New region, new chances: Does moving regionally for university shape later job mobility?*

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Abstract

Efficient local labour markets feature welfare and higher wages. For this efficiency, regional mobility is an essential factor. We find that high school graduates who move to another labour market region (LMR) when enrolling at a university, are also more likely to move to a third LMR when entering the job market. We take a subset of university graduates who went to high school in an agglomeration's suburbs. To take endogeneity in the decision to move into account, we use distance to university as an instrument. Experiencing a change in the residential region is a chance to induce regional mobility.

Keywords: regional mobility; job mobility; distance to university; students; spatial

JEL-Codes: J61, R23, I23

1 Introduction

The efficiency of local labour markets crucially depends on a good fit of workers and firms. On the one hand, if a labour market is not efficient, workers do not find a job as their skills are not demanded at the place they are living. On the other hand, firms do not find enough suitable workers due to a small labour pool and employ worker with a bad fit. This bad fit decreases the firm's productivity and the workers' wages. Thus, efficient

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local labour markets incorporate social welfare through these two factors. To increase labour market efficiency, many governments have set up subsidies, such as place-based policies, to strengthen economically weaker regions and set a counterweight against the natural advantages of agglomerations (Kline and Moretti, 2014). While subsidies should bring jobs to the workers, a counter-project would try to bring workers to the jobs. Besides offering job training, which may increase the workers' skills, one could incentivise workers to move to a labour market region (LMR) where their skills are demanded and they are likely to find suitable jobs. Increasing workers' mobility is therefore a meaningful way to increase the efficiency of labour markets as it increases both the potential pool of workers and the number of suitable jobs.[1]

This better fit might explain a mobility wage premium for students found by, e.g., Di Cintio and Grassi (2013). But wages and skills are highly influenced by where one grows up and where one works (e.g. Mion and Naticchioni, 2009; Combes et al., 2012 & Bosquet and Overman, 2019). A central point in the investigation of labour mobility outcomes is, therefore, the selection on unobserved characteristics. It is often impossible to measure motivation for mobility. In the case of students' mobility, usually, the willingness or financial capacity of parents to pay rent for the student in another city is not observed. Moreover, whether an individual decides to move to study is at least partly predetermined by her surrounding, her family background, and the area she lives in. Therefore, research that considers mobility as an explanatory variable must carefully address the question of reverse causality and selection into treatment.

We ask what shapes regional mobility for the first job by investigating previous moving experience. We examine the regional migration of high school graduates and their decision to enrol at a nearby university or a university in another labour market region (LMR), and how this movement decision affects the movement decision for the first job.

We apply an instrumental variable strategy to account for reverse causality in the endogenous movements after graduating from high school. The distance to university is applied as an instrument on the decision to study within the home LMR or at another university. However, there is still the issue of selection which is determined by the location a person lives. Therefore, we focus on graduates who went to high school in the suburban area of Munich, Germany. Additionally, we control for parental characteristics. We use a survey containing detailed information on locations of university graduates in Bavaria, Germany,

[1] Authors like Ehrenfried and Holzner (2019) and van Ours and Ridder (1991) show that firms need a certain number of suited applicants to fill a vacancy. Therefore, a more dynamic labour market increases the pool of potentially suitable applicants and because of this efficiency. Authors like Fahr and Sunde (2006) present evidence for the importance of spatial dependencies and the level of workers' mobility for the efficiency of the job matching process.

beginning with the high school, continuing with the university and finishing with all the locations where they lived up to roughly 1.5 years after graduation.

Migration generally flows from rural areas to larger agglomerations. In Germany, however, economic activity is more decentralised than in other countries. So-called "hidden champions", firms with significant market shares located in more rural regions of the country, represent a non-trivial part of the economy. Since German workers are generally less mobile by international comparison and high-skilled workers are strongly demanded outside agglomerations as well, it is of special interest in Germany to shape student's mobility and ensure that graduates also move from agglomerations to smaller places.

We find that the further a high school is located from a university, the more likely are its graduates to move to a university in another LMR. Notably, we exploit only small changes in the distance to university in the first stage. Subsequently, the decision to enrol at another university increases the likelihood to move again to a third LMR for the first job after graduating from university. We show that high-skilled workers' job mobility is shaped by a relatively early mobility decision and small differences at the beginning can have large effects later.

In contrast to the related literature on college proximity, which goes back to Card (1993), we focus on a suburban region where we exploit relatively small differences in distance to university. Our treatment distance lies within 15 km which is a finer spatial variation compared to related investigations (e.g. Kjellström and Regnér, 1999; Kling, 2001 & Frenette, 2006). Additionally, we apply this methodology on the issue of regional job mobility. We add by investigating migration starting in an agglomeration from where high school graduates move to other universities in the same state.

We structured our paper as follows. In Section 2, we discuss the related literature. In Section 3, we show relevant background information related to the educational system of Germany. Section 4 presents the methodology we apply to estimate the causal effect of movement and focuses on potential endogeneity issues which and how we deal with them. In Section 5, we describe the graduate survey we use for our investigation. In Section 6, results are discussed and we show robustness checks to validate our findings. Finally, Section 7 summarises our findings and provides policy implications one can deduct from our results.

2 Related literature

Our paper relates to the literature on using college proximity as an instrument. This strand of literature goes back to Card (1993) who estimates the returns of schooling. He measures college proximity by an indicator for whether a college is nearby and finds both more schooling

years and higher earnings for growing up near a college. Importantly, he finds 50 to 60 per cent higher estimates compared to the OLS results.

Many studies that build upon the college proximity instrument relate distance to college enrolment. Kjellström and Regnér (1999) use Swedish data to investigate the link between the distance between the place of residence and the closest university, what can be up to 150 km, and enrolment rates. They find a small but significant negative effect of distance on enrolment rates, controlling for a set of personal and parental characteristics. However, for the first 26 km, they cannot find any effect. Kling (2001) shows that college proximity has a great impact on the transition from high school to college when taking family background into account. Frenette (2004) establishes this link for the Canadian Survey of Labour and Income Dynamics and finds a more pronounced effect for individuals from lower-income families. These results are also found by Frenette (2006) who shows that the likelihood to enrol at a university decreases significantly if a person's residence does not lie within an acceptable "commuting distance" and that this effect is especially prevalent for people from the lower end of the income distribution. Further studies have identified parents' education and the household income as primary factors which affect the decision to enrol at a tertiary education institution, a university (e.g. Acemoglu and Pischke, 2001 & Shea, 2000). For Germany, Spiess and Wrohlich (2010) show a higher likelihood of university enrolment if the university is nearby when completing secondary education. In contrast to the studies beforehand, far away is defined as more than 12.5 km to the closest university while closely located are those, having a university within a radius of 6 km to their residence.

Taking these results into account, we only consider high school graduates living within a radius between 15 and 30 km to the city centre. So, it is likely that in this suburban space, with small differences in locations, distance does not affect enrolment. This allows us to focus on the decision where high school graduates enrol in their tertiary education institution, apply an instrument on the distance to university, and investigate how this decision affects later mobility.

A second literature strand, to which this paper adds, deals with students' mobility. For Germany, research on the question of how the effects of mobility can be identified is relatively limited. Krabel and Flöther (2014) use a nation-wide survey among German graduates and find that higher mobility from school to university coincides with higher mobility when starting the first job. Generally, they find a lower level of mobility for graduates in metropolitan areas and promising labour markets.

For the US, studies have linked labour market mobility to previous mobility. Groen (2004) shows that students going to one state for college tend to enter the labour market in this state as well. Malamud and Wozniak (2007) find a higher level of mobility and higher willingness to move longer distances for college graduates than workers without a college degree by

employing an instrumental variable approach. Similar results are found by Kodrzycki (2001) who evaluate the National Longitudinal Survey of Youth from 1979 to 1996. Her findings strengthen our argument to consider only university graduates in the analysis on the one hand. On the other hand, we add by investigating this specific group, university graduates, and analysing movements from an agglomeration.

3 Institutional setting

Students need a university entrance diploma to enrol at a university which is awarded when successfully finishing high school.[2] This diploma permits to enrol at every public university in Germany. However, universities may have local admission restrictions (so-called *Numerus Clausus*), allowing only high school graduates with a diploma grade better than that threshold for a certain field of study. In general, German public universities are free of charge and entirely financed by the public. Finally, students in Germany are not obliged to stay within regional boundaries when applying for university.

In our investigation, we focus on the city of Munich, the capital of the state of Bavaria and its political and economic centre. The city hosts three universities, which are amongst the biggest in Germany. Two of them (the University of Munich and the Technical University) belong to the so-called "*Exzellenz-Initiative*", a certification for German universities, exhibiting a high level of excellence in teaching and research. All relevant fields of study are covered by the universities in Munich. Hence, there are no academic reasons to leave Munich when starting to study.

The metropolitan area of Munich belongs to the wealthiest areas in Germany, especially characterised by a strong labour market including a high density of well-known firms.[3] This decreases the necessity to leave Munich when entering the labour market since Munich exhibits optimal labour market conditions, especially for high-skilled workers.[4] Hence, also if one selects the university to enrol at by the city's labour market perspective, the necessity to leave Munich when graduating from high school is low.[5]

Munich has a very good public transport system, especially in terms of travelling times from suburban regions to the city centre where most universities are located. For each individual in our sample, thus, it is possible to commute.

[2] Throughout this paper, we will refer to university and mean both university and university of applied sciences. Universities of applied sciences (*Fachhochschule*, FH) are a German peculiarity and represent universities which focus on an education closer to job requirements.

[3] Examples are corporations like Allianz SE or BMW AG.

[4] See e.g. https://www.wiwo.de/politik/deutschland/staedteranking/ 2019, accessed on 09.09.2020.

[5] This argument is theoretically validated by research of e.g. Weinstein (2018) who show the positive nexus between well-reputed universities (like the ones in Munich are) and so-called "elite firms", which is a paraphrase for favoured employers.

The main reason why people leave Munich is the competitive housing market which exhibits the highest rates within Germany. This is especially true for shared apartments, a mode students often decide for in Germany.[6] If a person wants to leave the parents' home when starting university, it is more affordable to study in another city.

4 Method

The decision to move is endogenous. Therefore, regressing moving for the first job on moving for university yields to a biased estimate. High school graduates might move when entering university because of their intrinsic motivation to experience living in another place. Moreover, they might need to move if they live in a region without a university or if the subject they are most interested in is not offered at their home university. Other reasons are the prospective advantages of a labour market in another region or reasons related to personal surroundings and the relation to the family and classmates. Especially the last reason could also explain why high school graduates do not move when entering university. Another reason for staying could be financial restrictions as it is cheaper to live with one's parents while studying.

To take endogeneity concerns into account, we use the (road) distance to university as an instrument.[7] To assure an as-good-as-random allocation of the individuals before their first movement decision, first, we control for parental characteristics, and second, we only take high school graduates coming from Munich's suburban area into account.

In the first stage, the commuting distance to university is important for the decision to move for university. It is driven by the trade-off between the costs and benefits of a movement. While the costs of staying increase with rising distance due to longer commuting times and higher prices for (public) transport, the costs of moving are not affected by the distance.[8] Hence, the distance to university is a relevant instrument for the decision to move for university.[9] Next, we argue that the distance to university is exogenous. The distance is driven by the place of living.[10] The parents decide where to settle based on labour market conditions, proximity to their job, relatives or friends, and the availability of affordable housing. Proximity to university is if at all only an issue of minor importance.

[6] See e.g. https://www.empirica-institut.de/nc/nachrichten/details/nachricht/empirica-ranking-mieten-fuer-wohngemeinschaften-in-unistaedten-iii2015/, accessed on 09.09.2020.

[7] We take the closest distance of the three universities in Munich. Throughout the paper, we refer to "distance to university".

[8] Only very few students possess a car for their daily commute.

[9] We calculate distances as road distances to account for the geography and streets which might reflect commuting more realistically. The Stata tool *osrmtime* by Huber and Rust (2016) calculates distances.

[10] We do not know the location of the home (town) but only the high school the graduates went to. However, the spacial deviation is likely not in a specific direction, and therefore, not biasing the distance between home and university.

The second movement, the transition from university to the first job, is substantially determined by experiences made depending on the decision in the first stage. If a graduate has experienced living in a new place as something positive, she might be willing to move again, as she knows that she can adapt easily to new surroundings. However, if she has not moved before, she might be more sceptical about getting to know a new region. The distance to university does not directly affect the decision to move for the first job after graduation from university. Only an indirect effect through the first movement is assumed.

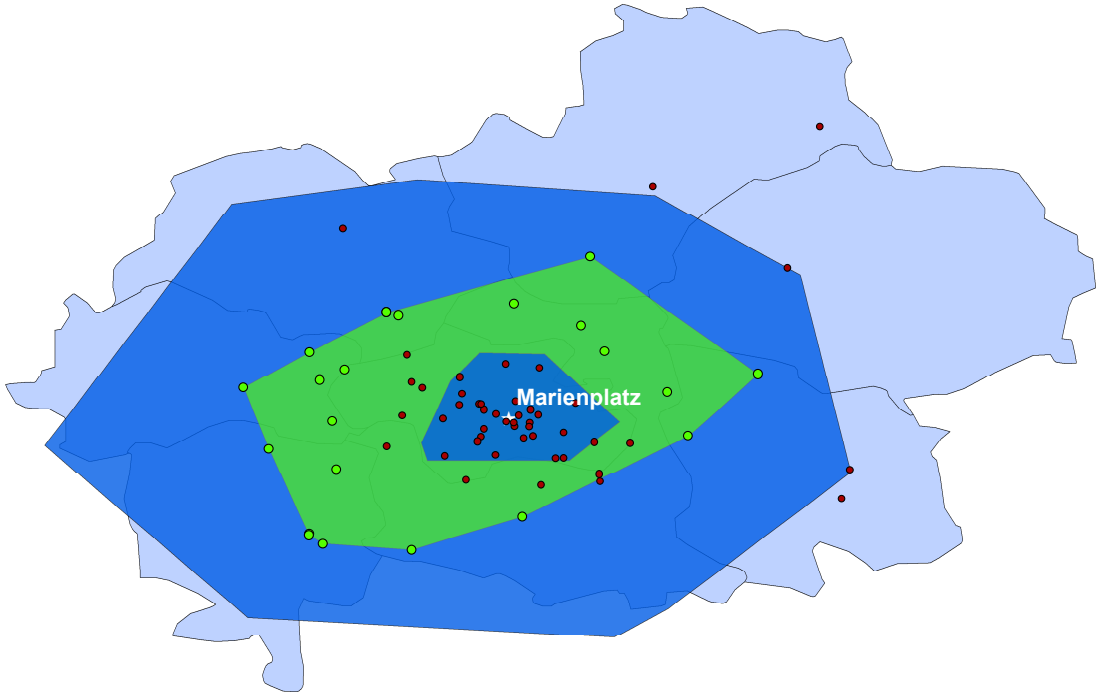
Another issue for an unbiased estimate is that high school graduates might be influenced by their peripheral surrounding, for instance, whether it is urban or rural. Therefore, we take a set of students stemming from Munich's suburban area. We define the suburban area based on the distance of the high school, where a graduate received her university entrance diploma, to the city centre. The centre is Mary's Square (*Marienplatz*), Munich's central square and the town hall's location, where all suburban trains and two of the major metros pass.[11] The suburban area is defined as a doughnut with an inner radius of 15 km and an outer radius of 30 km. In Munich, the average travel distance between the city centre and a terminal stop of a suburban train (*S-Bahn*) is 39 km while this distance is 11 km when taking the metro (*U-Bahn*) instead of the suburban train.[12] By drawing the inner circle at 15 km, we ensure that these people are located far enough from the terminal stops of the metro, which shapes to a certain degree the border of the city. At the same time, taking 30 km as the outer border ensures that all people within the circle live in an area with a similar degree of urbanisation. In the area between 15 and 30 km from the city centre, graduates are similarly close to a stop of the suburban train, and therefore, have equally good public transportation connections to the centre and the universities of Munich. In a robustness analysis, the two radii will be varied to account for high schools right at the border of the doughnut.

Figure 1 illustrates the group of interest for the analysis. In a light blue the LMR of Munich is shown. The darker lines reflect the county borders. Each dot represents one high school. Green dots are part of the doughnut, and therefore, in our group of interest. The green area is the convex hull of these high school and illustrates roughly the doughnut. Red dots are high schools which are not part of the analysis, either because they are too close to the city centre or too far away from it. The other blue areas are the convex hull of the metro stations (inner blue area) and the suburban train stains (outer blue area). The green doughnut has a relevant distance to them in each direction.

[11] One that goes to the University of Munich and one to one campus of the Technical University of Munich.

[12] The distances are the arithmetic mean of the distance between Mary's Square and the public transport's terminal stops.

Figure 1: Selection of the group of interest



Note: High schools are shown as dots. Green dots are part of the doughnut, whereas red dots lie in the inside circle or outside the doughnut. The green area is the convex hull of the green schools. The inner blue area is the convex hull of the metro stations, the outer blue area is the convex hull of the suburban train stations, and the bright blue ground is the shape of the LMR of Munich, with the darker lines showing the counties within the LMR.

We have to define movements based on the location of high school, chosen university, and first job.[13] We code moving as a change in the LMR. According to the definition of LMRs, commuting times are acceptable within these areas but not between them.[14] We argue that this is true, no matter whether a person commutes to her job or her university. We code "moved for university" as one if a graduate is not enrolled at a Munich university. Analogously, if the indicated first residence after graduating from university lies in another LMR than the

[13] This accounts especially for the first moments, as the survey does not include questions about moving out from the parents' home after graduating high school.

[14] The concept of labour market regions (*Arbeitsmarktregion*) was developed by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). LMRs are usually sharply defined by the counties (*Kreise*) and federal states (*Bundesländer*) and are defined as regions where workers rather commute within, but not between. More specific, LMRs are defined as regions where at least 65 per cent of all wage earners with residence in this region also work in this region and that at least 65 per cent of all paid jobs are filled with domestic workers (stemming from this region). Additionally, commuting times within an LMR should not exceed 45 minutes one way. For more information see https://www.bbr.bund.de/BBR/EN/Home/_node.html, accessed on 28.09.2020.

university and than Munich, we define the graduate as having "moved for job".[15] Formally, we regress "move for job" (Y_i) on "move for university" ($\hat{X}_i$):

$$Y_i = \beta_0 + \beta_1 \hat{X}_i + \beta_2 parental_i + \beta_3 Z_i + \beta_4 county_i + \epsilon_i, \tag{4.1}$$

where we are interested in β_1. Additionally, we control for parental characteristics ($parental_i$), further control variables (Z_i), and the county the graduates went to high school ($county_i$).[16] The parental characteristics $parental_i$ contain in the base specification the father's occupational status.[17] The first stage is as follows:

$$X_i = \alpha_0 + \alpha_1 distance_i + \alpha_2 parental_i + \alpha_3 Z_i + \alpha_4 county_i + e_i, \tag{4.2}$$

where $distance_i$ stands for the distance to university.

5 Data

5.1 Bavarian Graduate Panel

To investigate the movement decision, where to enrol at a university, as one determinant of early regional job mobility, we use the Bavarian Graduate Panel (*Bayerisches Absolventen Panel*, BGP), a survey amongst graduates from Bavarian universities.[18] The BGP is conducted by the Bavarian State Institute for University Research and Development (*Bayerisches Staatsinstitut für Hochschulforschung und Hochschulplanung*, IHF) and focuses on the transition from university to the labour market. The aim is to cover all Bavarian universities and all fields of study.[19] The survey is conducted approximately every two to three years with the first cohort interviewed in 2003/04 and the fourth and last in 2013/14. The paper-based questionnaires are sent to their respective graduates by the universities and are afterwards collected and processed by the IHF.

In the survey, graduates are asked about their course of study, their first working positions, socio-economic indicators and when and where they received their university entrance

[15] Explicitly, return migration for the first job after graduating from university is defined as not having moved for the first job.

[16] The control variables Z_i contain gender, age, whether the graduate has children, and her partnership. The partnership can either be without a firm partner, having a firm partner but not living together, or living with a firm partner. Moreover, the high school grade, the broad subject, whether the graduates did an internship during the time at university and whether she lived abroad are included in Z_i.

[17] We decided to control only for the father's occupational status as it might be the best proxy for family income. We do not include the father's educational level or the same variables for the mother. We did this due to the high correlation between these variables to avoid collinearity. Results with other specifications are shown as robustness checks.

[18] More information can be found at https://www.bap.ihf.bayern.de/en/bap-home, accessed on 10.09.2020.

[19] Due to data protection, a field has to have at least 10 graduates in the respective survey year to be included.

diploma. A distinct feature of the BGP is the possibility to track persons spatially at a granular level since graduates indicate the postcode of the high school they graduated from, the name of the university where spatial information can be generated easily and the postcode of their first working position.[20] Graduates are interviewed up to three times after graduation. While the first wave takes place roughly 1.5 years after graduation with a focus on the transition from university to the labour market, the second (approximately five years after graduation) and third (approximately ten years after graduation) are more focused on employment history and job training.

We use the first wave of the BGP and concentrate on the two graduation cohorts of 2005/2006 and 2009/2010. We focus our investigation on these two cohorts as they offer the biggest overlap of variables as the questionnaires of the BGP vary relatively strong between cohorts. The 2013/14 cohort has no detailed information on the high school location and is therefore not considered. In total, 22,296 graduates participated in the first interview of the two relevant cohorts.[21]

The location of all universities is shown on a map in Figure A.1 in the Appendix. This figure illustrates the high density of universities in Bavaria and supports our argument that students have a high variety to choose from when they start to study in Bavaria.

As the survey took place at Bavarian universities, we have no information on graduates who went to high school in Bavaria but did not go to a Bavarian university. Hence, we can only analyse mobility patterns of graduates who limited their university choice to the state they went to high school.[22] However, it is not problematic for our identification that we only investigate movement to a university within Bavaria for two reasons. First, German students are not very mobile between states. Statistics from the Federal Statistical Office (2019) show that roughly 60 per cent of all freshmen in Bavaria also stem from Bavaria and that only 20 per cent of all Bavarian high school graduates who decide to study leave Bavaria for enrolment.[23] Second, also in the general population more than 85 per cent of all relocations in Germany happen within the same state.[24] Moreover, we have no information on workers without a university degree. Hence, our results are also conditioned on graduating university. The fact that we only have university graduates might be less critical as university graduates are more mobile.[25]

[20] Graduates do not directly indicate the postcode of their employers' office but the postcode of their private address after beginning to work.

[21] In 2005/06 6,819 graduates participated which equals a respondent rate of 38.9 per cent. For the cohort 2009/10, the respondent rate was 37.5 per cent with 15,477 interviewed graduates.

[22] For job mobility, this limitation does not hold anymore. We observe graduates from a Bavarian university if they move to another state or even to another country.

[23] This percentage corresponds to the year 2014, the values for other years differ only slightly.

[24] See e.g. http://www.postadress.de/umzugsstudie.pdf, accessed on 23.09.2020.

[25] See e.g. http://www.postadress.de/umzugsstudie.pdf, accessed on 23.09.2020.

5.2 Descriptive statistics

Munich based high school graduates are relatively homebound. Only 22 per cent of all graduates from a Munich high school in our data leave Munich when entering university. This is among the lowest rates compared to other LMRs. Regensburg, where a small and lively student city is located, has a similar share. This tendency also holds for the second movement when people are deciding about where to enter the labour market for the first time after graduating from university: Only 13 per cent of all university graduates from Munich in our data decide to leave Munich for the first job. This is by far the lowest rate. Ingolstadt, the LMR with the second-lowest share, which is known for the car manufacturer Audi, has a share of 26 per cent. This shows that a majority of high school graduates from Munich stays in Munich both for university and the first job. About half in our data (58 per cent) of those who leave Munich to study return when entering the labour market. This is also by far the highest rate and shows again the strong labour market and bound people from Munich have to their hometown.

When it comes to our main group of interest, namely students who stem from Munich's suburban region, besides Munich the cities of Augsburg, Passau and Regensburg are the favourite destinations to start their university studies. Whilst Augsburg is still relatively close to Munich, Passau with 170 km and Regensburg with 125 km distance are relatively far away. The locations of the first job are geographically very widespread and include regions with smaller and bigger cities, within Bavaria but also in other parts of Germany or abroad.

5.3 Restriction of the data set

When dropping observations with missing locations, our data set for the cohorts 2005/06 and 2009/10 consists of roughly 9,500 interviewed individuals. For our purpose, we have to restrict the sample in several dimensions. We exclude more than 2,000 bachelor graduates since they are interviewed while still succeeding another degree (mostly a master's degree) and therefore are still students. The sample decreases further by implementing restrictions with respect to the high school location: We exclude nearly 6,000 graduates as they went to a high school which is not located in the Munich LMR. Finally, we take an additional restriction by the distance to the city centre and remove graduates that went to a high school too close or too far away from the city centre. This removes nearly another 1,000 graduates. Hence, the final sample of interest shrinks to roughly 350 observations.[26]

[26] Some of the graduates have several characteristics which lead to a drop. Few are dropped as they have not started working when they answered the survey.

6 Results

6.1 Effects of distance and early movements

The results presented in this section show a statistically significant causal effect of early mobility (for university) on later mobility (for the first job). Our results suggest that a person who has moved for university is around 60 percentage points more likely to move when entering the labour market compared to a person who stayed in Munich for university.[27]

The results are presented in Table 1a. In columns 1 to 3, OLS estimates are presented, whereas columns 4 to 6 show IV estimates. In each of these parts, first, our preferred specification with dummy variables for the county and controls for parental characteristics are shown. Second, all controls but the county are removed, and third, more control variables are added, for robustness.

The OLS results are weakly statistically significant at the 10%-level and show an estimate of .08 when parental controls are included. The fraction of movers for moving for the first job is 8 percentage points higher compared to non-movers. The estimate stays robust when the parental controls are removed. When more controls are added the estimate drops slightly and loses statistical significance.

In comparison, the IV results show a higher effect of .59 and a higher significance level. Hence, a person who has moved for university is 59 percentage points more likely to move when entering the labour market compared to a person who stayed in Munich for university. The estimate stays robust again when the parental controls are removed. The students' parental background is less decisive in our setting. This is not surprising as we analyse movements but not the general decision to study or not, which is highly influenced by parental characteristics as, e.g., Karen (2002) shows. In contrast to the OLS, the IV estimate increases slightly and does not loose statistical significance when more control variables are added.

From the OLS to the IV, the estimate increases from around .1 to around .6. Hence, the OLS estimate is downward biased. A priori, the direction of the bias is unclear. We can think of two omitted variables: preference for mobility and financial restrictions. An unobservable preference for mobility would bias the estimate upwards. However, financial restrictions or the parents' willingness to pay for rent at a new place would bias the estimate in the other direction. Comparing the financial side and personal preferences, it is likely that the financial effect is dominating and that we, therefore, estimate a downward biased coefficient.

[27] The probit model gives a better interpretation. The marginal effect from the probit model shows that a graduate who moved for university is two times more likely to move for the first job than a graduate who studied in Munich. As both the dependent and the explanatory variable are dummies, one might estimate a probit IV. However, linear models are easier to interpret. Therefore, we present linear specifications. All results estimated applying a probit model are similar to the linear model and can be shown upon request.

The first stage estimate is in all specifications around .02, meaning that a 1 km increase in the distance increases the probability of moving for university by 2 percentage points. Hence, a high school graduate close to the outer border is roughly 30 percentage points more likely to move to another university than a high school graduate close to the inner border. Hence, the instrument is relevant.

The reduced form (intention to treat) is presented in Table 1b, showing a highly statistically significant and robust effect across all specifications of around .013. The distance to university is correlated with the decision to move when taking the first job. The estimate is lower than in the first stage.

Table 1: Regression results

(a) OLS & IV

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) IV
Moved for university	0.0837*	0.0849*	0.0605	0.590**	0.526**	0.651**
	(0.0487)	(0.0476)	(0.0510)	(0.266)	(0.244)	(0.275)
First Stage						
Distance to university				0.0228***	0.0237***	0.0228***
				(0.00603)	(0.00594)	(0.00594)
county FE	X	X	X	X	X	X
parental controls	X		X	X		X
further controls			X			X
Observations	359	367	346	359	367	346
F-statistic				14.309	15.953	14.701

(b) Reduced form (intention to treat)

	(1) Moved for first job	(2) Moved for first job	(3) Moved for first job
Distance to university	0.0134**	0.0124**	0.0146***
	(0.00549)	(0.00529)	(0.00561)
county FE	X	X	X
parental controls	X		X
further controls			X
Observations	359	367	346
R^2	0.039	0.032	0.082

Note: Dependent variable: Moved for job. Instrument: Distance to university. Robust standard errors. All results contain fixed effects for the county. Parental Control: father's educational level. Further controls: gender, age, children, partnership, high school grade, university subject, internship, and lived abroad. Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

6.2 Threats to identification

As in any instrumental variable approach, it is important to ensure the validity of the exclusion restriction. We challenge the exclusion restriction by changing the instrumented variable. We regress the same instrument against all observable controls and show that only for two out of 32 variables the estimate shows statistical significance at the 5%-level (Figure A.2 in the Appendix). One could think of a selection problem in the data as only high school graduates who finished university are considered. For instance, it might be argued that with higher distance to the university, intellectual capacity of the enrolled students decreases. On the other hand, only students with excellent high school grades might be willing to enrol at a university even though they are living far away from it. At the same time, students from closer located high schools might enrol at a university even with less excellent grades. We evaluate this argumentation by taking the high school diploma (average) grade as a proxy for intellectual capacity and regress it on the instrument. The results are not statistically significant.

The observed bias could also be rooted in another selection into the sample. With higher distance, the likelihood to enrol at a university is affected as well (e.g. Kjellström and Regnér, 1999; Frenette, 2006 & Spiess and Wrohlich, 2010). However, this was shown in different setups and with longer distances only. Nevertheless, if distance drives the decision not to study, those who enrol at a university might be those that only face the decision to move or not to study, instead of to move or not to move when enrolling. We observe that with distance to university, the number of observations per high school is not affected.[28] Hence, this argument does not hold in our case when looking at commuting distances between 15 and 30 km. Unfortunately, our sample only contains university graduates. Therefore, we cannot directly test whether distance influences the overall decision to study.

Last, looking at the map in Figure A.1 in the Appendix illustrates that the LMR of Munich is relatively close to the city of Augsburg. This could lead to the possibility that the University of Augsburg becomes the relevant university for some individuals. However, this proximity does not affect our results as we look only at the direct suburban region of Munich. Even the high schools closest to the outer border of our group of interest are much closer to Munich than to Augsburg. Also, public transport in this area is much more concentrated towards Munich than Augsburg, meaning that commuting to Munich is easier and faster than to Augsburg.

6.3 Robustness

Our results stay robust against a broad variety of observable controls as shown in the last column of Table 1. Additionally, applying the logarithm of the instrument we can show that

[28] Results can be shown upon request.

results remain unchanged. This ensures that the results are not driven by observations with a high distance to university.[29] In our main specification, we only control for the father's occupational status, arguing that it is the best proxy for family income and that it is correlated with the father's educational level and the mother's characteristics. Figure A.3 in the Appendix shows that the results stay robust when varying parental controls or adding more parental controls. The first estimate shows the baseline (Table 1a, column 4). The second estimate contains the mother's occupational status instead of the father's occupational status. The next two estimates take the respective educational level instead of occupational status. The final three estimates combine these controls: first, the educational level of both parents is taken; then, the occupational status of both, and finally, both the educational level and the occupational status of both parents. The results show that including these controls do not alter the direction of our results significantly.

Moreover, we follow an alternative administrative approach by taking all observations in the Munich LMR which are not located in the administrative district of the city of Munich (Table A.1 in the Appendix). We present robustness checks with different cut-off points. Instead of setting the inner bound at 15 km, we expand the group of interest step-wise by varying the inner bound between the values 10, 12.5, and 15 km. For the outer bound, we expand the group of interest step-wise again by varying it between the values 30, 32.5, and 35 km instead of 30 km. Dropping the administrative district of the city of Munich and varying the distances also shows robust results (Figure A.4 in the Appendix). We take other measurements than the street distance. We show that our approach is still suitable and results stay robust if the linear distance or travel time (by car) is taken instead of street distance.[30]

7 Conclusion

A high level of mobility yields to benefits on both sides of the labour market: Mobile workers earn higher wages whilst employers can choose from a broader pool of workers if the respective labour market exhibits high levels of mobility. In our investigation, we step back one stage and investigate the decision to move or stay when enrolling at a university as a determinant for early regional job mobility. To do so we employ an instrumental variable approach to construct an exogenous movement when deciding about the place of university enrolment. We add to the literature by investigating migration starting in an agglomeration from where high school graduates move to other universities in the same state and by analysing a specific group: university graduates stemming from a suburban region.

[29] Results can be shown upon request.
[30] Results can be shown upon request.

We show that the decision to leave the home LMR for university is of great importance for later job mobility. Our results suggest that those who enrol at a university outside of their home LMR are twice more mobile when entering the job market. We are aware of threats to the identification strategy and show (non-existing) correlations of the instrument with the control variables. We address the issue of sample selection as we only observe university graduates from Bavaria. Finally, we apply several robustness checks, one showing that the selection of the area we investigate does not affect the results. The results are also robust against a variety of control variables.

From a policy point of view, the results shed new light on the importance of the choice of university. As more mobile workers increase the efficiency of the labour market and thus deliver important surplus for the general welfare, educational policies regarding universities should incorporate this aspect of mobility more intensely. If increasing the fraction of "non-local" students can help to increase labour market efficiencies, financial incentives for non-locals might be a relatively cheap way to improve welfare.[31] Whilst it may be relatively hard to motivate settled workers to move to another LMR, incentivising young prospective students to leave home to study might be an easier way to increase the match quality of labour markets. These incentives could be more cheap housing closely located to universities for non-local students. These student dorms with similar restrictions already exist, however, not in a sufficient number. One should notice that these policies might not benefit the LMRs where they are applied. This is since high school graduates who move to a certain university due to the low rental costs might move again to another LMR for the first job.[32] Therefore, these policies should be implemented at least at the state level.

[31] Additionally, it may increase diversity and the society may profit from more inter-regional exchange.
[32] Noteworthy, if they move again, they also move to new places instead of returning to their home LMR.

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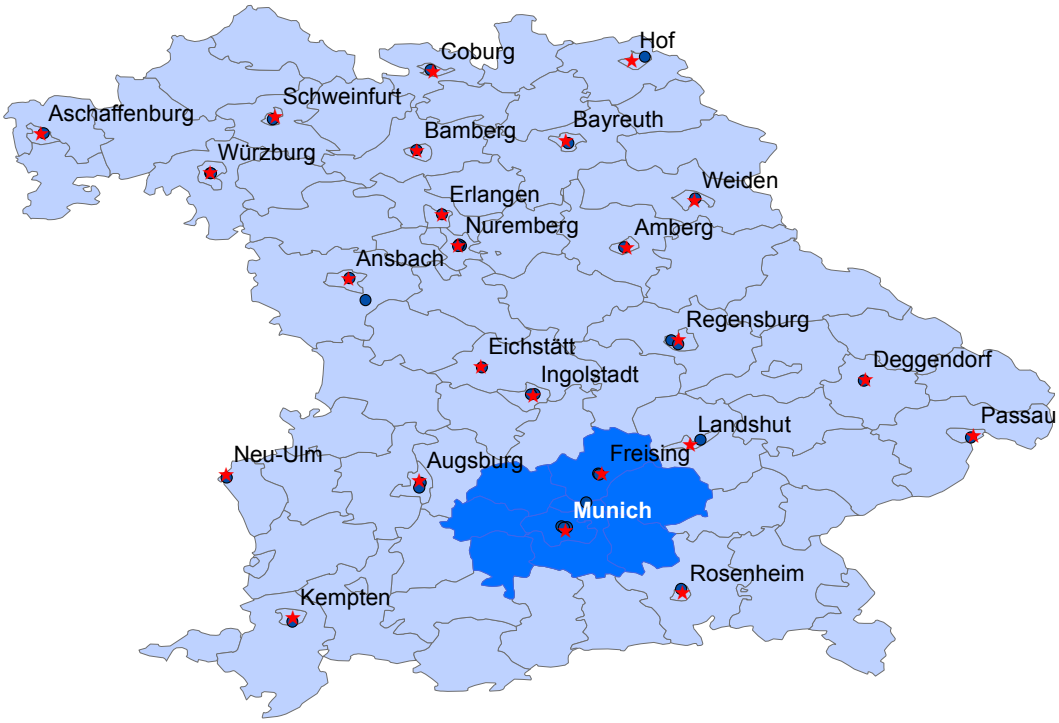
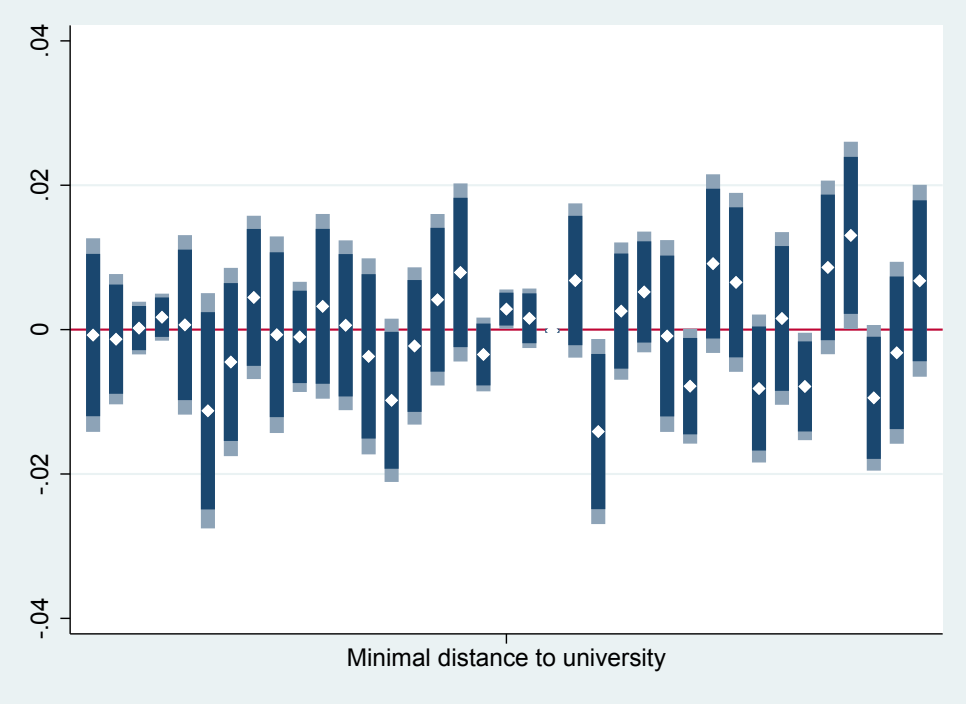
A Appendix

Figure A.1: Overview of all Bavarian cities with a university (of applied sciences)



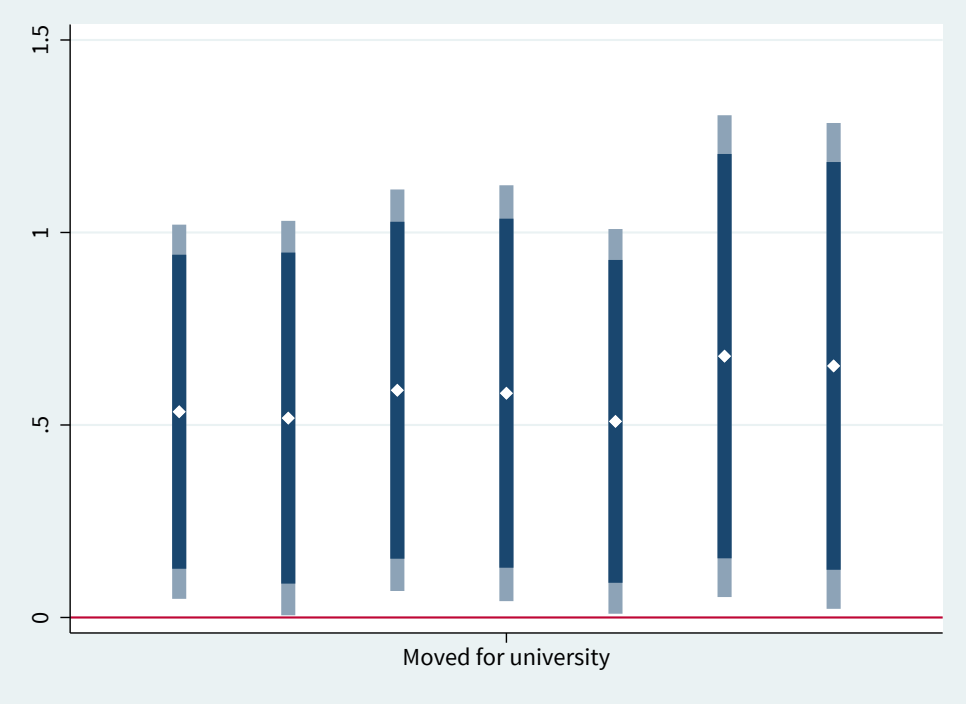
Note: In this map of Bavaria with county boundaries, all cities with a university (of applied sciences) are named and marked with a red star. Each university (of applied sciences) is shown with a blue dot. The LMR of Munich is made more visible with a different blue tone.

Figure A.2: Exclusion restriction (with parental controls)



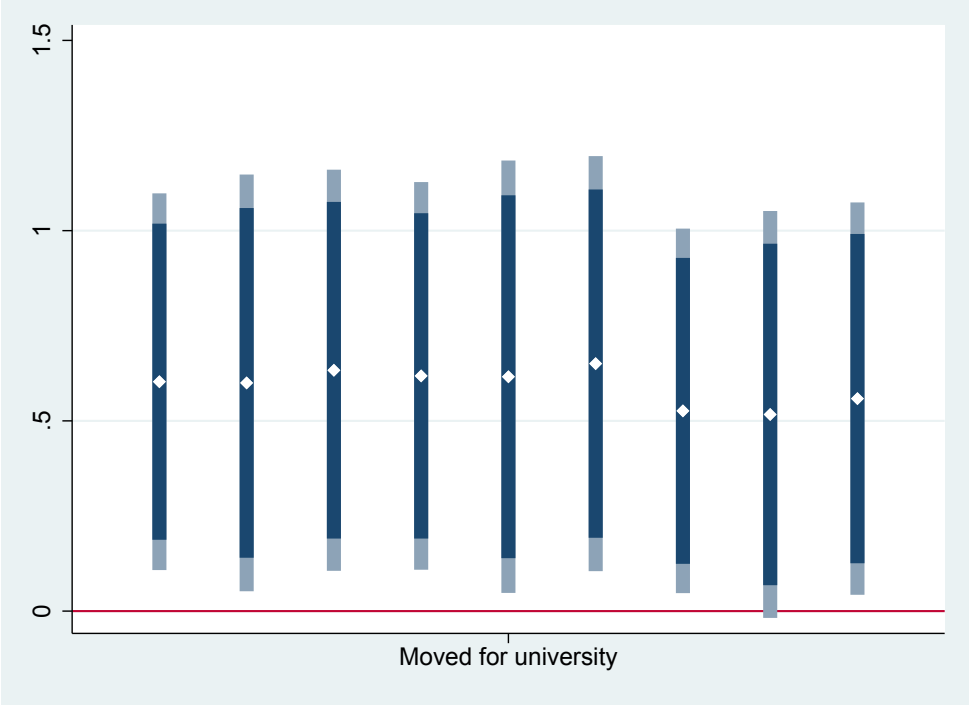
Note: All results contain fixed effects for the county. Parental Control: father's type of job. The control variables are regressed on the instrument (distance to university).

Figure A.3: Robustness of estimates when controlling for different parental characteristics



Note: All results contain fixed effects for the county.

Figure A.4: Robustness of estimates when changing distances of the borders and leaving the city-county of Munich out



Note: All results contain fixed effects for the county and controls for the father's education.

Table A.1: Robustness: Remove only city-county of Munich

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) IV
Moved for university	0.103***	0.105***	0.0771**	0.713**	0.686**	0.716**
	(0.0372)	(0.0367)	(0.0382)	(0.306)	(0.305)	(0.315)
county FE	X	X	X	X	X	X
parental controls	X		X	X		X
further controls			X			X
Observations	590	602	566	590	602	566
F				8.652	8.367	8.403

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variable: Moved for job. Instrument: Distance to university. Robust standard errors. All results contain fixed effects for the county. Parental Control: father's education. Further controls: gender, age, children, partnership, high school grade, university subject, internship, and lived abroad. The sample contains all graduates which went to a high school in the Munich LMR but those who went to a high school in the city-county of Munich.