

DISCUSSION PAPER SERIES

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## ABSTRACT

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# Are They Coming Back? The Mobility of University Students in Switzerland after Graduation

We analyze the internal mobility of university graduates in Switzerland. An empirically interesting question because not all the cantons have a university and therefore in some cantons students have to leave their home for studying but all the cantons have to bear the public costs for studying for their students irrespective of their study place. On average, approximately half of the students who had left their home canton in order to study, return to their home canton, and about half of those who do not return move onward from the canton where they studied to a third canton. Controlling for several factors explaining graduate mobility, we find that top performing students return less often than do low performers. As a consequence the home cantons, which cover the bulk of the costs also for the students that had left for studying in another canton, face a quantitative and qualitative disadvantage when losing mobile graduates.

**JEL Classification:** H52, H75, I23, J61

**Keywords:** student mobility, graduate mobility, brain gain, brain drain

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## 1. INTRODUCTION

Student and graduate migration has been the subject of academic and political debates for years. Initially, the focus was on graduates who left the country where they had received their first higher-education degree (up to the master degree or equivalent) in order to obtain a PhD or higher academic qualification in a third country and decided not to return to their country of origin. *Brain gain* or *brain drain* was also an issue that was discussed mainly in the context of industrialized vs. developing countries. More recently, the literature has broadened to study growing numbers of mobile students who leave their country for their initial degree (see e.g., OECD, 2015), and found that the mobility between and within industrialized countries can be of the same concern as the mobility between developed and less developed countries. The questions researched in this literature are those of who should finance higher education if mobile graduates do not return to their countries of origin, unequal distributions of positive growth and innovation effects of high skilled migration, as well as whether less-skilled workers in the receiving countries might be replaced by high-skilled foreign graduates.

This study adds to the growing literature on within-country migration of university graduates. The focus of the study is the identification of factors to describe mobility patterns after graduation of students who left their place of residence in order to study in another place. This is of interest because, similar to countries who publicly finance higher education and risk to lose these investments

if their students move abroad after graduation, Swiss cantons<sup>1</sup> risk losing their public investment if mobile students – students who decided to study in another canton – do not return to their home canton after graduation. This phenomenon is attributable to a compensatory financing arrangement between the cantons that stipulates that the canton of residence before studying has to transfer almost the full cost of study to the canton where the student decides to study.

Switzerland is a particularly interesting case to study the within-country mobility of university graduates for at least four reasons: First, not all the cantons where the prospective university graduates receive their university entry qualifications have universities – in the following we will use the terms “university-cantons” and “non-university-cantons”. As a consequence, a substantial number of graduates had to be already mobile for their studies, whereas other students had the option to choose between being voluntarily mobile for their studies or studying in the canton where they had grown up. Therefore, Switzerland offers the possibility not only to analyze the post-graduation migration of mobile and non-mobile students but also to observe voluntarily and involuntarily mobile students separately. This is interesting because empirical evidence suggests that previous mobility experience is an important predictor for later mobility (e.g., Haussen and Übelmesser, 2015), but the literature has so far not been able to make a distinction between voluntary and non-voluntary student mobility. Also, because of the small geographical size of the country and the cantons, the between-canton mobility of students and graduates is not limited by long distances. Many prospective students

can easily choose between different universities, and the funding cantons have a high risk of losing the students after graduation because one can easily move from one canton to another within a short distance.

Second, and related to the first point, universities in Switzerland have to universally accept all university entrance diplomas issued by Swiss baccalaureate schools, which means that the observed student mobility is not affected by differences in admission policies of particular universities or cantons.

Third, in Switzerland, where the costs of higher education are predominantly covered by tax payers, the cantons have installed a compensatory payment system between cantons. University-cantons finance their own university, but they also receive a compensatory payment (that equals almost the full costs for an average student) for students that come from other cantons. In other words, the sending cantons do not only stand to lose highly skilled workers (labor market effect) if their students do not return after graduation, but they would also lose their tax payers' investment (fiscal effect).<sup>ii</sup> In this respect, the effects of the internal mobility of graduates are comparable to between-country mobility, where public money covers most of the study costs but not comparable to countries where university costs are mainly covered by private tuition.

Fourth, Switzerland has a highly decentralized tax system and a high degree of tax competition between the cantons. On the one side, the possibility of lower taxes

might be used as incentive to attract highly skilled workers. But on the other side, higher taxes might be needed to pay for the compensatory system. This could potentially lead to the unfortunate situation where some cantons have to keep high taxes in order to collect money for compensatory payments, and would risk a thin tax base because few graduates would return home, and other cantons (mainly university-cantons) could keep taxes low, not only in order to retain or attract graduates but also because they do not have to bear the full costs of educating these graduates. As a consequence, this could even influence the education policy of the cantons that expect a brain drain (particularly the ones without universities), insofar that they have a disincentive to hand out too many university entrance diplomas (see OECD, 2009 on this issue).

The paper is structured as follows: Section 2 briefly reviews the literature and the research findings on graduate mobility, focusing on within-country mobility. Section 3 gives an overview of the institutional background of the Swiss higher education system and the financing of universities. Section 4 describes the database and presents some descriptive findings of the inter-cantonal mobility of graduates. Section 5 presents the main results of our empirical analyses, and section 6 summarizes our findings.

## 2. LITERATURE

The existing empirical evidence on internal mobility shows that individual and structural factors shape the mobility behavior of graduates. In terms of individual factors, many studies show that mobility experience prior to graduation (including exchange semesters) is an important predictor for mobility after graduation (Falk and Kratz, 2009; Haapanen and Tervo, 2012; Haussen and Übelmesser, 2015; Maier and Sprietsma, 2016). However, in most cases it is not clear whether the mobility experience prior to graduation has a causal impact on later mobility or whether it is just the mobility-prone students that move both prior to graduation and after graduation. Socio-demographic characteristics such as age, sex or marital status or children (Bjerke and Mellander, 2017) are also relevant for mobility decisions after graduation, as are the fields of study. Lawyers, natural scientists and social workers tend to be less mobile than graduates in economics (Mohr, 2002). The authors suggest that students who continue their academic career with PhD studies and therefore stay for a longer period at their place of study tend to be less mobile afterward and that the probability of doing a PhD is notably different from one field of study to the other. In terms of quality of graduates and their mobility patterns, to our knowledge two studies so far analyzed the internal graduate mobility in Italy (Capuano, 2012; Marinelli, 2013). The authors found that top grades at university reduce the probability of return to the home region. These results control for academic specialization after graduation (e.g., PhD or other postgraduate qualification).



Studies that stress structural factors show in general that the economic power of a region is an important pull factor. Graduates are attracted to regions that offer more job opportunities and higher wages. Conversely, high regional unemployment rates can be a push factor that makes graduates leave a place of study (Haussen and Übelmesser, 2015). However, unemployment rates only matter if they are particularly high for high-skilled workers. High rates of average unemployment are not a very good predictor of graduate mobility, as university graduates tend to find jobs more easily also in places with high levels of unemployment (Busch and Weigert, 2010; Falk and Kratz, 2009). Other factors, such as the size of a region (Falk and Kratz, 2009) or the level of urbanization (Krabel and Flöther, 2014), might be proxies for more and better job opportunities but also appeal to highly skilled workers for other reasons, such as a higher density or quality of cultural activities. In summary, economic factors should not be neglected when analyzing the determinants of graduate mobility but can of course not fully explain (see Crescenzi, Holman and Orru, 2016) the observed mobility patterns.

### 3. UNIVERSITY SYSTEM AND FINANCING OF UNIVERSITY IN SWITZERLAND

In Switzerland, 10 out of 26 cantons run a cantonal university<sup>iii</sup>. These universities differ in terms of the size of their student body (2,400 to 20,000 students) but also in terms of the number of departments. The majority of the universities are so-called full universities, offering the full range of study fields, whereas the remaining 3 have only 2 to 3 different departments. This institutional difference is important to notice because it impacts the choice of university, and therefore the probability of migration prior to graduation. In general, there is free access to all the universities in Switzerland for holders of an academic baccalaureate (university admission certificate in Switzerland). There are exceptions for medical studies and the science of sport in the German part of Switzerland. The limited number of available study places is assigned after an entrance examination (*numerus clausus*).

Tuition fees cover less than ten percent of the real costs of studying; the bulk of the costs are covered by public money. The operating costs of each cantonal university is mainly paid for by the canton itself,<sup>iv</sup> but the university-cantons receive money for students coming from other cantons, independent of whether these students come from university- or non-university-cantons. The inter-cantonal agreement (IUV; EDK, 1997), which regulates the payments for all students that study outside the canton where they had obtained their university

entrance diplomas<sup>v</sup>, should guarantee that all students have a free access to all universities in Switzerland. The fact that cantons pay the study costs of the students whose parents live and pay taxes locally, regardless of whether those students study locally or elsewhere makes it understandable that they have an interest that mobile students return to their canton of origin after graduation. Brain gain or brain drain is therefore an issue for all cantons.

#### 4. DATA AND DESCRIPTIVE FINDINGS

##### *Data and Operationalization of Variables*

The main focus of this study is the analysis of the potential consequences of graduate mobility on the financing of higher education. Therefore, we define graduate mobility as a change of the place of residence or in other words the canton in which the graduate is paying taxes. This can differ from an analysis of labor market mobility, as some graduates may choose to work in another canton after graduation but still live in the canton where they studied, or vice versa. Although we have data on the place of residence of the graduates for one and five years after graduation, we decided to focus on the place of residence five years after graduation because administrative demographic data show (similar to other countries; see Haapanen and Tervo, 2012) that there is a high degree of residential stability after this point. The yearly mobility from one canton to another of adults older than 30 (and younger than 65) is less than two percent.

The data we use comes from four cohorts of the Swiss graduate surveys. This census-type survey is conducted every two years by the Federal Statistical Office (BFS, 2009, 2016). Graduates are interviewed one and five years after graduation. The analyses are based on the cohorts that graduated with a master's degree in 2002, 2004, 2006 and 2008. Because the costs for foreign students are not subject to inter-cantonal payments, the analyses are limited to persons with a Swiss admission certificate, and therefore to students whose parents in almost all cases pay taxes in Switzerland, irrespective of whether they are Swiss or foreigners.<sup>vi</sup> Table A.1 in the Appendix provides an overview of the different surveys and the numbers of observations.

The Swiss graduate surveys provide a rich set of individual data (an overview of the variables is given in Table A.2 in the Appendix) that does not only cover socio-demographic characteristics but also information on the study programs, the study behavior (e.g. duration, mobility semesters during the study program and final grades). To make the information on grades comparable across students in different study fields and universities, we have standardized the grades by department, university and year of graduation and categorized students into terciles – high performers, middle performers and low performers. We also control for the first employment after graduation because grades and the probability of obtaining a PhD or obtaining employment at the university are interlinked, and both have an impact on post-graduation mobility (Capuano, 2012; Marinelli, 2013).

In addition to variables that can be taken or constructed from the data of the graduate survey, we have also matched external data to our data set. These variables are GDP per capita, the cantonal tax level, the population size and the cantonal unemployment rates, as well as the commuting distance between the capital of the canton of origin<sup>vii</sup> and the city of the university where the student graduated. This commuting distance is used as proxy information for having moved to the place of study. If a student lived near (less than 75 minutes commuting time per way and day) the university, the likelihood that the student had relocated to the place of study was probably small. However, if the student had moved to the place of study because of a longer commuting distance, this can be seen as a different form of prior mobility experience than just commuting from one place to another. The economic variables are operationalized as differences between the canton of origin or the canton where the student graduated and the (language) regional average (for students in the Italian-speaking part of Switzerland the French language region is used as reference point). For graduates, who had left their language region for study, we use the country averages as reference point. We tried different specifications of the economic variables that lead qualitatively to similar results. We use here a binary dummy specification where the variable takes the value of 1 if the canton of focus has a higher value than the neighboring region.

### *Descriptive Findings of Graduate Mobility between Cantons*

Looking at the cantonal graduate inflows and outflows (see Table 1), we can observe that although all non-university-cantons are net losers and the average university-canton is a net gainer of mobile graduates, there is a remarkable heterogeneity in the group of university-cantons. Being a university-canton therefore is not a sufficient condition to be a net gainer of mobile graduates. A more refined analysis of the determinants of graduate mobility is needed.

Insert Table 1 here

The cantonal averages of gains or losses in graduate mobility, differentiating by university- and non-university-cantons, miss two additional important dimensions, which are shown in Table 2. The first dimension differentiates between students from university-cantons studying in their canton of origin, students from university-cantons studying outside their canton of origin, and students from non-university-cantons. The second dimension takes into account that students who were mobile can choose to stay in the canton where they graduated, return to their canton of origin, or move to a third canton. Those who had not been mobile while studying do not necessarily have to stay in their canton after graduation.

Insert Table 2 here

There are two primary results from this descriptive analysis. First, among mobile students, less than half (for non-university-canton students) to about half (for mobile university-canton students) of the graduates return to their canton of origin. Among those who do not return, only about half remain in the canton of study. In other words, limiting the research to the question of whether students stay in the canton of study or return to the canton of origin would mask an important third option. Second, the graduates who studied in their canton of origin are considerably less mobile also after graduation.<sup>viii</sup>

## 5. EMPIRICAL ANALYSES AND FINDINGS

We will concentrate in the final analyses on the determinants of return mobility of those students for whom their cantons had to pay another canton because the students had left their canton of origin for their studies.<sup>ix</sup> For these students, the “sending” cantons had to pay the full average cost of studying, rather than the lower marginal cost of an additional student if the student were to study in her or his home canton. As the descriptive analysis has shown, the risk of losing the student after graduation is considerably higher if the student had left his or her home canton already for studying.

In the following, we analyze with separate models the determinants of the within-country migration of university graduates for two groups of students – students who voluntarily left their cantons for their studies and students who involuntarily

left their cantons.<sup>x</sup> The determinants are estimated using a multinomial logistic regression model in which the dependent variable (canton of residence five years after graduation) has three categories ( $j$ ): living in the canton of study, returned to the canton of origin or moved to a third canton. The probability  $P$  of the choice of the canton of residence  $Y$  of the individual  $i$  is described as

$$P(y_i=j | x_i) = \frac{\exp(x_i' \beta_j)}{\sum_{j=1}^3 \exp(x_i' \beta_j)} \quad j=1,2,3 \quad \text{Eq. (01)}$$

where  $x_i$  is a vector of various individual characteristics and structural canton characteristics. Clusters of graduation years were used to calculate the standard errors. All the statistical analyses are weighted using the weighting variable provided by the Federal Statistical Office.

#### *Determinants of Graduate Mobility of Non-Voluntarily Mobile Students*

The first regression analyzes the factors that affect the probability of each post-graduation mobility option for those students who were forced to leave their home canton for studying because it had no university. The results of the multinomial model (see Table 3) show four important determinants for a higher return mobility. Return mobility is higher if the chosen university was within a reasonable commuting distance, the student showed a low degree of mobility during his or her studies (no exchange or mobility semesters), the student who graduated in the lowest tercile of grades and if the canton of origin had a lower tax level than bordering cantons of the same language region.



In sum, the picture that emerges is rather bleak for the non-university-cantons, as it seems that these cantons can mainly attract the less-mobile (commuters and non-mobile during the studies) and low-performers to return to their home canton. This means that besides the quantitative problem of losing more than half of the students they had been financing, the returners are qualitatively a less-desirable selection of the entire cohort that left the canton for study.

Insert Table 3 here

The empirical analysis also reveals the factors that increase the likelihood that the graduates remain in the canton of their study place. As expected, the likelihood is higher if the graduate found employment at the university and if the GDP per capita is higher in the university canton. Interestingly, the factors that make it more likely that the graduates stay in the canton where they have studied decrease the likelihood that the graduates move to a third canton more than decreasing the likelihood that they return to their canton of origin. Conversely, if the university in the canton of study was not a full university, this canton significantly loses graduates to third cantons and not to the canton of origin for the students.

#### *Determinants of Graduate Mobility of Voluntarily Mobile Students*

The second regression analyzes the determinants of graduate mobility for students who were voluntarily mobile. Compared to the previous group, some interesting differences emerge (see Table 4). For example, the mobility during study does not

affect later graduate mobility, and shorter commuting times between the canton of origin and the canton of study not only increases the return mobility of graduates but also the likelihood that they stay in the canton of study, forgoing moving to a third canton. Particularly noting the difference with respect to the link between mobility semesters and later graduate mobility it becomes obvious that this group is composed of people with a higher affinity for mobility than those who were forced to be mobile. Therefore, additional mobility during study does not help to further differentiate between mobile and non-mobile graduates.

Insert Table 4 here

Regarding student performance, the results show again that regarding the non-university-canton students, the canton the students chose to study does not significantly gain the better students. In a more pronounced way, it is the third cantons that seem to benefit most from the mobility of top performing graduates, after controlling for the fact that the university canton is able to keep some of the top performing students as PhD students and those finding employment at the university are more likely to stay.

As for the size of the universities in the cantons of origin and the canton where the students studied, one finds that coming from a canton whose university offers only a limited number of departments increases the likelihood of staying away from the home canton. However, if the university where the student graduated

offers a limited choice of departments, the likelihood that the graduate moves away increases, but mainly to another canton rather than back home.

Concerning the economic factors, taxes and GDP again matter. If taxes are higher in the canton of origin, the probability of returning is reduced, but it is not the canton of study that profits from the reduced return mobility. Conversely, the canton of study enjoys a higher number of remaining students if its GDP is higher than the average of neighboring cantons and mobility towards other cantons is reduced. The result that when the canton of study has a higher tax level, the return mobility to the home cantons is reduced, however, is difficult to interpret and somewhat counterintuitive.

## 6. SUMMARY AND CONCLUSION

In this study, we analyzed the determinants of the graduate mobility of students who have already left their home canton in order to study. These mobile students are of particular interest, first because the return mobility of these students is considerably lower than the probability that students who studied in a nearby university later move away from their canton of origin after graduation, and second, because of an inter-cantonal agreement on financing of higher education, the cantons of origin have to fully pay the average study cost for every student that chooses to study in another canton. It is therefore of great interest to learn which explanatory factors are associated with the decision of these students to

return to the canton that had financed their studies.

There are two groups of mobile students that we look at, that is, the students who voluntarily choose to study in another canton although they would have had an opportunity to study in their home canton and the students originating from non-university-cantons who were forced to leave their home canton in order to study. Interestingly, although the return mobility for students coming from university-cantons is significantly higher, in both groups their decisions to return are explained by mainly the same factors, with some small differences. The main results show that student performance and economic factors in the home canton as well as the canton of study are linked to graduate mobility. Concerning the economic factors, higher tax levels in the home cantons are associated with a lower rate of returning graduates, whereas higher levels of GDP per capita in the cantons of study are linked to lower rates of graduates moving to a third canton. But most importantly, the observation that low-performing students are more likely to return to their home canton than top performing students is the most worrisome result for the cantons that financed the studies of their citizens. Not only do they lose on average half of these students to other cantons, but it is also a less-desirable selection of graduates that chooses to return.

Finally, the results also demonstrate that approximately half of the graduates that choose not to return to their cantons of origin do not stay in the place of study but move to a third canton, and in many cases, these are the top performing students.

When reconsidering the financial agreements between cantons to finance higher education, it should therefore be born in mind that brain gain and brain drain is not only an issue between the financing cantons of origin and the canton of study but that there is also a potentially profiting third party – cantons that neither covered the direct study cost or the additional cost of operating the university but benefit from the taxes of the graduates they were able to attract.

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## APPENDIX

TABLE A1: Number of Observations of Study Population (5 years after graduation, second-wave survey)

	<i>University canton</i>	<i>Non-university canton</i>
Graduates 2002	2325	805
Graduates 2004	2855	986
Graduates 2006	2786	969
Graduates 2008	2601	893
Pooled sample	10567	3653



TABLE A2: Descriptive Statistics of Variables (analytic sample, 11432 observations)

<i>Variable</i>	<i>Mean</i>	<i>Min./Max.</i>
Canton of origin is canton of residence (5 years after graduation)	0.644	0/1
<i>Mobility related to the studies</i>		
Not mobile, studies in the canton of origin	0.434	0/1
Voluntarily mobile, form a university canton, studies in another canton	0.310	0/1
Forced to be mobile, from a non-university canton	0.257	0/1
Commute (train journey max. 75 minutes)	0.794	0/1
Mobility semester (domestic or foreign)	0.224	0/1
<i>Studies related variables</i>		
Canton of origin with a university with a small selection of departments	0.152	0/1
Studies at a university with a small selection of departments	0.087	0/1
Academic Performance, grade sorted by department, university and year of graduation:		
Lowest tercile	0.328	0/1
Middle tercile	0.346	0/1
Upper tercile	0.326	0/1
Economic sciences	0.176	0/1
Humanities and social sciences	0.381	0/1
Law	0.172	0/1
Natural sciences	0.105	0/1
Medicine and pharmacology	0.155	0/1
Technical sciences	0.004	0/1
Interdisciplinary and other subjects	0.008	0/1
Working as a teacher (5 years after)	0.096	0/1
Writing a dissertation (1 year after)	0.107	0/1
Employee in the high education system (5 years after)	0.104	0/1
<i>Socio-demographic characteristics</i>		
Foreigner (non-Swiss nationals)	0.042	0/1
Female	0.528	0/1
Age (1 year after graduation)	28.300 (4.23)	21/60
Highest completed education of one or both parent(s) is tertiary 5A	0.399	0/1
Lives with his/her partner in the same household (5 years after)	0.408	0/1
Married (5 years after)	0.108	0/1
Children (5 years after)	0.065	0/1
<i>Canton specific economic variables (above average)</i>		
Taxes above average, in the canton of origin	0.502	0/1
Taxes above average, in the canton of study	0.578	0/1
GDP above average, in the canton of origin	0.407	0/1
GDP above average, in the canton of study	0.603	0/1
Population above average, in the canton of origin	0.667	0/1
Population above average, in the canton of study	0.731	0/1
Unemployment rate above average, in the canton of origin	0.447	0/1
Unemployment rate above average, in the canton of study	0.576	0/1

Note: For metric variables standard deviation in parentheses

TABLE A3: Probability of Living in the Canton of Origin (5 years after graduation)

Probit regression	Return
<i>From a university canton, voluntary mobile</i>	<i>Reference</i>
From a non-university canton, forced to be mobile	-0.083* (0.038)
From an university canton, not mobile	0.206** (0.018)
Control variables:	
Studies related variables	x
Individual characteristics	x
Canton specific economic variables	x
N	11432

Average marginal effects, pooled sample, robust standard errors in parentheses (clusters of graduation years)

\* p<0.05, \*\* p<0.01

## TABLES

TABLE 1: Net Gains of In- and Out Flows (in percent)

<i>University-cantons</i>	
Basel-Stadt	77
Berne	11
Freiburg	1
Geneva	10
Lucerne	-19
Neuchâtel	-7
St. Gall	-38
Ticino	-15
Vaud	11
Zurich	53
<i>Non-university-cantons</i>	
Aargau	-27
Appenzell	
Ausserrhoden	-58
Appenzell Innerrhoden	(-49)
Basel-Land	-44
Glarus	-42
Grisons	-35
Jura	-48
Nidwalden	-47
Obwalden	(-50)
Schaffhausen	-41
Schwyz	-29
Solothurn	-34
Thurgau	-58
Uri	-61
Valais	-30
Zug	0

Note: Average of first- and second-wave survey, the calculations are based on the numbers of university admission certificates per canton (100%). The net gain shown reflects the gain or loss of graduates (in percent). Figures in parentheses are based on small numbers of cases and are not statistically reliable.

TABLE 2: Mobility Pattern of University Graduates, Descriptive Statistics (percent)

	<i>Graduates from university-cantons</i>		<i>Graduates from non-university-cantons</i>	
	Not mobile	Mobile	Not mobile	Mobile
Student mobility	58	42	0	100
<i>Canton of residence 5 years after graduation</i>				
Canton of origin	84	54		43
Canton of study		24		30
Third canton	16	22		27
N (analytic sample)	4883	3539		3010

TABLE 3: Determinants of Mobility of University Graduates, Non-University-Cantons

<i>Multinomial logistic model</i>	<i>Return</i>	<i>Stay</i>	<i>Move</i>
Studies at a university with a small selection of departments	0.016 (0.041)	-0.170** (0.046)	0.154** (0.033)
Mobility semester (domestic or foreign)	-0.099** (0.018)	0.044** (0.015)	0.055** (0.018)
Commute (max. 75 minutes)	0.089** (0.024)	0.036 (0.019)	-0.125** (0.017)
<i>Academic Performance</i>			
<i>Lowest tercile</i>			
Middle tercile	-0.054** (0.019)	0.031 (0.017)	0.023 (0.022)
Upper tercile	-0.060** (0.022)	0.026 (0.020)	0.034 (0.018)
<i>Study subject</i>			
<i>Economic sciences</i>			
Humanities and social science	-0.047* (0.022)	0.009 (0.025)	0.038 (0.027)
Law	0.108** (0.035)	-0.041 (0.032)	-0.067* (0.025)
Natural sciences	0.016 (0.037)	-0.041 (0.028)	0.025 (0.030)
Medicine and pharmacology	-0.009 (0.033)	-0.055 (0.031)	0.049 (0.028)
Technical sciences (small number of cases, statistically not reliable)	-0.427** (0.022)	-0.316** (0.021)	0.742** (0.022)
Interdisciplinary and other subjects	0.086 (0.081)	0.011 (0.061)	-0.097 (0.090)
Working as a teacher (primary, lower or upper secondary) (5 years after)	0.186** (0.038)	-0.106** (0.033)	-0.080* (0.038)
Writing a dissertation (1 year after)	0.003 (0.032)	0.010 (0.027)	-0.013 (0.027)
Employee in the high education system (5 years after)	-0.015 (0.034)	0.120** (0.028)	-0.105** (0.034)
Taxes above average, in the canton of origin	-0.155** (0.037)	0.076** (0.022)	0.079* (0.032)
Taxes above average, in the canton of study	-0.049 (0.035)	-0.006 (0.021)	0.055 (0.032)
GDP above average, in the canton of origin	0.022 (0.045)	-0.056 (0.033)	0.033 (0.047)
GDP above average, in the canton of study	-0.035 (0.038)	0.116** (0.029)	-0.081* (0.036)

Average marginal effects, pooled sample, robust standard errors in parentheses (clusters of graduation years), \* p<0.05, \*\* p<0.01 N= 3010; Additional controls include socio-demographic characteristics (i.e., sex, age, nationality, tertiary education of parents, marital status, having children), population size and unemployment rate (in the canton of origin as well as canton of study).

TABLE 4: Determinants of Mobility of University Graduates, University-Cantons

<i>Multinomial logistic model</i>	<i>Return</i>	<i>Stay</i>	<i>Move</i>
Canton of origin with a university with a small selection of departments	-0.055 (0.034)	0.076* (0.028)	-0.017 (0.028)
Studies at a university with a small selection of departments	0.060 (0.044)	-0.180** (0.042)	0.119** (0.032)
Mobility semester (domestic or foreign)	-0.019 (0.025)	-0.008 (0.017)	0.027 (0.017)
Commute (max. 75 minutes)	0.082* (0.037)	0.070* (0.029)	-0.152** (0.025)
<i>Academic performance</i>			
<i>Lowest tercile</i>		<i>Reference</i>	
Middle tercile	-0.033 (0.020)	0.003 (0.017)	0.030* (0.014)
Upper tercile	-0.061** (0.022)	0.027 (0.018)	0.034* (0.014)
<i>Study subject</i>			
<i>Economic sciences</i>		<i>Reference</i>	
Humanities and social science	0.003 (0.033)	0.014 (0.037)	-0.017 (0.022)
Law	0.108** (0.039)	-0.074* (0.037)	-0.034 (0.034)
Natural sciences	-0.010 (0.038)	0.002 (0.039)	0.007 (0.026)
Medicine and pharmacology	0.017 (0.036)	-0.068 (0.039)	0.051* (0.025)
Technical sciences (small number of cases, statistically not reliable)	-0.104 (0.161)	0.245 (0.163)	-0.141* (0.067)
Interdisciplinary and other subjects	0.092 (0.091)	0.025 (0.075)	-0.117 (0.072)
Working as a teacher (primary, lower or upper secondary) (5 years after)	0.117** (0.037)	-0.044 (0.029)	-0.073* (0.033)
Writing a dissertation (1 year after)	-0.086** (0.027)	0.073** (0.029)	0.013 (0.022)
Employee in the high education system (5 years after)	-0.049 (0.034)	0.067** (0.022)	-0.019 (0.029)
Taxes above average, in the canton of origin	-0.110* (0.049)	0.013 (0.028)	0.097** (0.033)
Taxes above average, in the canton of study	-0.053* (0.025)	0.023 (0.025)	0.031 (0.027)
GDP above average, in the canton of origin	0.066 (0.038)	-0.043 (0.024)	-0.023 (0.032)
GDP above average, in the canton of study	0.024 (0.028)	0.064** (0.018)	-0.088** (0.025)

Average marginal effects, pooled sample, robust standard errors in parentheses (clusters of graduation years), \* p<0.05, \*\* p<0.01 N= 3539; Additional controls include socio-demographic characteristics (i.e., sex, age, nationality, tertiary education of parents, marital status, having children), population size and unemployment rate (in the canton of origin as well as canton of study).

## NOTES

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<sup>i</sup> The Swiss cantons are comparable with US states, German Länder or the Canadian provinces in terms of their degree of autonomy in educational policy.

<sup>ii</sup> For an overview on questions related to the financing of higher education and the implications for tax systems see e.g. Demange, Fenge and Übelmesser, 2014; Gérard and Übelmesser, 2014; Winter, 2015 or Haupt, Krieger and Lange, 2016).

<sup>iii</sup> Additionally there are two Federal Institutes of Technology (ETH, EPFL) and two private universities. In our analyses we exclude the two Federal Institutes of Technology and private universities as their financing differs from the cantonal universities; e.g. cantons do not have to pay for their students if they choose to study at one of the Federal Institutes of Technology. There are also two other types of higher education institutions, the Universities of Applied Sciences and the Universities of Teacher Education. Because of the differences in terms of admission criteria to these institutions (Universities of Applied Sciences) and the differences in terms of labour markets (Universities of Teacher Education), we decided not to include the graduates of these types of institutions in our analyses. They could be analysed in a separate study however.

<sup>iv</sup> There are also subsidies coming from the Federal level but most of the federal funds cover directly research expenditures and not teaching costs for undergraduate and graduate students.

<sup>v</sup> The study costs for foreign students have to be covered by the canton of study, and are therefore not covered by the inter-cantonal agreement or by federal funds.

<sup>vi</sup> Due to our focus on internal mobility, we excluded graduates who moved abroad.

<sup>vii</sup> We do not know the exact place of living of the graduate prior to studying.

<sup>viii</sup> A multivariate analysis (see Table A.3 in the appendix) shows that, even after controlling for differences in the composition of the student body, the probability that a graduate is living five years after graduation in the canton he or she was living prior to study is statistically significantly higher for those who did not leave their canton of origin for study compared to those who had left their canton of origin.

<sup>ix</sup> A probit regression in the appendix (see Table A.4) shows the factors that affect graduates who had initially stayed in their home canton to leave it five years after graduation. In comparison to the results for mobile students, the graduate mobility of students who studied in their home-canton is not affected by the students' performance at university. Tax levels, however, are a reason to leave the home canton.

<sup>x</sup> We also analyzed the determinants for the full sample of mobile students (results are available on request). However, we choose to present the specification with two samples because too many of the explanatory variables may differ between the two groups, and also because we are not primarily interested in testing differences between these two groups (which would be possible using interaction terms).