy regulations, cannot be discriminated against.

In order to get a first impression of the correlation between student mobility and the private funding share of higher education, we take a look at the simple correlation between the two variables. Panel (a) of Figure 3 displays average values for each of the 22 countries

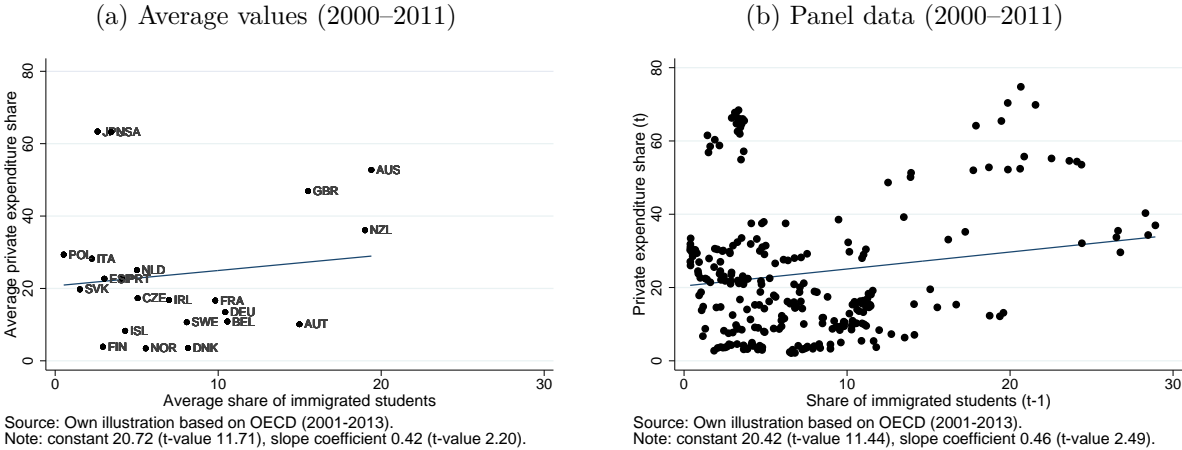
<sup>3</sup> The 10 countries are Austria, Belgium, Czech Republic, Denmark, Estonia, Ireland, Netherlands, Poland, Sweden and the United Kingdom (OECD 2013).

<sup>4</sup> As an example, see the bilateral agreement between New Zealand and Australia according to which students from New Zealand who study in Australia and students from Australia who study in New Zealand are eligible to apply for Commonwealth supported places (OECD 2012).



over the 12-year period. In Panel (b), the raw panel data is plotted. The graphs provide some indication of a weak positive correlation between the share of immigrated students and private funding of higher education. However, in Panel (a), the correlation is based on cross-country variation with the Anglo-Saxon countries the United Kingdom, Australia and New Zealand as the likely drivers. Japan and the United States, on the contrary, are rather outliers in this respect as they are characterized by a high private funding share but a modest immigration share. Panel (b) relies on variation between and within countries. As we are interested in identifying within-country effects of student immigration on the private financing share, we will use fixed-effects estimations exploiting the panel structure of our data and controlling for several factors that are likely to affect the private funding share. Also estimations of subgroups of countries will help us to test the robustness of the regression results.

Figure 3: Correlation between the private funding share and the share of immigrated students



### 3.3 Further data

As mentioned in Section 1, the more a country finances higher education via taxes paid by the labor force the more it should be interested in the number of foreign students but also in how likely it is that they will stay after graduation. Empirical evidence for the link between student or graduate migration is mixed. There are studies which show that there is a positive link between student immigration and the subsequent stock of tertiary educated foreign workers (see, e.g. Dreher and Poutvaara 2011; Felbermayr and Reczkowski 2014). But there are other studies that provide evidence that the propensity

of migration is higher for those graduates who have migrated before (see, e.g. Pary and Waldinger 2011). Unfortunately, there is no (panel) data available on the number of foreign graduates that stay in the host country for work reasons. As a proxy, we use the employment rate of tertiary educated individuals in the host country as this can be expected to represent labor market conditions students face after graduation. The employment rate of tertiary educated immigrants cannot be used due to data availability. We are aware of the limitations of this variable such as disregarding potential discrimination.<sup>5</sup>

The empirical literature on the determinants of education spending guides our choice of further control variables. Since this literature usually concentrates on overall education, we only use those fiscal, political and institutional variables which may be connected to tertiary education and which may explain the *share* of public and private contributions.

First, we will control for tax revenue (excluding social security funds) as a percentage of GDP. Since the source of the public funding share is mainly income tax revenue it seems plausible that with a comparably larger tax revenue policymakers are able to publicly fund education more extensively. On the contrary, a relatively small tax revenue might reduce a government's ability to publicly finance tertiary education and instead induce a shift to more private-based funding. In line with this argumentation, we also include a country's GDP in our regression.<sup>6</sup> As economies grow, we expect policymakers to anticipate that they have more public funds available, hence, we expect a negative relationship between GDP (growth) and changes in the share of private funding (Busemeyer 2007).

Second, we take into account political-economy variables such as the ruling party's ideology or the demographic structure of the electorate. As stated in Section 2, there is a broad consensus in the literature that government ideology influences the composition and allocation of the public budget (e.g. Potrafke 2011b, Kauder and Potrafke 2013). We, therefore, control for the share of parliamentary seats held by right-wing parties among all

---

<sup>5</sup> Based on results of the economic literature, we tested several plausible proxy variables in our regression analysis. One is the share of high skilled immigrants among the population (taken from Docquier and Marfouk 2006) which is based on the findings of Dreher and Poutvaara (2011) and Felbermayr and Reczkowski (2014). Another is the internal rate of return to higher education based on the idea of Bratsberg (1995) and Rosenzweig (2008), who show for foreign students in the US that they are less likely to stay in the host country if the return to education in the home country is higher than in the host country. However, both variables are only available for one or very few points in time which is why we cannot use them in a fixed effects regression.

<sup>6</sup> The correlations between GDP and the number of students is 0.988, between GDP and population 0.983 and between students and population 0.968. In order to avoid multicollinearity, we only included GDP. We obtain similar regression results if, instead, we include one of the other two variables.

governmental parties, weighted by the number of days the government was in office in a given year. Data is taken from Armington et al. (2012). Following the political-economy literature on intergenerational conflicts over the provision of education (see e.g. Poterba 1998; Ladd and Murray 2001), different shares of age ranges may place distinct pressures on the public education budget. It is assumed that as a society ages, support for programs that target young people such as public education decreases whereas support for programs that benefit older people (e.g public health care or pensions) increases. In order to control for this effect, we include the share of people older than 65 relative to the individuals aged 20 to 64 (old-age dependency ratio).

Third, we pay attention to the type of higher education institutions in each country. In the majority of the countries in our sample, tertiary education is controlled and managed by public authorities. However, in some countries (e.g. Japan, the Netherlands, the United Kingdom and the United States), a significant share of students is enrolled in private higher education institutions, i.e., in institutions that are controlled by a non-governmental, private entity. As this enables the universities to take financial decisions independently from the government, we will use the share of students enrolled in private higher education institutions among all enrolled students as a further control variable.

## 4 Estimation strategy

In order to evaluate the relationship between student mobility and the private funding share of higher education, we use a panel of aggregated data of 22 OECD countries for the period 2000 to 2011. As we assume the private financing share to be determined by the share of foreign students and other variables, we lag the independent variables by one year. We therefore estimate the following fixed effects equation:

$$\text{PrivExpend}_{i,t} = \alpha_i + \beta_1 \text{ImmigrStudents}_{i,t-1} + \beta_2 X_{i,t-1} + u_{i,t} \quad (1)$$

with countries  $i = 1, \dots, 22$  and time periods  $t = 2000, 2001, \dots, 2011$ .  $u_{i,t}$  is the normally distributed error term. Our dependent variable “PrivExpend $_{i,t}$ ” denotes the private funding share of higher education of country  $i$  in year  $t$ . Our main explanatory variable “ImmigrStudents $_{i,t-1}$ ” is the share of immigrated students among the total number of students in country  $i$  in year  $t - 1$ . “ $X_{i,t-1}$ ” is a vector of control variables of country  $i$

in year  $t - 1$ , which may affect the private funding share as described in Section 3.<sup>7</sup> The regressions include a country-specific, time-invariant intercept  $\alpha_i$  in order to deal with unobserved heterogeneity.

## 5 Results

The estimation results for the fixed effects models are presented first. The baseline estimations are followed by robustness checks to account for possible country-group effects and to allow for changes in the lag structure. Subsequently, we address the issue of reverse causality and perform instrumental-variable regressions to identify the underlying causal relationship.

### 5.1 Benchmark regressions

The first set of estimations includes seven models where we subsequently add control variables in order to see how the other coefficients respond (Table 1). As we are aware of the possible endogeneity problem that arises from the loop of causality between the private financing share (dependent variable) and the share of immigrated students (independent variable), we will first cautiously interpret our regression results as correlations. In Section 5.3, we present additional evidence which supports a causal interpretation.

Without adding any further control variables, the regression analysis yields a positive and significant correlation at the 1%-level between the share of immigrated students and the share of private expenditure of higher education (column (1)). This correlation may indicate that the larger the share of foreign students among the total number of students in a country the larger the private funding share. The coefficient of the employment rate of tertiary educated workers (the proxy for the stay rate of graduates) is negative and highly significant. This is in line with our hypothesis that positive developments on the labor market make highly educated graduate tax-payers more likely to stay which in turn should lead to a decrease in private funding of higher education.

In models (2) and (3), we subsequently add a country's tax revenue (excluding social security funds) and GDP. The coefficients of the share of immigrated students and

---

<sup>7</sup> Since total expenditure per student is included here to control for the different total expenditure levels, it is not lagged.

the employment rate of tertiary educated are unchanged in both, size and significance. Although the negative coefficient of the tax revenue may suggest that tax revenue increases lead to more financial scope to publicly fund education, it remains insignificant throughout our baseline regressions. Interestingly, GDP is positively and significantly related to the private financing share of higher education which is in line with the findings of Tandberg (2010) who argues that countries might invest relatively more in public areas other than education as the economy grows.

Table 1: Determinants of private higher education spending - benchmark regression

DV: private expenditure share	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share of immigrated students	0.551*** (0.133)	0.545*** (0.134)	0.533*** (0.133)	0.531*** (0.133)	0.498*** (0.132)	0.509*** (0.135)	
Share of non-discriminable immigr. students							0.741* (0.383)
Share of discriminable immigr. students							0.480*** (0.153)
Employment rate tertiary educated	-1.173*** (0.241)	-1.136*** (0.254)	-1.114*** (0.252)	-1.121*** (0.253)	-1.204*** (0.253)	-1.207*** (0.253)	-1.176*** (0.279)
Total expenditure (in % of GDP)	0.143 (0.189)	0.139 (0.189)	0.075 (0.190)	0.082 (0.191)	-0.002 (0.192)	0.004 (0.193)	0.082 (0.215)
Tax revenue (in % of GDP)		-0.129 (0.277)	-0.057 (0.277)	-0.061 (0.277)	0.009 (0.276)	0.007 (0.276)	0.126 (0.294)
GDP			0.175** (0.077)	0.172** (0.077)	0.129 (0.079)	0.129 (0.079)	0.176** (0.089)
Right-wing parties (seat share)				0.005 (0.011)	0.006 (0.011)	0.006 (0.011)	0.001 (0.012)
Old-age dependency ratio					0.664** (0.271)	0.680** (0.274)	0.583* (0.318)
Share of students enrolled in private universities						-0.031 (0.077)	-0.036 (0.100)
Constant	117.608*** (20.804)	117.995*** (20.854)	112.768*** (20.800)	113.219*** (20.857)	103.746*** (20.997)	104.319*** (21.082)	99.211*** (22.814)
Observations	264	264	264	264	264	264	242
No. of countries	22	22	22	22	22	22	22
log(likelihood)	-797.224	-797.104	-794.243	-794.121	-790.788	-790.694	-722.723

Notes: All variables are lagged by one year except the total expenditure for tertiary education in % of GDP. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Variable description in Tables A.1 and A.2.

In models (4) and (5), we include political-economy variables that have proven to be important for spending on education. We do not find any statistically significant relationship between the percentage of parliamentary seats of right-wing parties among all governmental parties and the private funding share of higher education.<sup>8</sup> We, however, find a positive and significant correlation between the old-age dependency ratio and the private funding share. Following the political-economy literature on intergenerational conflicts over the provision of education (e.g. Poterba 1998; Ladd and Murray 2001), this may suggest that an increase in the elderly population leads to more demand of public

<sup>8</sup> We also controlled for the percentage of parliamentary seats of center and left-wing parties, the coefficients of which were insignificant. Results can be provided upon request.

spending in other areas such as health care and pensions which, in turn, increases the need for more private spending on education.

The share of students enrolled in private universities among all enrolled students does not exert any significant effect on the private funding share of higher education (model (6)).

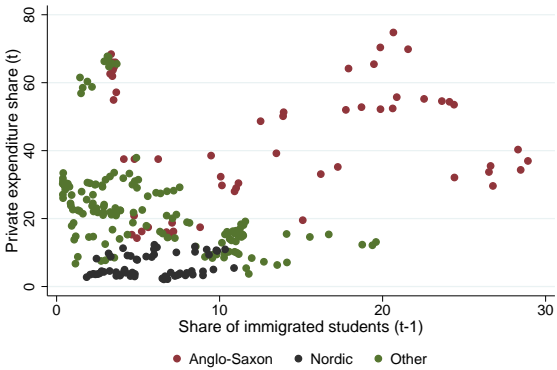
To account for the fact that foreign students are not a homogeneous group when it comes to the discrimination possibilities, we split the share of immigrated students into those that can or and those that cannot be treated differently (model (7)). Both student immigration shares remain positive and significant with the larger significance stemming from the share of students that can be charged higher tuition fees.

## 5.2 Robustness checks

### 5.2.1 Country groups

As argued in Sections 1 and 2, we expect a country’s private funding share to increase with the share of foreign students who likely move on after graduation. However, the correlation between the share of immigrated students and the share of private expenditure of higher education (see Figure 3) indicates that there are several groups of countries that differ from each other with respect to our main variables of interest. Figure 4 replicates Panel (b) of Figure 3 but highlights the data points of the Anglo-Saxon, Nordic and all other countries in our sample. Whereas the Anglo Saxon countries, in particular the United Kingdom, Australia and New Zealand, are characterized by high levels, but also large variations in the share of immigrated students and the share of private funding, respectively, the Nordic countries face much smaller levels and variations of both variables.

Figure 4: Correlation between private funding and student immigration: Country groups



Source: Own illustration based on OECD (2001-2013).

In models (8) and (9) in Table 2, we therefore re-run our specifications (6) and (7) of Table 1, but drop the United Kingdom, Australia and New Zealand from the sample. The magnitude of the coefficients of the student immigration shares decreases only slightly, but we lose some significance. The coefficient of the share of discriminable immigrated students even becomes insignificant. The coefficients of our control variables remain qualitatively unchanged. Only the coefficient of GDP becomes insignificant. As the next steps, we drop all Anglo-Saxon countries (models (10) and (11)) and all Anglo-Saxon and all Nordic countries (models (12) and (13)) from our sample. In all specifications, our main results do not change qualitatively, i.e., our results are not (fully) driven by specific country groups.

Table 2: Determinants of private higher education spending - Country groups

	w/o UK, AUS, NZL		w/o Anglo-Saxon		w/o Anglo-Saxon, Nordic	
	(8)	(9)	(10)	(11)	(12)	(13)
Share of immigrated students	0.357*		0.540**		0.676*	
	(0.208)		(0.252)		(0.362)	
Share of non-discriminable immigr. students		0.509*		0.615**		0.678*
		(0.276)		(0.300)		(0.408)
Share of discriminable immigr. students		0.230		0.348		0.602
		(0.257)		(0.329)		(0.539)
Employment rate tertiary educated	-0.816***	-0.811***	-0.901***	-0.897***	-1.059***	-1.097***
	(0.187)	(0.197)	(0.208)	(0.216)	(0.301)	(0.321)
Total expenditure (in % of GDP)	0.320**	0.255	0.305	0.194	0.281	0.128
	(0.162)	(0.168)	(0.185)	(0.189)	(0.245)	(0.252)
Tax revenue (in % of GDP)	0.127	0.214	0.039	0.154	-0.197	0.023
	(0.213)	(0.220)	(0.232)	(0.243)	(0.389)	(0.404)
GDP	0.007	0.046	-0.003	0.147	-0.108	0.058
	(0.054)	(0.059)	(0.222)	(0.249)	(0.287)	(0.339)
Right-wing parties (seat share)	0.003	-0.000	0.006	0.000	0.011	0.002
	(0.008)	(0.009)	(0.009)	(0.010)	(0.014)	(0.014)
Old-age dependency ratio	0.897***	0.897***	0.832***	0.816***	0.982***	0.942**
	(0.202)	(0.221)	(0.268)	(0.290)	(0.364)	(0.401)
Share of students enrolled in private universities	0.008	0.027	-0.019	0.009	-0.008	0.032
	(0.055)	(0.068)	(0.058)	(0.071)	(0.069)	(0.088)
Constant	56.906***	54.445***	65.324***	62.721***	84.447***	83.152***
	(15.479)	(16.040)	(19.259)	(19.708)	(26.307)	(28.288)
Observations	228	209	204	187	144	132
No. of countries	19	19	17	17	12	12
log(likelihood)	-594.153	-536.051	-534.012	-482.617	-395.609	-358.666

Notes: All variables are lagged by one year except the total expenditure for tertiary education in % of GDP. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Variable description in Tables A.1 and A.2.

When interpreting the results for the group of non-Anglo-Saxon and non-Nordic countries (models (12) and (13)), it should be taken into account that compared to the full sample, the countries of this group are much more heterogeneous. While we control for some important factors, we likely miss other factors which might be particularly relevant for the bilateral or multilateral relations among (some) countries of this group. We do not consider, e.g., geographic or linguistic closeness<sup>9</sup> nor the relative size of “close” countries and specific regulations. The examples of France and Belgium (the Walloon region) as well

<sup>9</sup> For our instruments, however, we will make use of measures of linguistic and geographic closeness.

as Germany and Austria serve to illustrate this. Both pairs of countries share a common language and common borders; one country is relatively larger, and in both cases, the smaller country found a non-monetary way to react to the relatively strong increase in the number of students from the larger neighbor. In 2007, Austria and Belgium introduced a quota for medical students from abroad. In particular, German and French medical students move to Austria and Belgium when they do not meet the access requirements in their home countries. Those students are likely to return home after graduation and therefore place a heavy financial burden on the Austrian and Belgian taxpayers.<sup>10</sup> With the implementation of this regulation, the relative proportion of students that can be discriminated against increases. As this is a subject-specific discrimination, however, we cannot take this into account due to data limitations. At the same time, focusing on smaller, more homogeneous (sub-)groups leads to problems due to (too) small sample sizes. In general, the reliability of the estimates should be expected to be larger for the full sample.

### 5.2.2 Lag structure

One may argue that there is a delay in policy-making, hence, one year is not an appropriate timespan for national parliaments to decide on changes in education policies in reaction to changes in the number of immigrated students. In order to further investigate the relationship between student immigration and the private funding share of higher education, Table 3 includes up to five lags of our independent variables in the regressions. We do so for both of our baseline specifications: with and without splitting the share of immigrated students (cf. models (6) and (7)).

Let us, first, look at model (14) with the share of immigrated students as the main independent variable. A two-year lag reveals very similar results as a one-year lag. The coefficient of the student immigration share becomes slightly smaller. However, it remains significant at the 1%-level. Considering the model with the split immigration share lagged by two years, we find that only the share of discriminable immigrated students remains significant while the share of non-discriminable immigrated students becomes insignificant (model (15)). When lagging the independent variables by three and four years, respectively,

---

<sup>10</sup> Although the quota violates the principle of freedom of movement within the European Union, the European Commission decided not to institute legal proceedings against the two countries until the year 2016 (European Commission 2012b) to secure the functioning of the health-care system.



the coefficients decrease in size but are still significant at least at the 5%-level (models (16) to (19)). Only when lagging the variables by five years, the coefficient of the student immigration share turns insignificant. However, the coefficient of the share of discriminable immigrated students remains significant at the 10%-level (model (21)). The main results thus prove to be robust against variations of the lag structure. Interestingly, the relative importance of that group of foreign students increases, which can be treated differently from the native students. Also note that some of the other control variables become significant. With a lag of three years or more we find a significant negative correlation between the tax revenue and the private funding. This result is in line with the idea that a relatively large tax revenue increases a government's ability to publicly finance tertiary education and therefore induces a shift away from private-based funding. The results of GDP found so far remain qualitatively unchanged up to three-year lags before turning insignificant. Note, that increasing number of lags also leads to a smaller sample size which can lead to changes in the results.

Table 3: Determinants of private higher education spending - Lags

	Lag: 2 years		Lag: 3 years		Lag: 4 years		Lag: 5 years	
	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Share of immigrated students (t-i)	0.466*** (0.135)		0.406*** (0.130)		0.280** (0.138)		0.230 (0.146)	
Share of non-discriminable immigr. students (t-i)		0.380 (0.396)		0.435 (0.451)		0.352 (0.531)		0.046 (0.590)
Share of discriminable immigr. students (t-i)		0.391*** (0.148)		0.385** (0.153)		0.288* (0.156)		0.279* (0.154)
Employment rate tertiary educated (t-i)	-1.218*** (0.301)	-1.230*** (0.318)	-1.180*** (0.316)	-1.205*** (0.353)	-0.712** (0.350)	-0.669* (0.380)	-0.468 (0.380)	-0.374 (0.405)
Total expenditure (in % of GDP)	0.178 (0.213)	0.941*** (0.319)	1.133*** (0.309)	1.002*** (0.332)	1.048*** (0.338)	0.812** (0.340)	0.655* (0.341)	0.191 (0.341)
Tax revenue (in % of GDP, t-i)	-0.464 (0.294)	-0.340 (0.299)	-1.092*** (0.323)	-0.987*** (0.344)	-1.104*** (0.359)	-0.953** (0.372)	-0.682* (0.368)	-0.568 (0.366)
GDP (t-i)	0.144* (0.086)	0.207** (0.092)	0.202** (0.087)	0.198** (0.096)	0.209** (0.101)	0.167 (0.108)	0.139 (0.121)	0.128 (0.125)
Right-wing parties (seat share, t-i)	0.014 (0.012)	0.012 (0.013)	0.008 (0.013)	0.003 (0.014)	-0.005 (0.014)	-0.012 (0.015)	-0.006 (0.015)	-0.014 (0.016)
Old-age dependency ratio (t-i)	0.545* (0.309)	0.121 (0.345)	-0.152 (0.342)	-0.317 (0.389)	-0.417 (0.400)	-0.577 (0.449)	-0.437 (0.465)	-0.745 (0.503)
Constant	118.366*** (25.054)	115.593*** (26.104)	136.136*** (27.753)	141.911*** (30.600)	106.159*** (31.416)	106.726*** (34.046)	81.827** (35.482)	85.930** (38.122)
Observations	242	220	220	198	198	176	176	154
No. of countries	22	22	22	22	22	22	22	22
log(likelihood)	-724.572	-645.651	-642.174	-571.807	-576.938	-500.049	-503.693	-420.993

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Variable description in Tables A.1 and A.2.

### 5.3 Causality issues

There are two main concerns regarding the exogeneity of the share of immigrated students in our regression. First, pure reverse causality. Although the share of immigrated students seems to induce changes in governmental policies, i.e. the private funding share of higher

education, it seems equally plausible that private contributions (e.g. fees) induce changes in student mobility patterns. Second, there may be an unobserved factor which determines both the private funding and the migration of students. Even though causality is difficult to establish in this aggregated context, it may be possible to rule out some concerns about the interdependence between student mobility and the financing of higher education. In the following we propose two strategies: First, we reverse the dependent and the independent variable, hence we test the effect of the private financing share (lagged by one year) on the share of immigrated students. Second, we use an instrumental variable approach to deal with the likely endogeneity of the student immigration share.

### **5.3.1 Reverse dependent variable and quality of higher education**

Let us, again, consider the statistically significant positive effect of the share of immigrated students on the private financing share of higher education. With pure reverse causality, the positive coefficient in our estimation would indicate that international students are more likely to move to a country with higher tuition fees. If we assumed that individuals maximize their utility, hence, that costs of education are an important determinant of the migration decision, this is not very likely to be the main causality channel (Beine et al. 2014). As a simple test of reverse causality, we run our baseline model again but now regress the lagged private financing share on the share of immigrated students. Our results are displayed in model (22) in Table 4. The positive significant relationship between the private financing share and the share of immigrated students persists. Hence, from a pure utility maximizing (cost-minimizing) point of view it is not very likely that higher private contributions in a country attract more students to that country. Similar results are found when using the share of non-discriminable students (model (24)) and the share of discriminable students (model (26)) as dependent variables.

Table 4: Baseline specification, reverse dependent variable

Dependent variable:	Share of immigrated students		Share of non-discriminable immigrated students		Share of discriminable immigrated students	
	(22)	(23)	(24)	(25)	(26)	(27)
Private expenditure share	0.111*** (0.026)	0.103*** (0.024)	0.027** (0.012)	0.030** (0.014)	0.095*** (0.028)	0.103*** (0.027)
Employment rate tertiary educated	0.193* (0.111)	0.004 (0.106)	-0.067 (0.052)	-0.024 (0.063)	0.364*** (0.122)	0.176 (0.119)
Total expenditure share (in % of GDP)	0.627*** (0.067)	0.236** (0.114)	0.076** (0.032)	0.124* (0.067)	0.532*** (0.074)	0.077 (0.127)
Tax revenue (in % of GDP)	-0.321*** (0.110)	-0.235** (0.104)	-0.020 (0.052)	-0.022 (0.061)	-0.254** (0.121)	-0.200* (0.116)
GDP	-0.029 (0.034)	-0.013 (0.038)	-0.029* (0.016)	-0.038* (0.022)	0.002 (0.037)	0.037 (0.042)
Right-wing parties (seat share)	0.004 (0.004)	-0.000 (0.004)	0.002 (0.002)	0.000 (0.003)	0.002 (0.005)	-0.001 (0.005)
Old-age dependency ratio	-0.069 (0.119)	0.097 (0.132)	0.141** (0.056)	0.158** (0.078)	-0.154 (0.130)	0.099 (0.148)
Share of students enrolled in private universities	0.110*** (0.035)	0.112*** (0.040)	0.083*** (0.016)	0.099*** (0.024)	0.045 (0.038)	0.065 (0.045)
Quality		0.314 (0.842)		-0.240 (0.496)		3.973*** (0.938)
Constant	-11.834 (9.057)	3.162 (8.970)	1.295 (4.257)	-3.425 (5.281)	-25.624** (9.928)	-16.895* (9.994)
Observations	242	198	242	198	242	198
No. of countries	22	22	22	22	22	22
log(likelihood)	-485.900	-351.896	-303.196	-246.996	-508.133	-373.303

Notes: All variables are lagged by one year except the total expenditure for tertiary education in % of GDP. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Variable description in Tables A.1 and A.2.

However, a plausible interpretation why students might move to countries with high tuition fees is that private contributions can serve as a signal for quality.<sup>11</sup> To account for this, we follow Beine et al. (2014) and use the average number of universities classified in the Shanghai top 500 ranking for each country relative to the total number of students. The Shanghai ranking is based on several indicators such as the number of scientific publications and their citations. Although the criteria used for this ranking leave room for criticism, to our knowledge it seems to be the most suitable one for our research. Models (23), (25) and (27) in Table 4 show results with the quality control added. The coefficient of the private financing share remains positive and significant at the 1% and 5%-level, respectively, after controlling for quality differences between countries' higher education systems.<sup>12</sup> The coefficient of our quality indicator is only significant and positively correlated with the share of discriminable immigrated students. One explanation may be that students who, in most countries, have to pay comparatively high private contributions react more sensitive to quality changes.

<sup>11</sup> Beine et al. (2014) indeed find support for a signaling effect but also for a direct positive impact of fees on enrollment.

<sup>12</sup> We also included the quality variable in our preferred specifications (6) and (7) with the private financing share as the dependent variable (which turned out to be positively significant at the 10%-level) and still obtained a positive significant relationship between the share of immigrated students and the private funding share.

Another concern may be that students who move to countries that charge higher fees are only affected by part of the private contributions – on the one hand, because the private contributions may be partially publicly subsidized (e.g. through grants) and, on the other hand, because private spending not only encompasses household expenditure but also expenditure of other private entities (e.g. private companies). We use the overall private financing share as data on the private financing share net of subsidies or on household contributions, respectively, are only available for a limited number of countries and years. For those countries and years for which we have the information, we re-run our preferred specification. Our results regarding the student immigration share remain qualitatively unchanged.<sup>13</sup>

### 5.3.2 Instrumental variable approach

As a second approach to find support for a causal effect of student immigration on the private funding share, we employ an instrumental variable estimation. Our choice of an instrument, that is correlated with student immigration but not with the private funding share, is based on the empirical migration choice literature where the importance of closeness has been proven to play an important role (see e.g. Chiswick 1987). We use two instruments based on linguistic and geographic closeness. Migration to a close country, be it in terms of language or geography, is likely to be associated with lower costs than migration to a more distant country. Countries should therefore experience larger student immigration from geographically close countries and/or countries with a similar language, while at the same time there is no reason to expect that closeness of countries affects the financing regime of higher education of the host countries. We use the CEPII online database (Mayer and Zignago 2011) to obtain the necessary data. For each (host) country  $i$  in our sample, we observe the linguistic and geographic closeness ( $d_{ij}$ ) to all possible home countries  $j$  in the world.<sup>14</sup> We multiply each closeness measure  $d_{ij}$  with the overall student population in the respective home country  $j$  in each year  $t$  ( $students_{jt}$ ) as larger countries can, *ceteris paribus*, send more students abroad than smaller countries. Both closeness measures are continuous and range from zero (distant) to one (close).<sup>15</sup>

<sup>13</sup> In both specifications, the UK, which is characterized by a high private share but also a large number of grants, is included in the sample. Results can be obtained on request.

<sup>14</sup> Full information is available for 74 possible (home) countries.

<sup>15</sup> The geographic closeness is measured as the distance between the capital cities of the home and the host country. We normalize this distance by relating it to the world's longest possible migration distance as the maximum and redefine it to obtain a continuous variable between zero (distant) and one (close).

For each (host) country in our sample, we then calculate the average of the student-weighted closeness measures for all (possible) home countries, which is our instrument:

$$IV_{it} = \frac{1}{J} \sum_{j=1}^J (d_{ij} * students_{jt}) \quad \forall i = 1, \dots, 22; t = 1, \dots, 12$$

As a further instrument, we combine both closeness measures by multiplying them. This takes into account that, even though a potential host country may be quite far, a similar language can partially compensate for that.

The first- and second-stage results from the instrumental-variable estimations are reported in Table 5. As a robustness check, we run each model with and without the Anglo-Saxon countries.

Table 5: Determinants of private higher education spending - Instrumental variable approach

	Linguistic		Geographic		Linguistic*Geographic	
	Full sample	Without Anglo-Saxon	Full sample	Without Anglo-Saxon	Full sample	Without Anglo-Saxon
	(28)	(29)	(30)	(31)	(32)	(33)
<i>Second stage results (Dependent variable: Private financing share):</i>						
Share of immigrated students (Instruments)	1.303*** (0.279)	2.273*** (0.597)	1.883*** (0.470)	1.622*** (0.528)	1.962*** (0.422)	2.167*** (0.582)
Employment rate tertiary educated	-1.533*** (0.324)	-0.987*** (0.256)	-1.701*** (0.375)	-1.004*** (0.242)	-1.724*** (0.376)	-0.990*** (0.254)
Total expenditure (in % of GDP)	-0.478* (0.250)	0.051 (0.218)	-0.827** (0.351)	0.142 (0.203)	-0.875*** (0.330)	0.066 (0.215)
Tax revenue (in % of GDP)	-0.145 (0.309)	0.213 (0.283)	-0.118 (0.344)	0.087 (0.264)	-0.115 (0.350)	0.192 (0.279)
GDP	0.130 (0.090)	-0.325 (0.288)	0.120 (0.101)	-0.199 (0.269)	0.118 (0.103)	-0.305 (0.284)
Right-wing parties (seat share)	0.000 (0.013)	-0.006 (0.011)	-0.000 (0.014)	-0.002 (0.011)	-0.000 (0.014)	-0.005 (0.011)
Old-age dependency ratio	0.684** (0.322)	0.716** (0.330)	0.628* (0.361)	0.805*** (0.310)	0.620* (0.366)	0.731** (0.326)
Share of students enrolled in private universities	-0.106 (0.088)	-0.127* (0.075)	-0.170 (0.106)	-0.080 (0.069)	-0.179* (0.105)	-0.119 (0.073)
<i>First stage results (Dependent variable: Share of immigrated students):</i>						
IV: Closeness	0.553*** (0.058)	0.277*** (0.038)	0.076*** (0.014)	0.053*** (0.007)	0.661*** (0.102)	0.430*** (0.058)
Employment rate tertiary educated	0.317*** (0.118)	0.073 (0.061)	0.361*** (0.133)	0.079 (0.059)	0.379*** (0.130)	0.080 (0.060)
Total expenditure (in % of GDP)	0.317*** (0.076)	0.052 (0.048)	0.463*** (0.082)	0.041 (0.047)	0.431*** (0.081)	0.048 (0.048)
Tax revenue (in % of GDP)	0.275** (0.122)	-0.072 (0.062)	0.142 (0.134)	-0.057 (0.061)	0.180 (0.132)	-0.068 (0.062)
GDP	-0.091** (0.036)	-0.090 (0.072)	-0.044 (0.040)	-0.080 (0.069)	-0.055 (0.039)	-0.084 (0.071)
Right-wing parties (seat share)	-0.003 (0.005)	0.004** (0.003)	-0.005 (-0.004)	0.003 (0.002)	-0.004 (0.005)	0.003 (0.002)
Old-age dependency ratio	-0.105 (0.124)	0.189** (0.074)	-0.241 (0.148)	0.079 (0.073)	-0.077 (0.135)	0.181** (0.073)
Share of students enrolled in private universities	0.008 (0.033)	0.037** (0.015)	0.020 (0.038)	0.022 (0.015)	0.031 (0.036)	0.032** (0.015)
Observations	242	187	242	187	242	187
No. of countries	22	17	22	17	22	17
F-statistic of excluded instrument	89.69	52.65	31.51	62.64	42.30	54.80
log(likelihood)	-739.918	-508.247	-766.140	-497.241	-770.285	-506.167

Notes: All variables are lagged by one year except the total expenditure for tertiary education in % of GDP. Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Variable description in Tables A.1 and A.2.

Our estimates confirm the relevance of the instruments: They are clearly positively correlated with the share of immigrated students. The high F-statistics of the instruments in the first stage confirm the strength of the instruments (see the lower panel of Table 5).

The second-stage results are reported in the upper panel of Table 5. The results show a statistical significant and positive effect of the instrumented share of immigrated students on the private funding share of higher education. Whereas the linguistic closeness IV is stronger for countries other than the Anglo-Saxon ones, the geographic closeness IV exerts a comparatively larger effect in the full sample. Similar to our baseline fixed effects results, we find a negative and significant effect of our proxy variable for the stay rate and a positive significant effect of the share of the elderly in the population. Interestingly, in the full sample models, the overall expenditure on higher education exerts a negative and significant effect on the private share. However, this effect seems to be driven by the Anglo-Saxon countries as the respective coefficient turns insignificant when excluding these countries.

The instrumental-variable estimates of the share of immigrated students (Table 5) are significantly higher than the fixed effects estimates (Table 1). This points toward an overall downward bias in the OLS estimates of the effects of student immigration on the private financing share of higher education and may result from the fact that the two plausible causality channels are at work at the same time: First, student mobility may induce changes in governmental policies towards more private financing. This is the channel focused on in the preceding analysis. But, second, a higher share of private contributions may also induce fewer students to come. A positive, but smaller coefficient in the OLS estimations compared to the IV estimations indicates that both (countervailing) effects are present with the former (positive) effect dominating the latter (negative) effect. Isolating the first causality channel by the use of an instrument, the coefficient of student immigration should indeed be larger.

## 6 Conclusion

In this paper, we have analyzed whether and how student mobility affects the governmental decision about the financial regime of higher education. Theoretical research suggests that in higher education systems that are partly tax-funded, a country's labor force might not be willing to subsidize the education of foreign students who can be expected to work abroad

after graduation with high probability. Increasing student mobility and a comparably low stay rate of graduates may thus lead to a larger share of private contributions if a government aims at sustainable financing of higher education.

We estimate the effect of the student immigration share on the private financing share of higher education based on aggregated data of 22 OECD countries for the period 2000 to 2011. Since there are various additional factors that may determine the financing of higher education we also include socio-economic, political and institutional determinants. Regarding student immigration we find a significant positive reaction: The larger the share of foreign students among all students in a country, the more a country shifts to private-based funding. This result is also robust to changes in the specification including IV estimates, even though there is evidence of different effects for different country groups. As countries have the possibility to charge different fees from (some) foreign students, we additionally ran our regressions splitting the share of immigrated students into those that can and those that cannot be treated differently. The effect of the share of immigrated students that can be charged higher tuition fees seems to be driven by the Anglo-Saxon countries, whereas in the other countries in our sample the share of non-discriminable foreign students is important.

With our paper, we want to highlight the importance of more empirical research on the question how, in general, mobility affects policy choice. For the case of student mobility, we have studied the impact on a country's political decision of an optimal, long-run sustainable financing scheme of higher education. In this context, the conclusion to be drawn is that research should not only focus on the determinants of student mobility but also on the fiscal consequences that may result from this.<sup>16</sup> One next step – complementing our analysis – could be to study the determinants of the private financing share with micro-level data. Not only would this permit the use of more control variables – if available – but also to include exact data on the amount of tuition fees paid by different student groups, data on the number of foreign graduates that stay and start working in the host country as well as data on grants and scholarships.

---

<sup>16</sup> For a discussion of possible policy instruments to correct for the underprovision of higher education as a result of student and/or graduate mobility, see, e.g., Gérard and Uebelmesser (2014) and the literature cited there.

## 7 Literature

- Beine, M.; R. Noël and L. Ragot (2014): Determinants of the international mobility of students, *Economics of Education Review* 41, 40-54.
- Boix, C. (1997): Political parties and the supply side of the economy: the provision of physical and human capital in advanced economies, 1960-1990, *American Journal of Political Science* 41(3), 814-845.
- Bratsberg, B. (1995): The incidence of non-return among foreign students in the United States, *Economics of Education Review* 14(4), 373-384.
- Bruckmeier, K.; G.B. Fischer and B.U. Wigger (2013): Does distance matter? Tuition fees and enrollment of first-year students at German public universities, CESifo Working Paper 4258, Munich: CESifo.
- Bussemeyer, M.R. (2007): Determinants of public education spending in 21 OECD democracies, 1980-2001, *Journal of European Public Policy* 14(4), 582-610.
- Bussemeyer, M. (2009): Social democrats and the new partisan politics of public investment in education, *Journal of European Public Policy* 16(1), 107-126.
- Chiswick, B. (1978): The effect of Americanization on the earnings of foreign born men, *Journal of Political Economy* 86, 897-922.
- Demange, G.; R. Fenge and S. Uebelmesser (2014): Financing higher education in a mobile world, *Journal of Public Economic Theory* 16, 343-371.
- Docquier, F. and A. Marfouk (2006): International migration by educational attainment (1990-2000) – Release 1.1. In: Ozden, C. and M. Schiff (eds), *International Migration, Remittances and Development*, Palgrave Macmillan: New York.
- Dreher, A. and P. Poutvaara (2011): Foreign students and migration to the United States, *World Development* 39(8), 1294-1307.
- Dwenger, N.; J. Storck and K. Wrohlich (2012): Do tuition fees affect the mobility of university applicants? Evidence from a natural experiment, *Economics of Education Review* 31, 155-167.
- European Commission (2012a): Report reveals wide fluctuations in cost of higher education and support for students.



[http://europa.eu/rapid/press-release\\_IP-12-947\\_en.htm](http://europa.eu/rapid/press-release_IP-12-947_en.htm)

European Commission (2012b): Austria and Belgium given more time to justify quotas.

[http://europa.eu/rapid/press-release\\_IP-12-1388\\_en.htm](http://europa.eu/rapid/press-release_IP-12-1388_en.htm)

Felbermayr G.J. and I. Reczkowski (2014): International student mobility and high-skilled migration: the evidence, in: M. Gérard and S. Uebelmesser (eds.): From mobility of students to mobility of the highly skilled: implications for fiscal and economic policy, CESifo Seminar Series, MIT Press, Cambr., MA, 2014, 145-188.

Gérard, M. (2007): Financing Bologna: Which country will pay for foreign students?, *Education Economics* 15(4), 441-454.

Gérard, M. and S. Uebelmesser (2014): Financing higher education when students and graduates are internationally mobile, in: M. Gérard and S. Uebelmesser (eds.): From mobility of students to mobility of the highly skilled: implications for fiscal and economic policy, CESifo Seminar Series, MIT Press, Cambr., MA, 2014, 145-188.

Hübner, M. (2012): Do tuition fees affect enrollment behavior? Evidence from a ‘natural experiment’ in Germany, *Economics of Education Review* 31, 949-960.

Kauder, B. and N. Potrafke (2013): Government ideology and tuition fee policy: evidence from the German States, *CESifo Economic Studies* 59(4), 628-649.

Ladd, H.F. and S.E. Murray (2001): Intergenerational conflict reconsidered: county demographic structure and the demand for public education, *Economics of Education Review* 20, 343-357.

Mayer, Thierry and Soledad Zignago (2011): Notes on CEPII’s distances measures: The GeoDist database, CEPII Working Paper 2011- 25, CEPII.

OECD (2002-2014): Education at a Glance. OECD Indicators, Paris: OECD.

Parey, M. and F. Waldinger (2011): Studying abroad and the effect on international labor market mobility: evidence from the introduction of Erasmus, *The Economic Journal* 121, 194-222.

Poterba, J.M. (1998): Demographic change, intergenerational linkages, and public education, *The American Economic Review* 88(2), 315-320.

Potrafke, N. (2011a): Does government ideology influence budget composition? Empirical evidence from OECD countries, *Economics of Governance* 12(2), 101-134.

- Potrafke, N. (2011b): Public expenditures on education and cultural affairs in the West German states: does government ideology influence the budget composition?, *German Economic Review* 12(1), 124-145.
- Rosenzweig, M. (2008): Higher education and international migration in Asia: brain circulation, In: *Annual World Bank Conference on Development Economics*, 59-100.
- Tandberg, D.A. (2010): Politics, interest groups and state funding of public higher education, *Research in Higher Education* 51, 416-450.

## 8 Appendix

Table A.1: Definitions and sources of variables

Variable	Description	Source	Year	Remark
Private funding share of higher education	Private share of expenditure for tertiary education among total expenditure.	OECD Education at a Glance	2000-2011	Linear interpolation: Norway 2004 and 2005; Values for New Zealand of year 2002 taken for 2001; Value for Germany of 2009 taken for 2010.
Share of immigrated students	Net share of non citizen students among all students in a country.	OECD Education at a Glance	1999-2011	Value of Portugal for 2002 is taken from the UNESCO, value of 2001 is created by linear interpolation.
Share of non-discriminable immigrated students	Share of foreign students that cannot be discriminated against (that pay the same amount of tuition fees like domestic students)	OECD Education at a Glance	2000-2011	
Share of discriminable immigrated students	Share of foreign students that can be discriminated against (that can legally be asked to pay higher tuition fees than domestic students)	OECD Education at a Glance	2000-2011	
Employment rate tertiary educated (Stay rate proxy)	Number of 25-64 year-old tertiary educated in employment as a percentage of the population aged 25 to 64	OECD	1999-2011	
Total expenditure (*10, in % of GDP)	Public and private expenditure for tertiary education per student (\$US, PPP, current) in % of GDP.	OECD Education at a Glance	2000-2011	Linear interpolation: Denmark, Iceland and Japan 2003, Norway 2004 and Slovak Republic 2002 and 2003; Germany 2010.
Tax revenue	Tax revenue (excl. social security funds) in % of GDP.	OECD	1999-2011	
GDP (/100,000)	Annual gross domestic product (\$US, PPP, current, in 1.0000 \$US).	OECD	1999-2011	
Students enrolled in private universities (share)	Share of students enrolled in independent private universities (institution that is controlled and managed by a non-governmental, private entity) among all students enrolled in a country.	OECD	1999-2011	
Right-wing parties (seat share)	Right-wing parties as a percentage of parliamentary seats of all governmental parties, weighted by the number of days the government was in office in a given year.	Armington et al. (2012)	1999-2011	
Old-age dependency ratio	Number of individuals older than 65 relative to the individuals aged 20 to 64.	OECD	1999-2011	
Quality	Number of universities classified in the Shanghai top 500 ranking relative to the total number of students in a country.	Shanghai ranking, OECD	2003-2011	
IV Linguistic closeness	Average of the linguistic closeness multiplied by the number of students of each potential home country with one host country	CEPII, OECD	1999-2011	
IV Geographic closeness	Average of the geographic closeness multiplied by the number of students of each potential home country with one host country	CEPII, OECD	1999-2011	

Notes: The dataset we use encompasses the following countries: Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, United Kingdom, United States

Table A.2: Summary statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Private expenditure share	overall	23.86	18.63	2.11	74.78	N = 264
	between		18.19	3.44	63.35	n = 22
	within		5.49	5.01	51.77	T = 12
Share of immigrated students	overall	7.85	6.35	0.38	28.91	N = 264
	between		5.88	0.58	20.98	n = 22
	within		2.68	-8.36	15.78	T = 12
Share of non-discriminable immigrated students	overall	2.13	2.29	0.00	12.47	N = 264
	between		2.07	0.00	8.76	n = 22
	within		1.05	-0.85	5.83	T = 12
Share of discriminable immigrated students	overall	5.72	5.68	0.37	27.24	N = 264
	between		5.28	0.51	19.78	n = 22
	within		2.35	-9.19	13.28	T = 12
Employment rate tertiary educated	overall	85.02	3.14	77.13	95.45	N = 264
	between		2.85	79.57	92.06	n = 22
	within		1.44	79.87	88.85	T = 12
Total expenditure (*10, in % of GDP)	overall	1.41	0.39	0.78	3.11	N = 264
	between		0.37	0.94	2.71	n = 22
	within		0.13	0.86	1.80	T = 12
Tax revenue (in % of GDP)	overall	26.52	6.90	15.55	48.43	N = 264
	between		6.93	16.79	46.17	n = 22
	within		1.22	22.83	30.91	T = 12
GDP (/100,000)	overall	14.23	27.66	0.08	155.18	N = 264
	between		27.94	0.11	130.60	n = 22
	within		4.15	-13.52	38.81	T = 12
Share of students enrolled in private universities	overall	24.93	28.44	0.16	100.00	N = 264
	between		29.03	1.25	100.00	n = 22
	within		3.84	2.32	37.22	T = 12
Right-wing parties (seat share)	overall	43.37	39.71	0.00	100.00	N = 264
	between		25.85	0.00	91.09	n = 22
	within		30.61	-31.80	129.85	T = 12
Old-age dependency ratio	overall	25.33	4.59	16.36	39.53	N = 264
	between		4.49	18.27	33.93	n = 22
	within		1.32	19.34	30.93	T = 12
Quality	overall	1.25	0.77	0	2.77	N = 198
	between		0.78	0	2.52	n = 22
	within		0.14	0.62	1.78	T = 9
IV Linguistic closeness	overall	21.86	7.94	5.06	44.88	N = 242
	between		7.45	7.46	36.75	n = 22
	within		3.15	13.86	29.99	T = 11
IV Geographic closeness	overall	89.21	21.79	32.14	127.49	N = 242
	between		14.88	47.41	98.65	n = 22
	within		16.21	61.04	118.05	T = 11
IV Linguistic*Geographic closeness	overall	14.22	5.10	2.82	31.66	N = 242
	between		4.82	4.50	26.17	n = 22
	within		1.92	8.77	19.71	T = 11