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**Conference Paper**

## Job Changes and Interregional Migration of Graduates

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel - Session: Youth Labor Markets, No. G15-V3

**Provided in Cooperation with:**

Verein für Socialpolitik / German Economic Association

*Suggested Citation:* Haußen, Tina; Haussen, Tina (2016) : Job Changes and Interregional Migration of Graduates, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel - Session: Youth Labor Markets, No. G15-V3, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

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# Job Changes and Interregional Migration of Graduates

February 26, 2016

## **Abstract**

We empirically analyze job changes and related location choices for graduates in Germany and its determinants. Using a longitudinal, representative survey-based dataset, we not only observe the transition of graduates to the labor market but also every subsequent job change within five years after graduation. Contrary to what is often assumed in the literature, our findings show that around 75% of the graduates have more than one job within our observation period and for a non-negligible share of them, job changes are related to interregional migration. Whereas job changes mostly depend on the field of study and previous employment conditions, migration is predominantly affected by previous migration paths and regional characteristics.

JEL-Classification: J61, J62, R11, I23, H72

Keywords: job changes, interregional migration, graduates, longitudinal graduate survey

## 1 Introduction

In recent decades, migration of high-skilled has notably increased (see, e.g., Docquier and Marfouk 2005 for international evidence). From a global perspective, this development is positive as a more mobile high-skilled workforce leads to a more efficient allocation of labor across regions and countries and allows for better adjustments to economic change (Borjas et al. 1997). From the regional or national perspective, however, the effects are less clear. In particular, whether the investment in higher education pays out depends on graduate mobility. If more graduates in a region lead to more human capital there, this can be expected to foster economic growth and innovative performance (see, e.g., Audretsch et al. 2005, Baptista and Mendonça 2010, Fritsch and Aamoucke 2013) and to lead to higher tax revenues (Gérard and Uebelmesser 2014). But there is considerable theoretical and empirical evidence that the individual propensity to migrate is positively correlated with human capital endowment (Coulombe and Tremblay 2009), e.g. because high skilled can transfer their human capital to other regions or countries and can adapt to new job environments more easily (Giannetti 2003, Fratesi 2014). From the regions' point of view, detailed knowledge about both the extent and timing of graduate migration but also its determinants is thus essential.

For this reason, a large body of empirical literature has analyzed the geographic distribution and the determinants of graduates' location choice. Yet, most of the empirical evidence is based on location choice at labor market entry only. Faggian et al. (2007a) and Faggian and McCann (2009) analyze the migration behavior of UK students from high school to university and from university to first employment. Their findings suggest that most of the British graduates are highly mobile at both stages even on the NUTS 1 level. Most importantly, they confirm the results of DaVanzo (1976) that individual migration experience is positively related to subsequent migration at labor market entry. Krabel and Flöther (2012) confirm this finding for German graduates. They find that 61% of graduates leave the university region for their first employment and 38% are even mobile on the NUTS 1 level. With respect to individual socio-economic characteristics, Krabel and Flöther (2012) find that, when using personal networks for job search, graduates are more likely to stay in the university region. Migration is also less likely to occur with strong family ties and children (Clark and Cosgrove 1991, Busch and Weigert 2010). In an analysis of the federal state of Bavaria, Falk and Kratz (2009) provide evidence that on average 75% of Bavarian graduates have their first employment in Bavaria. This, however, differs strongly across fields of study. Whereas only 10% of graduates in machine and electrical engineering leave Bavaria for work reasons, this is true for more than one third of graduates in business administration.

There is additional strong evidence that graduates' migration decision is closely linked to regional characteristics. Using micro data on Dutch college and university graduates, Venhorst et al. (2011) find that graduates migrate to regions with relatively strong economic growth and low unemployment rates. Distinguishing three different migrant types of Italian graduates, Marinelli (2013) confirms selective

migration patterns, in particular that weaker graduates are more likely to either stay in economically poorer regions or to return there. The strongest graduates, on the contrary, more likely have their first employment in highly innovative regions. Further, Buenstorf et al. (2016) find that German graduates are attracted by regions with favorable economic characteristics (e.g. high employment opportunities and wage levels) and a high degree of urbanity but similar cultural characteristics compared with their home region. More than half of the graduates in their sample either start to work in the university region or in their home region.

Studies which focus on graduates' first employment to analyze migration patterns and their determinants often assume that graduates no longer migrate after having their first job.<sup>1</sup> There is however some evidence that subsequent job changes imply also further migration. Making use of the annual household survey of the German Socio-Economic Panel, Busch and Weigert (2010) use information about individuals who graduated between 1984 and 2004 to analyze their mobility. Slightly more than 70% of the graduates in their sample stayed in the federal state where they studied. Applying a parametric hazard model, Busch and Weigert (2010) show that this holds in particular for those with a partner, children and a degree from a university of applied sciences ("Fachhochschule"). Haapanen and Tervo (2012) extend this approach by additionally considering hazard rates of migration before graduation for Finnish graduates between 1991 and 2003. In line with the results of Busch and Weigert (2010) they find that most of the graduates do not leave the university region within 10 years after graduation and that migration rates decrease with the years after graduation.

The purpose of this paper is to contribute to the existing literature on the determinants of graduate migration in two important dimensions: First, by using data from a representative and longitudinal graduate survey in Germany, we present in detail the work history of German graduates for the first five years after graduation. We find that roughly 75% of the graduates have more than one job after graduation and that for about half of them, job changes also imply interregional migration. Second, to our knowledge, we are the first who not only analyze the determinants of migration at labor market entry but also with respect to later job changes. We find that job changes mostly depend on the field of study and previous employment conditions, while related migration is predominantly affected by previous migration paths and regional characteristics.

Knowledge about the determinants of graduate migration is crucial to policy makers in order to develop strategies on how to keep or attract the highly skilled (Venhorst et al. 2011) and to understand the potential need for policies that deal with the economic and fiscal consequences of high-skilled migration.

The remainder of the paper is structured as follows. In Section 2, we study job change behavior and migration patterns. In Section 3, the possible determinants of

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<sup>1</sup> Marinelli (2013) considers the employment three years after graduation. Haussen and Uebelmesser (2015) analyze the determinants of graduates belonging to specific migration groups five years after graduation.

graduate migration are discussed. The empirical strategy and our results are given in Sections 4 and 5. Section 6 concludes.

## 2 Job changes and migration of graduates in Germany

### 2.1 The data

We use data collected by the DZHW (‘Deutsches Zentrum für Hochschul- und Wissenschaftsforschung’, Grotheer et al. 2012) on students who graduated from higher education institutions in Germany in the academic year 2004/05. The graduate survey is representative and longitudinal consisting of two parts – one part in 2006 and one part at the end of the year 2010. For the first part of the survey, about one year after graduation, individuals are asked about their studies, their qualifications and competencies and about their transition from university to the labor market. Additionally, the survey provides information on socio-economic characteristics such as gender, age and marital status. Most important for the analysis here, we observe whether graduates migrated across regions for studying or for job reasons where regions refer to the federal states (NUTS 1). The focus of the second part of the survey five years after graduation is on the employment history of the graduates, in particular, the type, duration and sector of the occupation(s) as well as their location. From the latter information, we can derive the graduates’ migration patterns. 6,495 graduates took part in both parts of the survey whereby we can draw on information of 5,122.<sup>2</sup>

The graduate survey is well suited for our research purpose for several reasons. First, we can retroactively track each graduates’ study and employment history, in particular we can observe every job they had up to five years after graduation. Second, the dataset contains information about the location of the graduates at different stages of their life: when acquiring their university entrance certificate, when graduating, when having their first employment after graduation, and for every further employment within the first five years after graduation. Finally, the survey contains many questions capturing different individual, study-related and job-related aspects which can be used as control variables.

There are two potential drawbacks of the data. One concerns the aggregation level. Obtaining detailed information about each job comes at the cost of a higher level of geographic aggregation (NUTS 1) than in some other studies (see, e.g., Faggian and McCann 2009, Krabel and Flöther 2012). With this in mind, we interpret the observed migration as a lower bound of sub-national migration.<sup>3</sup> Yet, with respect to policy conclusions, the NUTS 1 level of aggregation is very suitable in our

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<sup>2</sup> Given the non-responses, the DZHW attributes sample weights to each graduate in the final dataset, such that the panel is representative for East and West Germany with respect to gender, degree and field of study. The analyses in this paper are performed using these sample weights.

<sup>3</sup> We further excluded a small share of graduates who either reported that they migrated abroad or who stated for their job location “Germany”. Likely, the latter ones are graduates who permanently work at different places, e.g. Germany-wide working business consultants.

context as due to the federal structure in Germany, some important responsibilities, e.g. related to the provision and financing of higher education and other areas of economic policy, are allocated at the sub-national level.

The other potential drawback refers to the observation period. Due to the five-year structure of the data, data about a more recent graduate cohort are not yet available. However, the graduate cohort of 2004/05 has one important advantage compared to newer cohorts: At the time of this cohort's studies, no tuition fees were charged. After an episode between 2006 and 2014 where some German federal states charged moderate fees, there are now once again no regular tuition fees in Germany. This allows drawing conclusions from the results of this analysis about graduate migration patterns also for today.

## 2.2 Migration between school, university and employment

In order to compare our results with previous empirical findings on graduate migration and to draw a more detailed picture of migration of German graduates, we first provide descriptive information about the graduates' transition from school to university and from university to the labor market. Considering all graduates in our sample who went to a German university, 30.2% of the graduates left the region in which they obtained their university entrance certificate ('school region') for studying. This translated into between 18% and 82% of out-of-region students in the university regions. Whether a region hosts a large share of students from other regions is an important variable as there is empirical evidence that the propensity to migrate is higher for those graduates who have migrated before (DaVanzo 1976, Faggian et al. 2007a). After finishing university, graduates typically enter the labor market.<sup>4</sup> On average, 35.5% of all graduates leave the university region for their first job<sup>5</sup>, whereas roughly 65% start to work in the university region. These descriptive findings are relatively similar to those found by Krabel and Flöther (2012) who observe that 38% of German graduates' in 2007 changed the region after graduation.

When taking a closer look at the subsequent location choices of the graduates in our sample, we find that the share of graduates who worked in the university region five years after graduation is roughly 5 percentage points lower than the respective share at labor market entry. Hence, more than 40% of all graduates in our sample had left the university region five years after graduation. The share of mobile graduates is even larger as some had moved away but later returned to the university region at some point in time during our observation period. The order of magnitude of the observed migration is comparable to the two studies which also consider migration after labor market entry. For Germans who graduated between 1984 and 2004, Busch and Weigert (2010) find that some years after graduation more

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<sup>4</sup> Here, we define first employment by the first regular job. Internships and casual jobs are ignored. In our sample, 50% of the graduates found their first job within two month after graduation, 90% within the first 11 month and 98% within five years after graduation.

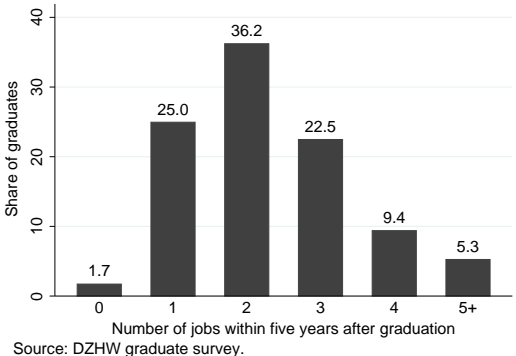
<sup>5</sup> On average 7.5% of all graduates move back to the school region.

than 70% still lived in the university region and that the likelihood to out-migrate to another region decreased with every year the graduate stayed there. Analyzing a considerably larger dataset on Finish graduates during a similar time period, Haapanen and Tervo (2012) confirm these results. Of those who graduated in Helsinki even 90% remained which can be attributed to the exceptional role of the Helsinki area for Finland.

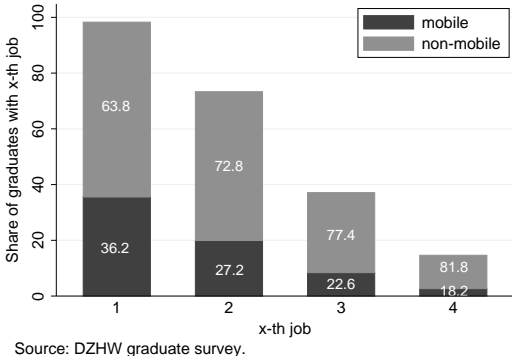
Focusing only on the first job after graduation but neglecting subsequent job changes may, thus, lead to an incomplete picture of graduate migration as it may well be that graduates choose a first (temporary) job in one region but move for subsequent jobs. In particular, it is important to know whether graduates have more than one job and whether job changes also mean interregional migration.

### 2.3 Job change frequency and the importance of interregional migration

The DZHW graduate survey allows us to observe the detailed study and work history of a graduate cohort, in particular the number of jobs and the migration pattern. Figure 1a illustrates the share of graduates with one or more jobs within the first five years after graduation. 25% only have one job. However, more than one third of all graduates have two jobs, while 23% have three jobs and 9% have four jobs. Less than 6% of graduates have five or more jobs. On average, graduates have 2.5 jobs within five years. Given these relative frequencies, for the following descriptive and regression-based analyses, we will concentrate on the first four jobs after graduation.



(a) Graduates by number of jobs



(b) Graduates by x-th job change

Figure 1: Job changes and related migration

In Figure 1b, the share of graduates with a x-th job change out of all graduates are displayed subdivided into those graduates who changed (“mobile”) or did not change (“non-mobile”) the region for this job change. For the first job 36.2% left the university region. However, among those graduates who have a second (third) job, about 27% (23%) moved to another region for this second (third) job. More

than 18% were still mobile for their fourth job. Although our descriptive statistics confirm the well-known result that the likelihood to migrate decreases over time (jobs), we find a significant share of mobile high-skilled also after labor market entry.

Using the information about the migration history, we can categorize each graduate according to the individual migration path. We do so up to the third job as we are only interested in graduates with up to four jobs and in the role of previous migration for subsequent migration. Our categorization follows Faggian and McCann (2009). Differently from them, however, we do not use the graduates' home region as the path's starting point but the university region given our focus on the university region's perspective.<sup>6</sup> We briefly introduce the categories for two job changes while those for three job changes are constructed in an analogous way. The different migration paths and the migration categories are displayed in Figure A.1 in the Appendix. Graduates are "University Stayers" if they had not left the university region within five years after graduation. Graduates who had left the university region but moved back to this region are labeled "Return migrants" while graduates who had left the university region and did not return are called "Job Stayers". Graduates are labeled "Late Migrants" if they only left the university region for the second job (but not for the first one). Finally, graduates who had changed regions more than once are categorized as "Repeat Migrants".

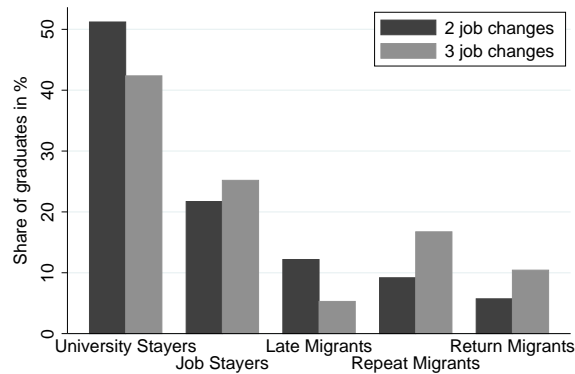
Figure 2 presents a summary of the different migration paths. It displays the shares of graduates belonging to one of the five migration categories. Dark grey bars illustrate the distribution of the five categories for two job changes and light grey bars do so for three job changes.<sup>7</sup> On average, we find that with two (three) job changes, 56% (52%) of the graduates are university stayers. Among those, who change at least once the region, 20% (23%) are job stayers, 11% (5%) are late migrants, 7% (9%) are repeat migrants and 6% (11%) are return migrants. Not too surprisingly, considering two instead of three job changes makes it more likely to observe interregional migration as evidence by the lower share of university stayers. Also the shares of return migrants and repeat migrants are higher. At the same time, there is also a larger share of those who started a new job in the same region (job stayer) and a smaller share of those who had not migrated for the previous job(s) but changed the region for this last job (late migrant).

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<sup>6</sup> Yet, we also control for pre-university migration in our regression analysis.

<sup>7</sup> The observed individuals can have more than these two or three job changes.





Source: DZHW graduate survey.

Figure 2: Graduates by migration categories

Summing up, several regularities can be observed: First, a considerable share of graduates has migrated between regions at any time between end of school and five years after graduation. Second, when focusing on labor entry and subsequent job changes, the majority of graduates has more than one job within the first five years after graduation with a substantial number of job changes involving interregional migration. Whereas a significant share of graduates leaves the university region for employment reasons we also observe a non-negligible share of graduates staying or returning to the university region at some point in time within five years. In the following, we will analyze the determinants of job changes and associated migration patterns in more detail.

### 3 Determinants of job changes and related migration

When analyzing migration paths of graduates, it is important to take into account that sub-national migration for the first job and potential further jobs can only be observed conditional on labor market entry and further job changes, respectively. Consequently, one of our groups of dependent variables consists of dummy variables capturing labor market entry and subsequent job changes while the other group consists of dummy variables indicating whether the respective job change also meant change of the region.

As the main independent variables and further control variables, we choose those which have been shown to determine labor market participation and/or migration such as socio-economic, study- and work-related characteristics but also (economic) characteristics of the university region or the region of employment and previous migration experience. Summary statistics of all variables used in the empirical analysis are given in Table A.1.

*Migration experience:* There is evidence in the economic literature that the propensity to migrate is higher for those individuals who have migrated before (see, e.g., DaVanzo 1976, Faggian and McCann 2009). In order to test this, we control for

whether graduates migrated for their studies or went abroad during their studies. We further control for any previous job-related migration. In particular for the analysis of migration for the third and fourth job, we include our five migration categories (cf. Section 2.3 and Figure A.1 in the Appendix). Moreover, we include a dummy for whether the region of previous employment equaled the school region. Being employed in the school region may lower the likelihood to migrate due to stronger ties to this region.

*Study characteristics:* With the qualification level being positively related to productivity (Becker 1964, Mincer 1974), the recruitment decision can be expected to depend positively on the job candidate’s qualification, which the graduate mainly signals to potential employers with the final exam grade. The expected effect of the exam grade on the migration decision is, however, ambiguous. Below-average graduates may need to search longer for a job and may need to migrate; analogously, above-average graduates may be able to realize their potential better elsewhere (Falk and Kratz 2009).

As to the German system of higher education, we distinguish between universities and universities of applied sciences (“Fachhochschulen”). Generally spoken, universities are more theoretically oriented whereas universities of applied sciences are more oriented towards the practical use of theoretical knowledge and maintain closer contact with the (regional) labor market (Jaeger and Kopper 2014). We would, therefore, expect graduates from universities of applied sciences to find a first job more easily but to be relatively less mobile than university graduates (Falk and Kratz 2009). Additionally, we control for a teachers’ exam as teachers are required to complete an internship as part of their education. We expect that this labor market contact at an early stage makes them particularly attached to internship region, which often is the university region, also in the longer run.

Given the possibly geographically differing relative demand and supply for different qualifications, we also take the fields of study into account. A low relative demand may make employment more difficult and therefore migration more likely than a high demand. Following the argumentation of Falk and Kratz (2009) and Krabel and Flöther (2012), we expect this especially to apply to graduates without a clear job-related specialization such as those with a degree in humanities and social sciences.

*Regional characteristics:* The German NUTS 1 regions differ in their economic conditions. This very likely affects both job availability and the migration of graduates. To control for this, we include several regional characteristics which we obtain from the German Federal Statistical Office for the university region when analyzing labor market entry and for the region of previous employment when analyzing the subsequent job-change and migration decisions. First, we use GDP growth rate and unemployment rate. If individuals maximize expected income, one would expect out-migration from regions with less favorable economic conditions, i.e. lower growth rate and a higher unemployment rate. To capture the structure of the labor market, we, second, include the share of large firms (> 250 employees)

among all large firms in Germany. The positive link between firm size and wages has often been shown in the economic literature (see, e.g., Troske 1999, Gibson and Stillman 2009). Third, we control for the share of the population living in cities with more than 100,000 inhabitants. This also serves to capture to some extent the three German city states Berlin, Hamburg and Bremen. Dense, urban regions are characterized by a large share of high-skilled workers because of positive sorting and the resulting higher average productivity. This, in turn, may make human capital accumulate more quickly in urban areas (see, e.g., Venables 2010, Glaeser and Resseger 2010).<sup>8</sup> For each graduate, we assign the regional characteristics of the year in which the graduate started to work in the respective job. Last, to capture possible (other) East-West differences, we moreover include a dummy for East German regions.

*Socio-economic characteristics:* We also control for individual characteristics such as gender, age, marital status, children and whether the graduate completed vocational training before studying. Especially with respect to gender, empirical results are mixed. Krabel and Flöther (2012) find that female graduates are significantly less likely to enter the labor market but equally likely to migrate for their first employment compared with male graduates. Faggian et al. (2007b), on the contrary, provide evidence that female graduates in the UK are significantly more likely to migrate both after finishing high school and after graduating from university. Further, we expect that having a partner or having children increases the costs, and therefore decreases the likelihood of moving while we have no clear prediction with respect to job changes. Also being older may be associated with stronger ties to the home region.

*Job characteristics:* Finally, job (search) characteristics are likely to affect the employment probability. With respect to labor market entry after graduation, we follow Krabel and Flöther (2012) and include whether a graduate already had connections to a company because of an internship or because the final thesis required for the university degree had been written in cooperation with a company. With respect to the determinants of having a second, third or fourth job, we control for the characteristics of the respective previous job. For each job we have information on whether the graduate was regularly or self-employed, part-time or full-time employed and whether he or she had a temporary or permanent contract.

## 4 Empirical strategy

Our primary goal is to analyze the determinants of the migration decision for the first job and subsequent jobs. However, we can only observe job-related migration conditional on job change, which itself is the outcome of a non-random selection process. The two stage Heckman selection model (Heckman 1979) presents the standard solution to account for sample selection. In the first stage selection

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<sup>8</sup> Due to multicollinearity, we cannot include a control for regions' population size.

equation of the standard model, a probit estimator is employed while in the second stage, the actual outcome is estimated by ordinary least squares. As in our case not only the employment but also the migration choice is binary, we apply the Van de Ven and Van Praag (1981) probit extension of the Heckman selection model.<sup>9</sup>

The first stage defines the observed graduates, that is those graduates who change their job. The selection equation can be written as

$$y_1^* = z'\gamma + \epsilon \quad \text{with } y_1 = \begin{cases} 1 & \text{if } y_1^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

where  $y_1^*$  is assumed to be the unobservable, latent dependent variable.  $y_1$  denotes the measured binary dependent variable of the first stage, i.e. whether the graduate changes job.  $z'$  represents a vector of independent variables in the first stage,  $\gamma$  is the vector of coefficients to be estimated and  $\epsilon_1$  gives the error term.

Only for those graduates who change jobs can the migration decision be analyzed. The second stage of the Heckman probit selection model can thus be written as

$$y_2^* = x'\beta + \nu \quad \text{with } y_2 = \begin{cases} 1 & \text{if } y_2^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

where  $y_2^*$  represents the second stage latent dependent variable and  $y_2$  the observed binary dependent variable, i.e. whether or not the graduate migrates.  $z'\beta$  denotes the vector of independent variables and respective coefficients and  $\nu$  specifies the second stage error term. In both stages, the errors are assumed to be standard normally distributed with  $\text{corr}(\epsilon, \nu) = \rho$  (Greene 2003). If  $\rho \neq 0$ , sample selection is present, for which the Heckman model control while a simple probit model without accounting for selection would yield biased results.

Choosing the independent variables for the selection and outcome estimation is not trivial as many of our control variables can be expected to affect both employment and migration choices. Still, there should not be perfect collinearity between the vectors  $z'$  and  $x'$  in order to improve the identification.<sup>10</sup> We include several instruments in the first stage regression which we consider good predictors of labor market entry and job changes, respectively. In the first regression when we consider the transition from university to the labor market, we use information on whether a graduate had connections to a company through an internship or the final thesis in the first stage. In the regressions with which we analyze subsequent job changes, we include job characteristics about the previous job in the first stage, such as whether a graduate was self-employed as well as full-time and permanently employed.

<sup>9</sup> We use the Stata command “heckprob” to estimate the model.

<sup>10</sup> According to Wooldridge (2003),  $x'$  must be a strict subset of  $z'$ .

## 5 Results

For the analysis of job changes and possible interregional migration, we present results of probit estimates correcting for possible selection. Average marginal effects (AME) are displayed in Tables 1 and 2. The numbers of observations in each model reflect those in Figure 1b (with 100% corresponding to 5,122). The censored observations reflect those graduates who did not change the job and for whom the migration decision could not be observed. Note that from one model to the next model, we lose a few observations in addition due to missing answers to some of our control variables.<sup>11</sup>

Before interpreting our regression results, we have a closer look at the test statistics of the probit model. With respect to the full models, the Wald tests are highly significant. We can thus reject the null-hypothesis that all coefficients jointly equal zero. We moreover apply a Wald test to see whether the correlation coefficient  $\rho$  of the error terms significantly differs from zero. This would indicate that selection is present and that the Heckman probit procedure is necessary. For the transition from university to the labor market (Models (1a) and (1b)), we find clear evidence for a selection bias. Graduates who do not find a job within five years after graduation – albeit a very small number – seem to differ significantly in their characteristics from graduates who find at least one job within this time period. Likewise, a selection bias is present for the transition from the third to the fourth job (Models (4a) and (4b)). For the job changes in between (Models (2) and (3)), however,  $\rho$  does not significantly differ from zero. The absence of a selection bias can be explained in the following way: Due to the inclusion of graduates’ migration history, regional characteristics and previous job characteristics, the selection equation can only account for selection of those graduates with a further job compared to those without this further job. E.g. we do not compare graduates with a third job to those with no job at all but we compare graduates with a third job to those with two (but not three) jobs. The two groups can thus be expected to be relatively homogeneous. Still, the first stage regressions yield interesting results with respect to the driving factors of job changes.

### 5.1 Labor market entry

As displayed in Models (1a) and (1b) in Table 1, migration experience – be it migration from the school region to the university region or international mobility during studies – only slightly affects the likelihood of entering the labor market within five years after graduation. Migration before or during the studies, however, has a positive and highly significant effect on the likelihood to leave the university region after graduation. Graduates who have migrated to the university region are

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<sup>11</sup> As an example, there are  $5,122 - 88 = 5,034$  graduates who successfully entered the labor market (Model (1)). For some individuals, however, we lack some information about this first job such as the type of the contract (full-time versus part-time etc.). Only for those 4,771 individuals for whom all relevant data are available can we analyze the subsequent job change (Model (2)).

about 26 percentage points more likely to move away after graduation. Similarly, the probability to move away is 11 percentage points higher for those who went abroad during their studies.

As to the exam grade, less able students are more likely to out-migrate after graduation – a result also found by Krabel and Flöther (2012) – while the likelihood of having a first job is not affected.<sup>12</sup> We neither find a significant difference between graduates from universities and universities of applied sciences with respect to labor market entry nor migration. Future teachers, however, are 23 percentage points less likely than university graduates to leave the university region for their first job. Labor market entry seems to be more difficult the younger graduates are who are also less mobile.

The estimation results with respect to regional economic characteristics suggest that they do not influence employment opportunities. They do, however, significantly determine graduates' migration decision for the first job. The lower the share of large firms and of the urban population and the higher the unemployment rate, the more likely graduates leave the university region after graduation for a first employment in another region.

The selection instrument is statistically significant and positive. Strong connections to a company through an internship or final thesis strongly and positively affect the likelihood of successfully entering the labor market.

## 5.2 Subsequent job changes within five years after graduation

In the second part of our empirical analysis, we investigate the determinants of job changes and related location choices of graduates after labor market entry within five years after graduation (see Models (2) to (4) in Tables 1 and 2). Our first-stage instruments for job changes capture the characteristics of the respective previous job. Full-time employment, unlimited contract or self-employment significantly reduce the likelihood of having a further job within five years after graduation.

Again, previous migration experience predominantly shapes subsequent location choices but hardly affects the likelihood of further job changes. Interestingly, though not surprisingly, we find that especially the most recent migration experience (e.g. having migrated for the previous job) positively affects subsequent migration whereas relatively far-ago migration (e.g. migration from school to university) has little or no influence on job to job migration. Further, having migrated back to the school region, which is likely the home region, tends to reduce the likelihood to out-migrate again for a new job. With respect to our migration categories, we find for the third and fourth job change that university stayers (reference category) are the least mobile group. Having stayed in the university region for the previous jobs after graduation makes it rather unlikely to leave this region for a further job. Compared with university stayers, return migrants and job stayers are the next least mobile graduates. Interestingly, the propensity to out-migrate again for the

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<sup>12</sup>In Germany, grades range from 1.0 ('excellent') to 4.0 ('still passed').

third job is still 13 percentage points higher among those graduates who returned to the university region for the second job compared with university stayers. This significant difference disappears when considering the fourth job. Job stayers, on the contrary, remain 9 to 12 percentage points more likely to migrate than university stayers. Graduates classified as late and repeat migrants are between 18 and 31 percentage points more likely to continue migrating when changing their second and third job compared with university stayers. We find late migrants to be even more mobile than repeat migrants. Overall, our results clearly confirm the DaVanzo (1976) hypothesis and previous empirical findings on graduate migration with respect to migration experience as a predictor of further migration.

Less able graduates are significantly more likely to have a third or a fourth job, with the marginal effects however being very small. Migration decisions are, however, not affected by exam grades. One may conclude that graduates with worse grades have less stable jobs than better graduates forcing them to change jobs more often in order to find a new job. Consistent with the results in Table 1, teachers are more likely to stay in the region in which they graduated. In addition, they are 19 percentage points more likely to have a second job than university graduates which nicely reflects the fact that future teachers first have to successfully complete a required internship before being actually allowed to work as a teacher. We can now also confirm the results found in previous literature (see, e.g., Jaeger and Kopper 2014) that graduates from universities of applied sciences are more likely to stay in the region – at least for the third job. In terms of the subject studied, the effects are small. Only graduates of medical schools are significantly less likely to have a third or fourth job within five years after graduation than the graduates from languages and cultural studies (reference group). Likely, this result is due to the fact that the specialist medical training takes many years making it unlikely to change jobs often within the first five years.

As to the socio-economic characteristics we find that having children decreases the probability of changing jobs more than once. Also children or a partner tend to increase migration costs.

The characteristics of the region in which the graduates had the previous job do not affect the probability of a job change. They do, however, have strong and significant effects on the migration decision associated with a job change. The lower the GDP growth, the share of large firms and the degree of urbanity and the higher the unemployment rate the more likely graduates change the region when changing their job. These factors become slightly less relevant when considering the migration choice for the third job (Model (3b)) and completely disappear when the migration choice for the fourth job is analyzed (Model (4b)). Interestingly, graduates who had their second job in an East German region more likely start a third job in the same region.

**Table 1:** Determinants of job changes and related migration – Heckman probit model, Marginal effects

Dep. Variable:	University → 1. Job				1. Job → 2. Job			
	Model (1a)		Model (1b)		Model (2a)		Model (2b)	
	Job 1		Migration for job 1		Job 2		Migration for job 2	
	AME	SE	AME	SE	AME	SE	AME	SE
<i>Mobility</i>								
Migration from school to university	0.009*	(0.005)	0.256***	(0.014)	0.002	(0.017)	-0.012	(0.016)
International mobility during studies	0.003	(0.005)	0.111***	(0.014)	0.025*	(0.015)	0.043***	(0.015)
First job in school region					-0.004	(0.018)	-0.125***	(0.021)
Migration from university to first job					0.035**	(0.017)	0.107***	(0.019)
<i>Study characteristics</i>								
Exam grade	0.000	(0.000)	0.003**	(0.001)	0.001	(0.001)	0.001	(0.001)
University of applied science	-0.005	(0.006)	0.025	(0.018)	-0.008	(0.017)	-0.023	(0.017)
State examination (Teacher)	0.008	(0.008)	-0.226***	(0.028)	0.186***	(0.028)	-0.106***	(0.031)
<i>Field of study</i>								
Economics, Law and Social Sciences	0.014**	(0.007)	0.035	(0.023)	0.057**	(0.022)	0.003	(0.023)
Math, Natural Sciences	0.009	(0.008)	0.017	(0.024)	0.020	(0.024)	0.040*	(0.024)
Medicine	0.023	(0.014)	0.036	(0.031)	-0.015	(0.028)	0.036	(0.030)
Agriculture	0.015	(0.011)	0.010	(0.036)	0.037	(0.031)	0.045	(0.035)
Engineering	0.021**	(0.010)	0.050**	(0.025)	0.022	(0.024)	-0.007	(0.025)
<i>Socio-economic characteristics</i>								
Female	-0.003	(0.005)	-0.019	(0.015)	0.016	(0.015)	-0.028*	(0.017)
Age	-0.012**	(0.005)	-0.037*	(0.020)	0.003	(0.015)	-0.011	(0.019)
Age <sup>2</sup>	0.000**	(0.000)	0.000	(0.000)	-0.000	(0.000)	0.000	(0.000)
Partner, not married	0.002	(0.005)	-0.018	(0.015)	0.040***	(0.015)	-0.026	(0.016)
Married	-0.015**	(0.007)	-0.015	(0.026)	0.022	(0.024)	-0.052*	(0.028)
Children	-0.005	(0.008)	-0.034	(0.032)	-0.001	(0.029)	-0.044	(0.031)
Vocational training	0.008	(0.005)	-0.011	(0.019)	-0.003	(0.018)	-0.012	(0.020)
<i>Regional characteristics</i>								
GDP growth rate	0.001	(0.003)	-0.001	(0.012)	0.001	(0.005)	-0.012**	(0.005)
Share of firms with >250 employees	0.000	(0.000)	-0.006***	(0.001)	0.001	(0.001)	-0.002*	(0.001)
Share of population in cities	0.000	(0.000)	-0.001***	(0.000)	0.001*	(0.000)	-0.001**	(0.000)
Unemployment rate	0.000	(0.001)	0.015***	(0.005)	-0.003*	(0.001)	0.005***	(0.002)
University in East Germany	0.001	(0.014)	-0.062	(0.048)				
First job in East Germany					0.039	(0.029)	-0.020	(0.030)
<i>Characteristics of the previous job</i>								
Previous employer contacts	0.019***	(0.006)						
Full-time					-0.046***	(0.017)		
Permanent contract					-0.127***	(0.015)		
Self-employed					-0.144***	(0.026)		
Obs. (Censored Obs.)			5,122 (88)				4,771 (1,015)	
<i>Test statistics of the probit regressions</i>								
Log-Likelihood			-3180.706				-4238.666	
Wald $\chi^2$ (Whole model)			698.269***				197.382***	
Correlation coef. of error terms $\rho$			0.710				0.560	
Wald $\chi^2$ test of indep. eqns.			15.179***				1.950	

Notes: Average marginal effects (AME) reported. Models (1a) and (2a) are the first stage selection estimation of the Heckman probit model. Models (1b) and (2b) represent the second stage estimation. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The coefficients of the probit regressions are displayed in Table A.2 in the Appendix.



**Table 2:** Determinants of job changes and related migration – Heckman probit model, Marginal effects

Dep. Variable:	2. Job → 3. Job				3. Job → 4. Job			
	Model (3a)		Model (3b)		Model (4a)		Model (4b)	
	Job 3		Migration for job 3		Job 4		Migration for job 4	
	AME	SE	AME	SE	AME	SE	AME	SE
<i>Mobility</i>								
Migration from school to university	-0.016	(0.023)	-0.020	(0.022)	-0.000	(0.032)	-0.034	(0.025)
International mobility during studies	0.000	(0.020)	0.021	(0.020)	0.022	(0.027)	0.055**	(0.023)
Previous job in school region	0.044*	(0.025)	-0.063**	(0.026)	0.033	(0.035)	-0.030	(0.029)
<i>Ref.cat: University stayers</i>								
Return migrant	0.016	(0.038)	0.129***	(0.049)	0.031	(0.046)	0.035	(0.035)
Job stayer	0.039	(0.027)	0.123***	(0.032)	0.055	(0.037)	0.090**	(0.036)
Late migrant	0.080**	(0.036)	0.310***	(0.051)	0.059	(0.065)	0.306***	(0.096)
Repeat migrant	0.016	(0.043)	0.177***	(0.052)	0.076	(0.055)	0.273***	(0.084)
<i>Study characteristics</i>								
Exam grade	0.005***	(0.002)	0.002	(0.002)	0.007***	(0.002)	0.000	(0.002)
University of applied science	0.033	(0.024)	-0.065***	(0.024)	0.059*	(0.034)	0.001	(0.027)
State examination (Teacher)	0.009	(0.030)	-0.175***	(0.042)	-0.024	(0.039)	-0.011	(0.037)
<i>Field of study</i>								
Economics, Law and Social Sciences	0.035	(0.030)	0.002	(0.030)	-0.067*	(0.040)	0.051	(0.037)
Math, Natural Sciences	-0.012	(0.030)	0.001	(0.032)	-0.051	(0.038)	0.041	(0.032)
Medicine	-0.139***	(0.042)	0.005	(0.037)	-0.228***	(0.055)	0.009	(0.044)
Agriculture	0.065	(0.050)	0.000	(0.040)	-0.043	(0.059)	0.023	(0.048)
Engineering	-0.023	(0.033)	0.019	(0.034)	-0.051	(0.046)	0.044	(0.036)
<i>Socio-economic characteristics</i>								
Female	0.031	(0.021)	-0.041*	(0.023)	0.043	(0.029)	0.006	(0.022)
Age	0.044*	(0.023)	-0.007	(0.022)	-0.019	(0.033)	0.023	(0.041)
Age <sup>2</sup>	-0.001*	(0.000)	0.000	(0.000)	0.000	(0.001)	-0.000	(0.001)
Partner, not married	0.019	(0.021)	-0.032	(0.021)	-0.010	(0.028)	0.005	(0.022)
Married	0.059*	(0.032)	-0.089**	(0.035)	-0.001	(0.044)	0.019	(0.039)
Children	-0.105***	(0.039)	-0.034	(0.036)	-0.081	(0.051)	-0.094*	(0.055)
Vocational training	0.014	(0.027)	0.006	(0.025)	0.022	(0.034)	-0.060*	(0.032)
<i>Regional characteristics</i>								
GDP growth rate	-0.010*	(0.006)	0.005	(0.008)	-0.020**	(0.010)	-0.004	(0.010)
Share of firms with >250 employees	-0.001	(0.002)	-0.005***	(0.002)	0.002	(0.002)	-0.001	(0.002)
Share of population in cities	0.000	(0.001)	-0.001*	(0.000)	0.001	(0.001)	-0.001	(0.000)
Unemployment rate	-0.000	(0.002)	0.002	(0.002)	0.000	(0.003)	0.003	(0.002)
Previous job in East Germany	0.013	(0.040)	-0.097**	(0.040)	0.070	(0.055)	-0.003	(0.044)
<i>Characteristics of the previous job</i>								
Full-time	-0.071***	(0.026)			-0.073**	(0.030)		
Permanent contract	-0.325***	(0.018)			-0.325***	(0.024)		
Self-employed	-0.280***	(0.040)			-0.194***	(0.054)		
Obs. (Censored Obs.)	3,447 (1,546)				1,792 (1,042)			
<i>Test statistics of the probit regressions</i>								
Log-Likelihood	-2930.154				-1320.136			
Wald $\chi^2$ (Whole model)	238.701***				95.851***			
Correlation coef. of error terms $\rho$	0.165				0.440			
Wald $\chi^2$ test of indep. eqns.	0.704				3.386*			

Notes: Average marginal effects (AME) reported. Models (3a) and (4a) are the first stage selection estimation of the Heckman probit model. Models (3b) and (4b) represent the second stage estimation. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The coefficients of the probit regressions are displayed in Table A.3 in the Appendix.

To conclude, our econometric analysis helps to understand in more detail how both job changes and associated location choices are affected by individual characteristics, university- and job-related aspects as well as regional economic conditions. When analyzing graduate migration, only analyzing the determinants of the location choice at labor market entry neglects that most graduates have more than one job after graduation and that motives to change jobs and to migrate may vary. Many, but not all, of our results confirm those found in the literature. The results differ, however, in at least two respects: First, we find less evidence for the importance of socio-economic characteristics. One possible reason may be that most other studies use data aggregated on a (smaller) regional level in their analysis and thus focus more on “marginal” migration decisions. Second, we use several migration-specific control variables. They allow us to identify in a differentiated way the role of previous migration and, in particular, how job changes and interregional migration are related. Moreover, we highlight the changing importance of some determinants in the employment and migration decision for subsequent job changes.

## 6 Conclusion

In the present study, we have analyzed job changes and related location choice and its determinants for German graduates within five years after graduation. With this, we have extended existing empirical evidence which to a large extent focuses at location choice at labor market entry only. Our findings show that most graduates have more than one job within our observation period; on average two to three. Moreover, for a non-negligible share of graduates job changes are related to interregional migration. Five years after graduation more than 40% of all graduates in our sample have left the university region. The share of mobile graduates is even larger as around 10% moved away but returned to the university region at some point.

Applying a Heckman probit model, we empirically investigate the determinants of labor market entry, subsequent job changes and related location choice. We find that successful labor market entry mostly depends on the fields of study and some socio-economic characteristics whereas subsequent job changes are more affected by previous employment conditions, study and socio-economic characteristics. In particular, being full-time or permanently employed but also self employment as well as having children reduces the probability of changing the job.

Whether a graduate leaves the university region for labor market entry, however, predominantly depends on the university region’s population and economic characteristics and the graduate’s migration history. Especially a low degree of urbanity, a low share of large firms and a high unemployment rate induce graduates to move away. Additionally, graduates who migrated for their studies or went abroad during their studies are significantly more likely to leave the university region. Likewise, migration decisions associated with subsequent job changes are strongly connected with the migration history. Graduates who stayed in the university region for

previous jobs are more likely to stay there also for further jobs. Similarly, those who moved away from the university region but later returned, likely stay there. On the contrary, graduates who moved away but did not return are also very mobile when changing the job again.

A region's attractiveness for graduates – be it the own graduates or graduates from other regions – determines whether investment in higher education pays out. From our estimation results one could conclude that those German regions with less favorable economic conditions should undertake efforts to improve their productivity in order to foster employment possibilities and wage increases for the high skilled. However, a region's economic conditions cannot be changed easily, at least not in the short-run. Still, efforts which improve the work-related environment for high skilled – even if only effective in the medium- to long-run – might be worthwhile. What the analysis has shown above all is that a significant number of graduates is still mobile some few years after graduation. This enlarges the time window for policy responses.

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## 7 Appendix



Figure A.1: Migration paths and migration categories

**Table A.1:** Summary Statistics

	University → 1. Job		1. Job → 2. Job		2. Job → 3. Job		3. Job → 4. Job	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Mobility</i>								
Migration from school to university <sup>°</sup>	0.30	0.46	0.29	0.46	0.29	0.46	0.29	0.45
International mobility during studies <sup>°</sup>	0.36	0.48	0.35	0.48	0.35	0.48	0.33	0.47
Previous job in school region <sup>°</sup>			0.62	0.48	0.60	0.49	0.61	0.49
Migration from university to first job <sup>°</sup>			0.33	0.47				
University stayer <sup>°</sup> (R)					0.56	0.50	0.52	0.50
Repeat migrant <sup>°</sup>					0.06	0.24	0.11	0.31
Job stayer <sup>°</sup>					0.20	0.40	0.23	0.42
Late migrant <sup>°</sup>					0.11	0.31	0.05	0.21
Repeat migrant <sup>°</sup>					0.07	0.25	0.09	0.28
<i>Study characteristics</i>								
Exam grade	18.60	5.54	18.61	5.51	18.63	5.57	18.78	5.57
University <sup>°</sup> (R)	0.50	0.50	0.49	0.50	0.48	0.50	0.48	0.50
University of applied science <sup>°</sup>	0.38	0.49	0.38	0.49	0.36	0.48	0.35	0.48
State examination (Teacher) <sup>°</sup>	0.13	0.33	0.13	0.34	0.16	0.37	0.17	0.38
<i>Study characteristics</i>								
Languages and cultural studies <sup>°</sup> (R)	0.24	0.43	0.25	0.43	0.26	0.44	0.29	0.45
Economics, Law and Social Sciences <sup>°</sup>	0.31	0.46	0.31	0.46	0.31	0.46	0.31	0.46
Math, Natural Sciences <sup>°</sup>	0.17	0.37	0.16	0.37	0.17	0.37	0.16	0.37
Medicine <sup>°</sup>	0.07	0.26	0.08	0.26	0.07	0.26	0.07	0.26
Agriculture <sup>°</sup>	0.03	0.16	0.03	0.16	0.03	0.16	0.03	0.17
Engineering <sup>°</sup>	0.19	0.39	0.18	0.39	0.17	0.37	0.14	0.35
<i>Socio-economic characteristics</i>								
Female <sup>°</sup>	0.51	0.50	0.50	0.50	0.52	0.50	0.57	0.50
Age	27.32	3.36	27.32	3.38	27.25	3.28	27.36	3.30
Single <sup>°</sup> (R)	0.33	0.47	0.33	0.47	0.31	0.46	0.30	0.46
Partner, not married <sup>°</sup>	0.55	0.50	0.55	0.50	0.56	0.50	0.57	0.50
Married <sup>°</sup>	0.12	0.33	0.12	0.33	0.13	0.33	0.13	0.34
Children <sup>°</sup>	0.08	0.27	0.08	0.27	0.08	0.27	0.08	0.27
Vocational training <sup>°</sup>	0.30	0.46	0.30	0.46	0.29	0.45	0.29	0.45
<i>Regional characteristics</i>								
GDP growth rate	1.33	0.75	1.93	1.56	1.93	1.50	1.90	1.43
Share of firms > 250 employees	11.65	7.63	12.14	7.47	12.11	7.46	12.11	7.70
Share of population in cities	29.17	21.10	31.36	23.56	32.16	24.50	32.69	24.66
Unemployment rate	11.59	4.17	9.04	7.40	9.06	7.42	9.51	7.47
University in East Germany	0.20	0.40						
Previous job in East Germany			0.14	0.35	0.13	0.34	0.15	0.36
<i>Characteristics of the previous job</i>								
Previous employer contacts <sup>°</sup>	0.35	0.48						
Full-time <sup>°</sup>			0.76	0.43	0.80	0.40	0.75	0.43
Permanent contract <sup>°</sup>			0.35	0.48	0.56	0.50	0.60	0.49
Self-employed <sup>°</sup>			0.07	0.25	0.06	0.23	0.07	0.25

<sup>°</sup> Dummy variable: 1 = yes, 0 = no. (R) Reference category.

**Table A.2:** Determinants of job changes and related migration – Heckman probit model, Coefficients

Dep. Variable:	University → 1. Job				1. Job → 2. Job			
	Model (A1a)		Model (A1b)		Model (A2a)		Model (A2b)	
	Job 1		Migration for job 1		Job 2		Migration for job 2	
	AME	SE	AME	SE	AME	SE	AME	SE
<i>Mobility</i>								
Migration from school to university	0.205*	(0.112)	0.817***	(0.049)	0.008	(0.061)	-0.044	(0.060)
International mobility during studies	0.057	(0.121)	0.353***	(0.047)	0.089*	(0.054)	0.159***	(0.055)
School region = Region of first job					-0.015	(0.064)	-0.465***	(0.069)
Migration from university to first job					0.128**	(0.063)	0.394***	(0.066)
<i>Study characteristics</i>								
Exam grade	0.005	(0.011)	0.009**	(0.004)	0.002	(0.005)	0.004	(0.005)
University of applied science	-0.105	(0.133)	0.081	(0.056)	-0.029	(0.062)	-0.085	(0.064)
State examination (Teacher)	0.189	(0.175)	-0.721***	(0.089)	0.676***	(0.103)	-0.393***	(0.108)
<i>Field of study</i>								
Economics, Law and Social Sciences	0.326**	(0.151)	0.111	(0.072)	0.207**	(0.082)	0.011	(0.086)
Math, Natural Sciences	0.200	(0.170)	0.054	(0.075)	0.073	(0.087)	0.147*	(0.088)
Medicine	0.525	(0.323)	0.114	(0.098)	-0.055	(0.103)	0.135	(0.110)
Agriculture	0.349	(0.227)	0.030	(0.114)	0.135	(0.114)	0.167	(0.131)
Engineering	0.476**	(0.199)	0.161**	(0.080)	0.080	(0.087)	-0.025	(0.092)
<i>Socio-economic characteristics</i>								
Female	-0.077	(0.120)	-0.060	(0.049)	0.058	(0.054)	-0.105*	(0.060)
Age	-0.275**	(0.114)	-0.119*	(0.065)	0.010	(0.056)	-0.039	(0.069)
Age <sup>2</sup>	0.004**	(0.002)	0.001	(0.001)	-0.000	(0.001)	0.001	(0.001)
Partner, not married	0.051	(0.119)	-0.059	(0.049)	0.146***	(0.054)	-0.098	(0.060)
Married	-0.342**	(0.158)	-0.047	(0.085)	0.078	(0.088)	-0.193*	(0.102)
Children	-0.120	(0.191)	-0.109	(0.104)	-0.003	(0.106)	-0.162	(0.113)
Vocational training	0.189	(0.117)	-0.034	(0.061)	-0.012	(0.066)	-0.046	(0.073)
<i>Regional characteristics</i>								
GDP growth rate	0.033	(0.076)	-0.002	(0.038)	0.002	(0.016)	-0.045**	(0.018)
Share of firms with >250 employees	0.009	(0.009)	-0.019***	(0.004)	0.003	(0.004)	-0.007*	(0.004)
Share of population in cities	0.001	(0.003)	-0.005***	(0.002)	0.002*	(0.001)	-0.003**	(0.001)
Unemployment rate	0.001	(0.032)	0.046***	(0.015)	-0.009*	(0.005)	0.017***	(0.006)
University in East Germany	0.023	(0.328)	-0.199	(0.155)				
Job 1 in East Germany					0.143	(0.104)	-0.073	(0.111)
<i>Characteristics of the previous job</i>								
Previous employer contacts	0.434***	(0.123)						
Full-time					-0.167***	(0.064)		
Permanent contract					-0.463***	(0.055)		
Self-employed					-0.522***	(0.096)		
Obs. (Censored Obs.)			5,122 (88)				4,771 (1,015)	
<i>Test statistics of the probit regressions</i>								
Log-Likelihood			-3180.706				-4238.666	
Wald $\chi^2$ (Whole model)			698.269***				197.382***	
Correlation coef. of error terms $\rho$			0.710				0.560	
Wald $\chi^2$ test of indep. eqns.			15.179***				1.950	

Notes: Coefficients reported. Models (A1a) and (A2a) are the first stage selection estimation of the Heckman probit model. Models (A1b) and (A2b) represent the second stage estimation. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



**Table A.3:** Determinants of job changes and related migration – Heckman probit model, Coefficients

Dep. Variable:	2. Job → 3. Job				3. Job → 4. Job			
	Model (A3a) Job 3		Model (A3b) Migration for job 3		Model (A4a) Job 4		Model (A4b) Migration for job 4	
	AME	SE	AME	SE	AME	SE	AME	SE
<i>Mobility</i>								
Migration from school to university	-0.044	(0.064)	-0.085	(0.094)	-0.001	(0.091)	-0.222	(0.155)
International mobility during studies	0.000	(0.056)	0.090	(0.086)	0.062	(0.079)	0.354**	(0.140)
School region = Region of second job	0.122*	(0.071)	-0.270**	(0.106)	0.094	(0.100)	-0.191	(0.179)
<i>Ref.cat: University stayers</i>								
Return migrant	0.044	(0.105)	0.549***	(0.167)	0.090	(0.131)	0.309	(0.241)
Job stayer	0.109	(0.076)	0.528***	(0.119)	0.090	(0.131)	0.637***	(0.197)
Late migrant	0.226**	(0.103)	1.092***	(0.139)	0.170	(0.184)	1.408***	(0.281)
Repeat migrant	0.046	(0.120)	0.705***	(0.159)	0.216	(0.157)	1.310***	(0.257)
<i>Study characteristics</i>								
Exam grade	0.015***	(0.005)	0.006	(0.008)	0.020***	(0.007)	0.002	(0.015)
University of applied science	0.093	(0.068)	-0.281***	(0.100)	0.171*	(0.098)	0.005	(0.173)
State examination (Teacher)	0.025	(0.084)	-0.750***	(0.158)	-0.069	(0.111)	-0.070	(0.241)
<i>Field of study</i>								
Economics, Law and Social Sciences	0.097	(0.084)	0.007	(0.130)	-0.191*	(0.116)	0.331	(0.220)
Math, Natural Sciences	-0.035	(0.083)	0.006	(0.136)	-0.148	(0.110)	0.268	(0.201)
Medicine	-0.389***	(0.118)	0.023	(0.159)	-0.656***	(0.162)	0.061	(0.279)
Agriculture	0.181	(0.141)	0.000	(0.173)	-0.123	(0.170)	0.146	(0.311)
Engineering	-0.065	(0.092)	0.082	(0.144)	-0.146	(0.132)	0.287	(0.225)
<i>Socio-economic characteristics</i>								
Female	0.087	(0.058)	-0.175*	(0.092)	0.122	(0.083)	0.038	(0.142)
Age	0.124*	(0.063)	-0.032	(0.094)	-0.056	(0.096)	0.145	(0.260)
Age <sup>2</sup>	-0.002*	(0.001)	0.001	(0.001)	0.001	(0.001)	-0.003	(0.004)
Partner, not married	0.054	(0.058)	-0.137	(0.089)	-0.029	(0.081)	0.031	(0.143)
Married	0.167*	(0.091)	-0.382***	(0.143)	-0.003	(0.126)	0.120	(0.251)
Children	-0.295***	(0.110)	-0.144	(0.154)	-0.233	(0.147)	-0.604*	(0.336)
Vocational training	0.040	(0.075)	0.025	(0.106)	0.065	(0.098)	-0.386*	(0.202)
<i>Regional characteristics</i>								
GDP growth rate	-0.029*	(0.017)	0.023	(0.032)	-0.058**	(0.028)	-0.024	(0.066)
Share of firms with >250 employees	-0.003	(0.004)	-0.020***	(0.007)	-0.058**	(0.028)	-0.006	(0.011)
Share of population in cities	0.001	(0.001)	-0.004*	(0.002)	0.003	(0.002)	-0.004	(0.003)
Unemployment rate	-0.000	(0.006)	0.009	(0.009)	0.001	(0.008)	0.020	(0.014)
Previous job in East Germany	0.037	(0.112)	-0.415**	(0.170)	0.201	(0.157)	-0.020	(0.283)
<i>Characteristics of the previous job</i>								
Full-time	-0.200***	(0.074)			-0.210**	(0.087)		
Permanent contract	-0.912***	(0.059)			-0.932***	(0.082)		
Self-employed	-0.784***	(0.116)			-0.557***	(0.157)		
Obs. (Censored Obs.)	3,447 (1,546)				1,792 (1,042)			
<i>Test statistics of the probit regressions</i>								
Log-Likelihood	-2930.154				-1320.136			
Wald $\chi^2$ (Whole model)	238.701***				95.851***			
Correlation coef. of error terms $\rho$	0.165				0.440			
Wald $\chi^2$ test of indep. eqns.	0.704				3.386*			

Notes: Coefficients reported. Models (A3a) and (A4a) are the first stage selection estimation of the Heckman probit model. Models (A3b) and (A4b) represent the second stage estimation. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.