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Abstract

International students are potential highly skilled workers who can enter in their host country's labor market. In Switzerland, migration policies regulate the selection criteria for migrant workers, including international students who subsequently seek employment after graduation. However, Switzerland has competing national interests: on the one hand, economic efficiency requires highly skilled workers who are partially recruited abroad; on the other hand, the state has to address concerns related to immigration, social cohesion, national identity, and security. We analyze the dynamic of international graduates' integration in the Swiss labor market. We first provide an overview of the stay rates of graduate students based on register data, and then we conduct a multivariate analysis of Swiss labor market integration based on graduate surveys from the Swiss Federal Statistical Office. We complement the analysis with responses to problems encountered by the international graduates when seeking employment. We find that Switzerland accesses a pool of variously skilled graduates upon their graduation from Swiss universities. While Swiss employers recruit both European and non-European graduates, the priority rule and facilitated mobility for EU nationals are reflected in higher employment rates of EU graduates. Graduates with degrees in science, technology, engineering, and math (STEM) are more likely than non-STEM graduates to find employment in Switzerland. Yet, this factor is not as strong as expected for all non-EU nationals: STEM graduates from both EU and non-EU countries, as well as the Asia-Pacific region, are employed at a significantly higher rate than non-STEM graduates from the same region.

Keywords

International graduates, study-to-work transition, labor market integration policies

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Contents

1 Introduction

Developed countries compete worldwide to attract skilled workers to their labor market. International graduate students constitute a pool of highly skilled workers who could potentially be recruited and retained in the host country. Trained on site, these graduates internalize some characteristics that make them more suited for employment than other foreign workers recruited from abroad. They have experienced life in the host country and have therefore acculturated to a certain degree to the local society, culture, customs, and language. Furthermore, their training is relevant to the domestic labor market, where their Swiss degrees are immediately recognized (Felbermayr and Reczkowski 2012, Tremblay 2005). In other words, international students possess skills which can considerably accelerate their social and economic integration and have proven that they can establish themselves and thrive in a foreign context (Mayer et al. 2012).

Through an economic lens and as formulated by Ruhs (2008), three rationales speak in favor of retaining international graduates. First, to support labor expansion by complementing the skill base of the domestic workforce; second, to facilitate economic growth by employing highly qualified workers; and third, to provide fiscal benefits (while) maximizing overall gains (and) minimizing adverse distributional effects for existing residents. In addition, recruiting international graduates lessens the demographic trend of an aging society and helps to co-finance retirement provisions and other social welfare systems. Furthermore, some countries—such as the United States, the United Kingdom, Australia, New Zealand, and Canada—benefit from the high fees paid by international students, which contribute to financing the higher education system. On the contrary, universities in other countries—such as Switzerland, Germany, and Finland—not only do not ask for higher fees but subsidize the studies of international students. Several countries have identified international graduates as potential highly skilled workers and aim to retain them by providing attractive regulations for staying after graduation. First among these are the so-called traditional immigration countries—Canada (She and Wotherspoon 2013), Australia (Hawthorne 2010, 2012, Hawthorne and To 2014), the United States, and the United Kingdom—which target foreign students as possible permanent immigrants (Suter and Jandl 2006, 2008). Many other countries have followed this model, turning the issue into a competition for talent (Skeldon 2009, Boeri et al. 2012). Furthermore, the Organization for Economic Co-operation and Development (OECD) and the European Union (EU) have defined strategies (e.g. “youth on the move”, “smart growth”) for retaining international students (European Commission 2011, OECD 2016).

Our study of the labor market integration of international students focuses on Switzerland. This is an interesting case given its geographical situation at the heart of Europe without being part of the EU. On the labor market, Switzerland gives priority to Swiss residents and prioritizes EU to non-EU citizens. The combination of courses offered in English and other common European languages, as well as the good reputation of Swiss universities, attracts many students from abroad. Over the last fifteen years, the number of international students in Switzerland has more than doubled, reaching about 33,800 in 2017 (FSO 2017). Switzerland holds a 17% share of international students enrolled at higher education institutions on all levels and is positioned, in relative terms, behind New Zealand (21%) and the UK (18%). At the master’s level, every fourth student is an international student (OECD 2017).

One important aspect of fostering innovation is the recruitment of new talent, especially in the science, technology, engineering, and math (STEM) fields, which are in great demand in the labor market (AMOSA 2015). Countries that aim to integrate international graduates into their labor markets can provide attractive conditions for admission and residency status policies, as well as access to employment. However, migration policies are shaped by various—and sometimes competing—state interests. Ruhs (2013) identified four interrelated policy goal dimensions: *economic efficiency* (i.e. maximizing the benefits of immigration for economic growth); *distribution* (i.e. making sure immigration does not harm the lowest-paid workers in the economy); *national identity and social cohesion*; and *national security and public order*. Achieving one policy goal can create a trade-off situation that has to be managed by the state. Thus, in order to attract international graduates as highly skilled workers, the state can adapt existing immigration policies that regulate the number, the selection, and the rights of migrant workers admitted.

Migration policies in Switzerland have been shaped by these competing objectives. On the one hand, the economy has a strong need for highly skilled workers and many of them are recruited from abroad. On the other hand, the state has to address concerns related to national identity and security, public order, and social cohesion. These competing state policy objectives—restricting migration versus attracting highly skilled foreign workers—resulted in different forms of regulations on admission and labor market access. In practice, they have a selective effect on who can obtain a residence permit and subsequently integrate into the Swiss labor market.

In addition to migration policies, study performance (Kuptsch 2006) and familial situations (Brooks & Waters 2010) also influence the employment outcomes of international graduates in Switzerland. The aim of our study is, therefore, to identify *which selective dynamic predominates the employment outcomes of international master's graduates*. We examine the employment rate of these students one year after graduation by taking degree field, study performance, familial status, and nationality into consideration. Then, to best explain the differences in employment outcomes, we test the following five hypotheses based on the existing literature:

- *1) Study performance*: Differences in employment rates are explained by the final grades of the graduates. Graduates with high final grades have higher employment rates.
- *2) Parenthood*: Differences in employment rates are explained by parenthood. Graduates with children have lower employment rates.
- *3) Nationality*: Differences in employment rates are explained by the legal framework providing EU nationals with better access to the labor market than non-EU nationals. Non-EU nationals have lower employment rates than EU nationals.
- *4) Labor market demand for STEM qualifications:* Differences in employment rates are explained by a strong demand for STEM graduates in the labor market. Graduates in STEM sectors have higher employment rates than those in non-STEM sectors.
- *5) Third-country nationals with STEM qualifications*: Among non-EU graduates, differences in employment rates are mostly explained by employment in STEM fields. The difference between graduates in STEM and non-STEM fields is higher among non-EU nationals than among EU nationals.

2 Literature and Legal Framework

2.1 Reasons for Staying or Leaving

Studies show that international students consider a variety of reasons when deciding whether or not to remain in the host country. In his study on university students, Rérat (2016) recognizes four theoretical perspectives to explain the logic behind mobility decisions: utilitarian (factors related to the labour market), calculating (factors referring to finances), sensitive (factors related to residential amenities), and affective (factors referring to partners, family members, and friends). These factors also apply for international students (e.g. Weisser 2016). Bijwaard and Wang's (2016) study in the Netherlands identified employment and marriage as the most important factors influencing international students to stay, whereas unemployment correlates with leaving. These findings agree with results from Sykes and Ni Chaoimh (2012) reporting that career-related factors, such as employment and the desire for international work experience, are the strongest motivators for staying. In contrast, personal factors such as family and other relationships are among the strongest motivations for returning. Language barriers, not feeling welcome, familial obligations, and the desire to use their skills to serve their home countries all appear to be reasons to leave. Furthermore, international students do not move across time and space alone but are embedded in various relationships (Riaño et al. 2015, Kim 2014). Eventually, the desire of staying or is not always fulfilled due to legal restrictions which can create discrepancies between intentions and actual mobility behavior (Van Mol et al. 2018). Sykes and Ni Chaoimh (2012) show in their study of international students in five EU member states (France, Germany, Sweden, the Netherlands, and the UK) that the expressed desire to stay is higher than the share of students that actually stay.

2.2 Labor Immigration and Retention Policy Practices in Switzerland

The bilateral Agreement on the Free Movement of Persons (AFMP) between Switzerland and the EU entered into force in 2002, facilitating the mobility and immigration of EU and European Free Trade Agreement (EFTA) nationals. At the same time, the Foreign Nationals Act (FNA), which regulates the admission and residency policies for non-EU and non-EFTA nationals (hereafter named *third-country nationals*), became applicable and proved to be much more restrictive according to predominant economic interests in Switzerland,[1] resulting in the admittance of predominately urgently required qualified workers. The precedence regulation (hereafter named *priority rule*)[2] grants EU nationals priority access to the labor market, meaning that third-country nationals can only be hired if no suitable Swiss resident or EU national is found. The revision of the FNA and the legal amendments due to a parliamentary initiative[3] provided new opportunities for third-country nationals who graduated from a Swiss university, including doctoral students[4].

[1] Art. 3(1) FNA: Admission: "The admission of gainfully employed foreign nationals is allowed in the interests of the economy as a whole; the chances of lasting integration in the Swiss employment market as well as in the social environment are crucial. Switzerland's cultural and scientific needs shall be appropriately taken account of."
[2] Art. 21(1) FNA: Presedence: "Foreign nationals may be permitted to work only if it is proven that no suitable domestic employees or citizens of states with which an agreement on the free movement of workers has been concluded can be found for the job." [...]
[3] Parliamentary initiative (08.407) "Faciliter l'admission et l'intégration des étrangers diplômés d'une haute école Suisse"
[4] Art. 21(3) FNA: Simplified admission for foreign nationals with university degrees: "Foreign nationals with a Swiss university degree may be admitted in derogation from paragraph 1 if their work is of high academic or economic interest. They shall be temporarily admitted for a period of six months following completion of their education or training in Switzerland in order to find suitable work."

Since 1 January 2011, third-country nationals with a Swiss university degree can apply for a permit to seek employment for a duration of six months after graduation under the condition that the work is "of high academic or economic interest", and make use of an exception to the priority rule regulations (Vaitkeviciute 2017).

The legal restrictions and rights that graduates experience in Switzerland depend on their residence status (short-term versus long-term) and the type of permit issued related to a specific migration purpose (study, employment, marriage, family reunification, permit transformation). In practice, when a student permit expires upon graduation, EU nationals can legally stay in Switzerland, whereas third-country nationals with a permit related to their studies have restricted options. If they do not enroll in subsequent studies (e.g. PhD after master's), they can either seek employment before graduating (if the employer requests a work permit) or they can apply for the six-month job-seeking permit. Of course, not all international graduates have a student permit—for some, the main reason for applying is unrelated to their study enrollment.

The possibility of switching between different permit statuses (and their associated rights) is one form of facilitating the study-to-work transition. In Switzerland, this pathway is not as developed as it is in other countries, such as Germany or the Netherlands (Brooke and Sykes 2012), and the six-month post-graduate job-seeking permit (including the exception of the priority rule) is the only provision for facilitated access to the labor market. However, graduates have to apply for the permit and they are eligible only under specific conditions (e.g. high academic or economic interest).

2.3 Labor Immigration and Retention Policy Practices Outside Switzerland

In the European Union, the need to attract third-country nationals for academic and economic purposes, as well as to boost innovation in Europe, was emphasized as a top priority at the Lisbon European Council in 2000 and led to the creation of the European Research Area (ERA). In 2007, the European Commission's Green Paper on the ERA aimed to increase the transnational mobility of researchers. Furthermore, the EU introduced the Blue Card (Directive 2009/50 EC),[5] which was designed to attract highly skilled labor by facilitating entry for third-country nationals. The EU also combined the Student Directive (Directive 2004/114/EC) and the Researcher Directive (Directive 2005/71/EC) into the Recast Directive (Directive 2016/801/EU). This provides better conditions for international students and researchers as well as for their families, including harmonized rules on admission conditions, extra-economic rights for students, increased possibilities for inter-EU mobility, the integration of students into the EU labor market, more rights for family members of researchers and effective judicial protection, and other guarantees. Most importantly (and for the first time), the directive imposes an obligation on every member state to allow third-country researchers and students to stay in its territory for at least nine months in order to seek employment or set up a business.[6] These graduates are required to undergo specific administrative procedures and submit the relevant documents for the permit application (Vaitkeviciute 2017).

[5] Currently, a revision of the 2009 Blue Card—designed to attract highly skilled labor—is underway. The proposed changes include new schemes offering more flexibility for recent graduates and for workers in occupations suffering shortages. Furthermore, the proposal includes the abolition of parallel national schemes.

[6] Art. 25(1) Recast Directive: "After the completion of research or studies, researchers and students shall have the possibility to stay on the territory of the Member State that issued an authorisation under Article 17, on the basis of the residence permit referred to in paragraph 3 of this Article, for a period of at least nine months in order to seek employment or set up a business [...]."

The Recast Directive sets minimal standards and provides EU member states wide discretion regarding implementation in national law. Consequently, the implemented regulations among member states are very heterogeneous, and the UK, Ireland, and Denmark opted not to apply the directive (Directive 2016/801/EU). However, fifteen EU member states include five special incentives to retain former third-country national students: 1) simplified application procedures for authorization to stay for work or business (e.g. applicants are not subject to labor market tests or examinations), 2) lower salary requirements, 3) full access to the labor market (e.g. not restricted to the field of study or work, nor limited to reduced working hours), 4) a possibility to remain in the member state to look for work or to set up a business (e.g. for a minimum period of 1.5 years), and 5) various additional incentives (e.g. fewer years of residence required to qualify for permanent residence, exception of quota rules, orientation year with free access to the labor market and a residence permit) (EC 2017).

2.4 Stay Rates and Post-Graduate Mobility of International Students

A previous study based on national register data in Switzerland on international master's students graduating from Swiss universities in 2012 shows their nationalities and stay rates as a percentage of international master's graduates registered with a residence permit two years after graduation (Lombard 2017). The overall stay rate is 49% and students from the European non-EU group have the highest stay rates of all regional groups (Table 1). Germans have stay rates above the average, while North Americans, Asians, and Oceanians have the lowest stay rates.

Table 1: International students graduating in 2012 and their stay rates in 2013/2014, by nationality

International students graduating in 2012, by nationality	**Number and % of graduates in 2012**		**Stay rates in 2013**	**Stay rates in 2014**
Germany	772	24 %	54 %	51 %
France	443	14 %	49 %	47 %
Italy	339	11 %	52 %	47 %
EU-17 and EFTA (without GER/FRA/ITA)	365	11 %	51 %	49 %
European non-EU (incl. EU-8 and EU-2)	448	14 %	64 %	62 %
Asia and Oceania	423	13 %	43 %	40 %
Latin America	179	6 %	48 %	43 %
North America	139	4 %	43 %	38 %
Africa	120	4 %	53 %	48 %
Total	**3228**	**100 %**	**52 %**	**49 %**

Source: LABB & ZEMIS, 2015

Non-EU nationals have in average lower stay rates (44%) than EU nationals (51%). Besides the country of origin, other factors affecting the observed stay rates include the geographical location of the host university and the study field. STEM graduates have very high stay rates—engineering 57%, life sciences 62%, and environmental studies 58%—whereas non-STEM fields have lower stay rates—social sciences 42% (Lombard 2017). However, stay rates provide information based solely on whether graduates stay. They do not explain integration into the Swiss labor market, difficulties encountered while seeking work, or reasons for staying other than employment.

3 Data and Methods

3.1 Data Sources

The study-to-work transition focuses on international master's students. The analysis relies on data from the Swiss Federal Statistical Office (FSO). The Swiss graduate survey is conducted biennially with (Swiss and international) students graduating from Swiss universities. All graduates are asked to fill out the survey one year after graduation. The survey includes particularly detailed information about studies and transitions to the labor market. Our analysis includes 3,542 international master's students who graduated in 2006, 2008, 2010, 2012, or 2014 and who still lived in Switzerland one year after graduation. We did not include the 2002 and 2004 graduate surveys in the analyses because of a low response rate among international students, who were difficult to reach since the survey was still conducted by post at the time. The survey was sent to all graduates; the response rate from 2006 to 2014 was between 53% and 60% and was slightly higher among international students. In order to correct for non-response biases, we used the weights estimated by the FSO in all descriptive analyses.

3.2 Methods

We used binomial logistic regression models to test our hypotheses on the integration of international graduates into the Swiss labor market. The dependent variable indicates whether or not international graduates are active on the labor market one year after graduation. The main independent variables are nationalities (9 categories), grades (5 categories), and a dichotomic variable indicating if the study field is STEM (science, technology, engineering, and math). The models also include gender and year of graduation as control variables. A first model, which includes all presented variables, was built to test (ceteris paribus) nationality, study performance, parenthood, and labor market hypotheses. A second model adds an interaction effect between nationalities and STEM fields in order to test the study field hypothesis. The nationalities have been clustered in nine categories according to their geopolitical situation during the period of analysis. The three largest neighboring EU countries—Germany, France, and Italy—are analyzed individually. The other member states (without Germany, France, and Italy) of the EU-17, as well as the EFTA states, benefitting from complete freedom of movement rights, are grouped as EU-17/EFTA.[7] The EU-8 and EU-2[8] nationals had only limited freedom of movement rights until 2012, therefore they are grouped with other countries situated on the European continent that are not part of the EU as European non-EU. Non-EU nationals who fall under the stricter regulations of the FNA are grouped by continent.

Some robustness checks have been performed. First, we tested differences between nationality groups. In particular, given the transitional phases of limited freedom of movement rights (contingents and priority rules) after accession to the EU, we tested differences between EU-8 and EU-2 nationals, who appeared to have similar access to the Swiss labor market as European non-EU. In fact, the categorization presented in the paper is of the highest quality according to the

[7] EU-17: Germany, Austria, Belgium, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, the United Kingdom, Sweden (EU-15), Cyprus, and Malta. EFTA: Iceland, Liechtenstein, and Norway.
[8] EU-8: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia.
EU-2: Bulgaria and Romania. Non-EU European countries: Russia, Turkey, Serbia, Ukraine, Albania, a.o.

Akaike Information Criteria (AIC). We also tested models with additional control variables, but these variables did not clarify our research questions. Regarding study fields, there are important differences in labor market integration—students in medicine, for example, have a very high degree of labor market integration, which is sector-specific. The control in the models for different study fields has little influence on the other independent variables. We therefore focus on the STEM sector, as students in these fields benefit from increased political attention and regulations formulated in their favor. Since STEM students are a consistent population with a generally high level of labor market integration, we decided to facilitate the interpretation by presenting a dichotomy only between STEM and non-STEM students. Second, we run several models including Swiss graduates. Taking the Swiss population into account has a dramatic influence on most of the independent variables presented. This means that the underlying factors explaining the labor market integration of graduates are not the same for Swiss and international students.

4 International Master's Graduates' Employment in Switzerland

Table 2 provides an overview of the characteristics—i.e. the variables used in modeling the transition to the labor market—of the master's graduates who filled out the survey and still lived in Switzerland one year after graduation.

According to national register data, 48% of international master's graduates in Switzerland in 2014 were German, French, or Italian, while only a third were from non-EU countries. China (3.4%) was the most prominent non-EU country of origin, followed by the United States (2.9%), Russia (2.0%), India (1.9%), and Turkey (1.5%) (ZEMIS, FSO 2015).

Table 2: Descriptive statistics of the sample, Swiss graduate survey 2006–2014

	Number	Percentage	Weighted percentage	Share of STEM
Cohort				
2006	249	7.0	7.7	33.1
2008	362	10.2	11.9	27.1
2010	636	18.0	18.7	31.3
2012	1115	31.5	29.1	30.2
2014	1180	33.3	32.5	33.8
Sex				
Women	1875	52.9	51.5	21.0
Men	1667	47.1	48.5	42.4
Age group				
24 or younger	516	14.6	14.2	50.5
25–29 years	2077	58.6	58.3	34.6
30–34 years	621	17.5	18.0	17.6
35–39 years	192	5.4	5.6	12.2
40 or older	136	3.8	3.9	5.6
Parent				
No	3190	90.1	89.9	32.9
Yes	352	9.9	10.1	17.8

Nationality				
Germany	860	24.3	23.1	31.4
France	341	9.6	10.1	37.9
Italy	241	6.8	6.8	29.0
EU-17 & EFTA	437	12.3	12.3	36.4
European non-EU	682	19.3	19.3	22.5
Africa	227	6.4	7.1	29.7
North America	106	3.0	2.9	33.7
Latin America	260	7.3	7.7	24.8
Asia & Oceania	388	11.0	10.7	42.4
Grade				
4 to 4.5	87	2.5	2.7	12.5
4.5 to 5	649	18.3	19.0	21.4
5 to 5.5	1392	39.3	38.9	34.4
5.5 to 6	1096	30.9	30.0	39.4
missing	318	9.0	9.4	19.3
Study field				
Human and social sciences	807	22.8	22.8	0.0
Economic sciences	549	15.5	17.2	0.0
Law	151	4.3	4.8	0.0
Exact and natural sciences	716	20.2	18.0	98.1
Medicine and pharmacy	100	2.8	3.0	0.0
Technical sciences	524	14.8	13.8	100.0
Interdisciplinary and other	89	2.5	2.7	0.0
Applied universities	606	17.1	17.7	0.0
Total	**3542**	**100.0**	**100.0**	**34.6**

Source: Swiss Graduate Survey 2006–2014 (FSO)

4.1 Employment Rates of International Graduates

Altogether, the employment share of international graduates in Switzerland one year after graduation is 83%, which is very high. Germans have an outstandingly high employment rate of 93%, which is higher than that of Swiss graduates (90%). Thereafter follow French (88%), EU-17 and EFTA nationals (86%), and Italians (85%). Non-EU nationals have overall lower employment rates, with the exception of North Americans (85%). Further behind are Latin Americans (79%), European non-EU nationals (77%), Asians and Oceanians (73%), and Africans (66%).

We ran multivariate regression models in order to know which group enjoys the greatest access to employment: graduates with the best final grades, those with better legal conditions due to their nationalities, those who are in demand in the labor market, or STEM graduates from third countries. The first model expresses, ceteris paribus, the effect of all international graduate characteristics (see section 3.2 regarding methods) on labor market integration. Model 2 includes the same variables as Model 1 but also takes into account the interaction between STEM status and nationality. Finally, Model 3 is similar to Model 1 but reflects the effects for Swiss graduates instead of international students. The results are presented in Table 3.

Table 3: Binomial logistic regressions of labor market integration international master's graduates

	Model 1			Model 2			Model Swiss		
	coef.	**(SE)**	**sig.**	**coef.**	**(SE)**	**sig.**	**coef.**	**(SE)**	**sig.**
Intercept	**3.13**	**(0.42)**	***	**2.63**	**(0.45)**	***	**1.51**	**(0.16)**	***
Nationality (ref. Germany)									
France	-0.44	(0.22)		0.07	(0.4)				
Italy	-0.65	(0.23)	**	-0.06	(0.48)				
EU-17 & EFTA	-0.71	(0.19)	***	0.55	(0.43)				
European non-EU	-1.13	(0.16)	***	-0.31	(0.34)				
Africa	-1.72	(0.21)	***	-1.27	(0.36)	***			
North America	-0.74	(0.31)	*	-0.84	(0.48)				
Latin America	-1.08	(0.21)	***	-1.20	(0.37)	**			
Asia & Oceania	-1.52	(0.18)	***	-0.76	(0.31)	*			
STEM (ref. STEM)									
not STEM	-0.62	(0.12)	***	0.10	(0.28)		0.02	(0.05)	
Grade (ref. 4 to 4.5)									
4.5 to 5	-0.04	(0.28)		-0.04	(0.28)		0.14	(0.12)	
5 to 5.5	0.25	(0.27)		0.24	(0.27)		0.42	(0.11)	***
5.5 to 6	0.02	(0.28)		0.01	(0.28)		0.55	(0.12)	***
missing	-0.42	(0.3)		-0.43	(0.3)		0.38	(0.13)	**
Sex (ref. female)									
male	0.17	(0.1)		0.16	(0.1)		0.03	(0.04)	
Cohort (ref. 2006)									
2008	-0.19	(0.25)		-0.20	(0.25)		-0.03	(0.06)	
2010	-0.18	(0.22)		-0.19	(0.23)		0.21	(0.06)	***
2012	-0.27	(0.21)		-0.28	(0.21)		0.24	(0.06)	***
2014	-0.41	(0.21)		-0.43	(0.21)	*	0.23	(0.06)	***
Parenthood (ref. no)									
yes	-0.51	(0.14)	***	-0.51	(0.15)	***	-0.45	(0.08)	***
Age group (ref. 24 or less)									
25–29 years	-0.10	(0.27)		-0.07	(0.27)			(0.14)	
30–34 years	-0.20	(0.24)		-0.19	(0.24)		0.18	(0.12)	
35–39 years	0.12	(0.23)		0.12	(0.23)		0.22	(0.11)	*
40 or more	-0.07	(0.26)		-0.09	(0.27)		-0.09	(0.12)	
Interaction Nationality x not STEM									
France x not STEM				-0.69	(0.48)				
Italy x not STEM				-0.80	(0.55)				
EU-17 & EFTA x not STEM				-1.65	(0.48)	***			
European non-EU x not STEM				-1.08	(0.39)	**			
Africa x not STEM				-0.62	(0.43)				
North America x not STEM				0.25	(0.62)				
Latin America x not STEM				0.13	(0.44)				
Asia & Oceania x not STEM				-1.10	(0.38)	**			
Observations	3542			3542			28459		
AIC	2983			2973					

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Sources: Swiss Graduate Survey 2006–2014, SFO

Model 1 shows that final grades have no significant effect on the employment rates of international graduates. This means that among international students there are no differences in employment rates between those who received the best grades and those who only had sufficient results. This surprising result does not apply to Swiss graduates (Model 3) for whom good grades offer better chances of employment after graduation. In contrast, we observe important differences by nationality. In a multivariate analysis of labor market integration, compared to the Germans—whom we use as a reference category—the other EU nationals (odds between 1.6 and 2.0 times less than Germans) and North Americans (odds 2.1 times less than Germans) have lower employment rates but competed far better than the rest of the other non-EU nationals. Non-EU international students have slightly lower rates of employment in Switzerland one year after graduation; this is clearly the case for Africans (whose odds of finding a job are 5.6 times lower than for Germans).

Furthermore, graduating with a STEM degree is significantly and positively associated with better access to the Swiss labor market (odds ratio of 1.9) although this association loses effect for Swiss nationals (Model 3). On the contrary, being a parent strongly diminishes the odds of being active in the labor market (odds ratio of 0.60). Among the other control variables, we observe that men are better integrated into the labor market than women (odds ratio of 1.2) and that no significant differences can be found by cohorts of graduating classes, nor by age group.

In order to test the fifth hypothesis, and assess the differentiated effect of STEM by nationality group, we run Model 2 with an interaction effect between these two variables. As labor market integration of STEM students actually differs by nationality groups, the effects of these interactions are commented on in the following lines and in Figure 1, which synthesizes the predicted probabilities of labor market integration according to STEM and nationality for a selected profile.[9]

First, looking at the labor market integration of STEM graduates, there are no significant differences between German and other EU STEM graduates, meaning that being European and having a STEM degree offers the best chances for employment. Among non-EU STEM graduates, employment rates are lower compared to German STEM graduates, but the coefficients are only significantly lower for Latin Americans, Asians and Oceanians, and Africans. For example, an African STEM graduate has 3.6 lower odds of employment than a German STEM graduate, all other factors being equal.

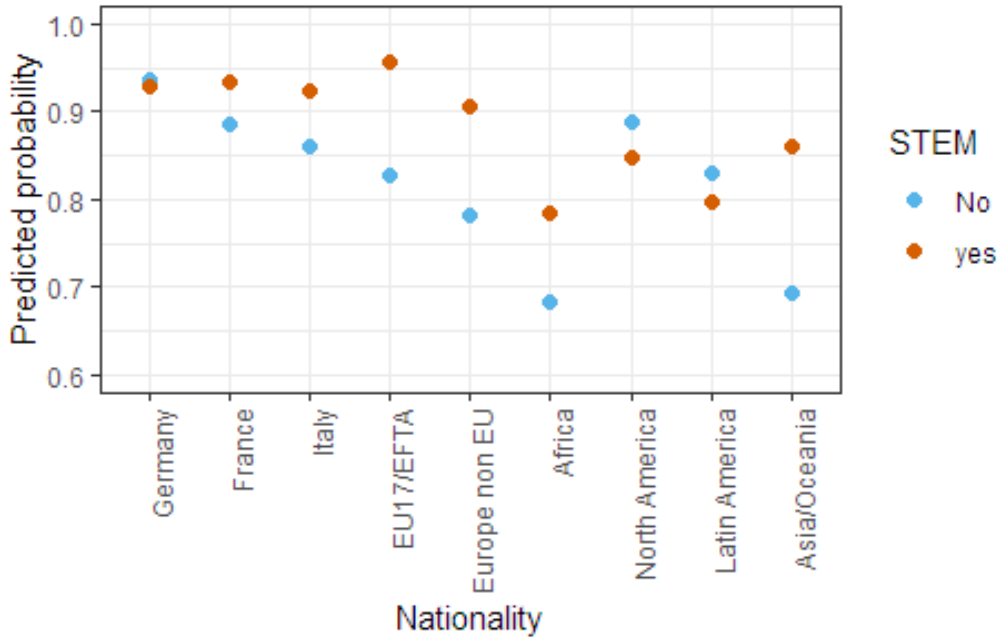
Second, there are no significant differences (coefficient = 0.10) in employment rates among Germans who have STEM and non-STEM degrees: German non-STEM graduates have an equal level of labor market integration as German STEM graduates.

Third, looking at the interaction effects for all other groups, i.e. understanding to what extent the effect of not having a STEM degree differs by nationality from Germans, significant values can be observed among EU-17, non-EU European, and Asian nationals (see also the gaps between the red and the blue points of Figure 1). This means that non-STEM EU-17, non-EU European, and Asian and Oceanian nationals have significantly lower employment rates than their STEM compatriots (odds ratios between 2.7 and 4.7). Although the interaction effects of France, Italy, and Africa are high (coefficients between -0.62 and -0.80), they do not significantly differ from Germany,

[9] Modal category of each variable: A woman aged 26 to 30 from the 2014 cohort, having no child and final grade between 5 and 5.5.

probably because of the low sample size in these groups. For North and Latin Americans, the interaction effects are not significant, and the coefficients are small and even positive. As a concluding remark, we can see that this interaction has minor effects on the other dependent variables.

Figure 1: Predicted probabilities of having a job among international master's graduates by nationality and STEM status (for women aged 26 to 30 from the 2014 cohort, having no children and a final grade between 5 and 5.5)



Sources: Swiss Graduate Survey 2006–2014, SFO

4.2 Difficulties Encountered while Job-Seeking

The previous section showed significant heterogeneity in labor market integration among international graduates. These differences are now put into context with difficulties encountered while looking for a job.

Besides the 83% of graduates who were employed one year after graduation, 12% were not employed, and 5% were seeking a job. We observe that Africans (22%), as well as European non-EU and Asian graduates (both 12%), had high shares of graduates seeking employment. Given this observation, we complemented additional descriptive analyses on whether or not they encountered problems while seeking employment, and what were the reasons.

Altogether, 30% of all graduates in Switzerland reported difficulties finding work (Table 4). Among the international graduates, the Germans reported the fewest difficulties (25%), even fewer than Swiss graduates (28%). French graduates (29%) reported difficulties below the average and Italians (40%) above the average. With the exception of North Americans (38%), in general, non-EU graduates encountered more difficulties: Asia and Oceania (47%), European non-EU (49%), Africa (58%).

Table 4: Difficulties encountered while looking for a job, weighted percentages by nationalities

	Yes	No	Did not look for a job	N
Germany	25	73	2	860
France	29	65	5	341
Italy	40	55	5	241
EU-17 and EFTA	32	62	5	437
European non-EU	49	44	7	682
Africa	58	34	8	227
North America	38	55	7	106
Latin America	44	44	12	260
Asia and Oceania	47	41	12	388
Total	**53**	**40**	**7**	**3542**

Sources: Swiss Graduate Survey 2006–2014

Table 5 shows that the most frequently reported reason for problems encountered while seeking a job was related to nationality. This is most strongly expressed by African, Asian, and Oceanian (85%), Latin American (83%), and European non-EU (79%) graduates. The second most frequent reason was the current economic situation, most often indicated by Italian (55%) and French (52%) graduates. The third reason indicated was the chosen field of study, mentioned relatively often by Asian and Oceanian (34%) and North American (30%) graduates. Last, the need to reconcile family and career was mentioned as an impediment to job-seeking by 12% of German and 8% of European non-EU graduates.

Table 5: Reasons for difficulties encountered while looking for a job, weighted percentages by nationalities among those who reported difficulties

	Nationality	Economic situation	Study field	Family and career	N
Germany	41	30	15	12	220
France	34	52	19	6	100
Italy	43	55	29	5	92
EU-17 and EFTA	44	39	21	5	138
European non-EU	79	34	29	8	337
Africa	85	37	24	1	131
North America	69	49	30	2	41
Latin America	83	34	29	5	117
Asia and Oceania	85	31	34	5	181
Total	**63**	**40**	**26**	**5**	**1357**

Note: Respondents could choose more than one item for explaining their difficulties finding employment

Sources: Swiss Graduate Survey 2006–2014, SFO

5 Discussion

When we combined the results from the regression analysis with the responses on difficulties experienced while job-seeking, we found a relatively good labor market integration of international students compared to other countries, but we also observe that some of the nationality groups that stay and seek employment in Switzerland one year after graduation encountered several problems. In this section, we discuss the result of our testing of the five hypotheses related to the overall research question: *Which selective dynamic predominates the employment outcomes of international master's graduates?*

The employment rates based on data from the graduate survey provide a more complete picture of which international graduates are employed in Switzerland one year after graduation and gives an idea of the selectivity dynamic. Still, we are limited in our interpretation, as we cannot identify the reasons why other graduates left. They either sought and found employment elsewhere, were recruited or attracted by better conditions in another country or back home, or left because they did not find employment, felt discriminated against, or simply did not intend to stay. Especially for third-country nationals, obtaining a permit for employment or another reason (e.g. marriage or family reunification) after graduation is crucial, as without one they must leave the country. In the case of relatively low employment rates, we further complement the analysis with the responses on impediments to job-seeking, as this provides further explanation as to whether these problems are related to nationality—and therefore to the legal migration framework—or to the study field and profile on the labor market. With the five hypotheses, we discuss the employment of international master's students in Switzerland one year after graduation.

5.1 Final Grades

Differences in employment rates are not explained by the final grades of the international graduates

We reject the hypothesis of study performance. There is no evidence showing that international graduates with higher final grades also have higher rates of employment. Even though Swiss national strategies for innovation (SBFI 2016), as well as Swiss higher education and research institutions, aim to retain the "best and brightest", final grades are not a factor that can explain Swiss labor market integration of international graduates. It seems that other factors play more significant roles in determining employment.

5.2 Parenthood

Differences in employment rates are partially explained by whether or not international graduates are also parents

We confirm the hypothesis of parenthood. There is evidence for lower employment of international graduates that have children, but this effect is also observed for Swiss graduates. From a life course perspective, both Swiss and international graduates are of the age for family building and important career decisions. International graduates, however, have in general less support in terms of childcare from their families. Furthermore, employment is delayed due to maternity leave and family duties one year after graduation.

5.3 Nationality

Differences in employment rates are explained by the legal framework providing EU nationals better access to the labor market than non-EU national graduates

We confirm the hypothesis of nationality. In general, even when controlling for confounding effects, we observe that EU nationals are positively related to higher employment compared to non-EU nationals. As expected, all EU nationals had relatively high employment rates (85%–93%). EU and EFTA nationals not only have better legal conditions for staying in Switzerland, but they also benefit from the priority rule of the labor market, and so are employed to a greater extent than non-EU nationals.

Surprisingly, German graduates' employment rates were even higher than those of Swiss graduates and their stay rates were above the average. French, Italian, and EU-17 graduates also performed well in labor market integration but had stay rates below the average. This difference between Germans and other EU nationals can partly be explained by the greater size of the labor market in German-speaking Switzerland. French and Italian speakers also have an advantage due to common national languages, but these labor markets are smaller than in the German-speaking regions.

Among non-EU nationals, North Americans had strong results similar to EU-17 and EFTA nationals. At the same time, North Americans had the lowest stay rates, meaning that the few who stayed were employed to a very high extent. Compared to other non-EU graduates, North Americans reported relatively few difficulties experienced while job-seeking and, if they did, these were mostly related to their study field and the economic situation.

With regard to employment rates, European non-EU nationals from countries like Russia, Turkey, Serbia, Ukraine, Albania, Croatia, and Macedonia rank between EU and non-EU nationals. This result corresponds to their partial rights to freedom of movement during the transition period. Interestingly, European non-EU nationals had the highest stay rates of all national groups even though their legal opportunities were restricted. Very high stay rates, combined with relatively low employment rates and more difficulties encountered due to nationality, imply that in many cases European non-EU graduates obtained permits unrelated to employment. Possible explanations include the geographical proximity of these countries, strong national diaspora and social networks in Switzerland, and binational marriages or marriages with a foreign person residing in Switzerland.

Further behind are Latin American, Asian and Oceanian, and African graduates, who have lower employment rates and relatively lower stay rates. With the exception of North Americans, non-EU graduates reported relatively more problems in job-seeking due to their nationalities. Other problems encountered while job-seeking—that were not directly related to the legal framework—can also reflect perceived or real discrimination in the Swiss labor market. Furthermore, the economic situation was mostly reported by French and Italian graduates. The formulation of the survey question is not country-specific, so we do not know whether this refers to the economic situation in their home country or in Switzerland. Given that the economic crisis in 2008 affected France and Italy more strongly than Switzerland, we assume that they refer to the economic situation of the home country. Also, we do not find significant negative cohort effects on employment rates after 2008. Furthermore, we observe that, compared to EU graduates, non-EU graduates more often replied that they were not looking for a job one year after graduation. These

shares were elevated for Latin American and Asian and Oceanian graduates. Independent of nationality, considerations of how to reconcile family and career for graduates who have children can be a great challenge and a reason for not seeking or finding adequate employment, and underline our results we found related to parenthood.

5.4 STEM Qualification

Differences in employment rates are partially explained by the strong demand for STEM graduates in the labor market.

We confirm the hypothesis of labor market demand for STEM qualifications. Graduating with a STEM degree is significantly and strongly related to higher employment rates. All other factors being equal, studying in a STEM field opens the doors for employment after graduation. STEM graduates are in demand on the labor market and are recruited by Swiss employers.

5.5 Nationality and STEM Qualification

Among non-EU graduates, the differences in employment rates are only to a limited extent explained by employment in STEM fields.

We reject the hypothesis of third-country nationals with STEM qualifications. Considering the interaction effects, the results provide a mixed picture of the effect of having a STEM degree for different nationality groups. In general, the greater the geographical distance from Switzerland, the larger the gap between STEM and non-STEM graduates. Yet, there are some exceptions. For German graduates, for example, there are no differences in labor market integration between STEM and non-STEM graduates, as both groups of German international graduates have very high labor market integration. Italian and French non-STEM graduates, however, encounter more difficulties than their STEM fellows. In the case of EU-17, European non-EU, and Asian and Oceanian graduates, there is a gap in the employment rate between STEM and non-STEM graduates—non-STEM graduates encounter more difficulties in job-seeking, but it is predicted that STEM graduates will have the same high probabilities as German STEM graduates. African graduates have a particularly low level of labor market integration for both STEM and non-STEM graduates. Hence, since stay rates among Africans are above average, other types of residence permits (e.g. marriage, family reunification, further studies) determine their ability to stay. Even though having a STEM degree improves the chances of being employed after graduation in general, we do not find a significant interaction effect on North Americans and Latin Americans, meaning that having a STEM degree does not predominantly explain their relatively high levels of successful labor market integration.

6 Conclusion

Switzerland accesses a pool of variously skilled students upon their graduation from Swiss universities. Swiss employers recruit European and non-European graduates, but the priority rule and facilitated mobility for EU nationals result in higher employment rates for EU graduates. Studying in a STEM field enhances the chances of employment in Switzerland but, due to the exceptions of the priority rule, this effect is not as strong as we expected for all non-EU nationals. In general, European non-EU and Asian and Oceanian STEM graduates are employed to a significantly higher degree than their non-STEM fellows.

6.1 International Students' Transition from Studies to Employment

EU and EFTA national graduates access the Swiss labor market through the pathway of bilateral agreements, which accompanies measures for securing wages and working conditions but does not limit the number of migrants. These graduates benefit from entry and employment rights in the host country through treaties negotiated between Switzerland and the EU that apply to all occupational fields. Therefore, the selection criteria for employment are not limited by migration policies but are mostly shaped by labor market demand and the entrepreneurial environment.

Non-EU national graduates found employment, in most instances, through permanent skilled migration or temporary labor migration pathways, both of which are regulated by the FNA and related to regulations on the entry and admission of migrants. Due to the priority rule, recruiting graduates through these pathways disadvantages non-EU nationals compared to EU and EFTA nationals and creates additional bureaucratic procedures for employers. These additional administrative requirements reduce the incentives to recruit third-country nationals. Nonetheless, due to a need for skilled workers, non-EU STEM graduates were also recruited where the demand met the workforce offered by third-country nationals.

Alternatively, temporary labor migration (short-term contracts) is another possible pathway to employment, especially in the case of graduates who apply for trainee or internship programs. Whether or not employers undertake the additional administrative efforts required to recruit third-country graduates for a short time is unknown to us but less likely. Thus, mostly for EU nationals, a short-term contract may be a useful opportunity to gain work experience abroad before moving on.

The study-migration pathway could be an opportunity to make use of the priority exception rule and the six-month job-seeking permit. The introduction of this pathway in 2011 did, however, not show a significant effect, as we cannot identify any cohort effect in employment after 2011, nor can we observe that third-country nationals are predominately employed in STEM fields (with the exception of European non-EU and Asian and Oceanian graduates).

6.2 Competing Interests and the Effectiveness of Migration Policies

As with most nation-states, Switzerland uses immigration, integration, and naturalization policies to admit and regulate migrants' conditional access to residence and citizenship status. In general, Switzerland does not foresee a subsequent stay of third-country nationals upon graduation. Case-by-case control of access to the labor market and residence permits serves the interests and concerns of

the nation-state to protect national identity and social cohesion, as well as to guarantee national security and public order. Since the enactment of agreements between Switzerland and the EU in 2002 gave EU nationals the same employment rights and benefits as Swiss nationals, accompanying measurements were put in place to fight wage and social dumping. With these restrictions, including limited economic and social rights, Switzerland aims to prevent undesired distribution effects that could be damaging to Swiss residents, especially low-skilled workers. The FNA is designed so that the admission of third-country nationals should be in the interests of the economy as a whole. According to international law, Switzerland is also required to admit foreign nationals on humanitarian grounds, such as the unity of the family (FNA). Considering the limitations and considerable leeway of the implementation of these regulations, Swiss migration policies predominately reflect interests of economic efficiency in admitting mostly highly skilled migrants and those who are in demand on the labor market.

Our results show that overall, these policies enable the employment of a substantial share of international master's graduates who were recruited and integrated into the Swiss labor market, whereas STEM qualifications make up a considerable part of all study field qualifications. A crucial point in the discussion is, however, the definition and interpretation of the selection criteria. The wording of the priority rule ("the economic interest of the economy as a whole"), as well as of the six-month permit and the exception rule ("if their work is of high academic or economic interest") describes these selections with economic or academic criteria. Focusing on STEM graduates is only one of many possibilities for differentiating and testing how these selection criteria are implemented by the authorities, and it is justified by the discourse on the high demand for STEM graduates. Similar results could, however, be expected for graduates in the field of medicine, as an example.

As a global leader in innovation, economic stability, high salary levels, and other favorable conditions, Switzerland is attractive to researchers, innovators, and other highly skilled workers. However, other countries have similarly high standards and even larger research infrastructures, and many of them offer better legal conditions (e.g. facilitated transition to a permanent residence permit, more rights for family members of employees, more time allowed for job-seeking, easier integration into the labor market). If Switzerland aims to increase its economic competitiveness by continuing or increasing the recruitment of specialized and talented highly skilled workers among international graduates, the following adaptations could be considered: 1) change the conditions of permanent skilled migration, 2) change the conditions of temporary labor migration, 3) conclude additional bilateral or multilateral agreements, or 4) adapt the study-migration pathway.

The first two options are regulated by the FNA, and the selection criteria could either be less strict—so that more third-country graduates would be encouraged to stay and seek a job—or the admission criteria could be stricter or more selective but include more rights for those who are admitted. With these measures, graduates could be more or less precisely targeted for recruitment in Switzerland. However, we have to be aware that if a graduate wants to stay in Switzerland, circumventing the employment-related selection criteria is possible through marriage or adding more years of study. It can therefore be assumed that given a stricter and more selective legal framework, more graduates would make use of these alternative pathways instead of attempting to fulfill the legal conditions of employment. However, adapting the study-work pathway could have a direct impact on international graduates' opportunities for employment. Even with more relaxed regulations, the demands of the labor market and the available employment opportunities would to a great extent decide which graduates successfully integrate into the Swiss labor market.

Besides reformulating the selection criteria, other non-legal measures could be of great potential, such as better provision of information on legal opportunities—especially the six-month permit and the exception rule—as well as information for employers (large, small, and medium-sized enterprises) on how to manage the bureaucratic requirements for hiring third-country graduates. Such improvements could foster the retention of STEM and other graduates who can contribute to the Swiss labor market. Furthermore, in order to encourage graduate retention, Switzerland could provide a more streamlined study-to-work pathway, better access to information (e.g. dedicated website for graduates seeking employment), career coaching, and even a symbolic welcome upon arrival—rather than having to sign a document stating that one must leave immediately upon completion of their studies, as in some cases still is the practice. Last but not least, affordable and accessible childcare would be a crucial incentive for job-seeking graduates with young children.

6.3 Outlook for Future Research

Our results contribute to the discussion of trade-offs between security, national identity, social cohesion, and the interests of economic efficiency with regard to retaining international graduates. Labor market opportunities and demand-driven decisions are shaped by the legal frameworks provided by national regulations, but also very concretely by an employer's readiness to undertake the administrative efforts required in order to hire third country nationals. From a Swiss labor market perspective, more research should be done to better understand whether and how the current legal framework restricts employers from recruiting third-country national graduates, and whether there is a possibility to facilitate employment practices by implementing study-to-work transition policies. Finally, a complementary analysis of international graduates' mobility intentions using qualitative interviews would deepen the understanding of their employment situation in Switzerland as well as other personal reasons on an individual basis.

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