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Geographical Educational Path: A new geospatial approach

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Abstract. The mobility of young people during their education has a spatial pattern. This paper presents a new proposal to study the geographical educational path of people. Its elements are points (addresses of schools) and lines connecting successive schools of each of the researched persons. The results can be useful for detecting patterns of educational pathways in different countries, social groups, and comparing them. Indirectly, they can be used to study mobility, gentrification processes in academic cities, and to indicate the range of schools studied. The study was carried out among a group of students at the University of Lodz. Visualisation and analysis of their geographical educational path showed that most of them attended schools near their place of residence, which indicates their low mobility during their studies. Surprisingly, there was a lack of mobility when entering a master's degree program. The results showed low mobility of students and indirectly of their families during the education period. The all research process would be carried out using Geographical Information System (GIS) tools.

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1. Introduction

The contribution of geography to the social sciences is to incorporate geographically space into their research. It is growing and is related to the interdisciplinary perspective of research and the'spatial turn' in the social sciences (Warf & Arias, 2009). This also applies to education research. Geographical concepts have been significantly and increasingly used in education research (Taylor, 2009), (Gulson & Symes, 2007). The role of space is relevant in many education studies in the context of analyses of territorial equity and educational governance at different levels (from local, regional, national, and international). Research on education in conjunction with mobility focused on finding links between the duration of education and mobility of the workforce, e.g. (Machin et al., 2012), education and wages for women and men (Myck et al., 2009), unemployment, poverty and location of places of residence (Wolbers, 2000), (Freeman, 2010), (Crivello, 2011) and globalisation in education (Findlay et al., 2012), (Stromquist & Monkman, 2014), the impact of the location of schools on the limited possibilities of using them by certain social groups (Hamnett & Butler, 2011). They all share a less geographical and more economic aspect. Social research has addressed, among others, the issues of mobility and human activity based on data collected in social media (Ebrahimpour et al., 2020), the impact of geographical distance changes caused by life events on frequency of social interactions (Sharmeen et al., 2014), and the issue of the quality of geographical space around schools in relation to social justice (Bruno, 2000).

The mobility of young people depends on many temporal and spatial as well as social, economic and other factors (Hägerstraand, 1970), (Jones & Jamieson, 1997), (Cairns, 2010), (Kiniorska & Brambert, 2021). At an early stage in life, their parents or guardians have a strong influence on their change of residence and choice of school (Kučerová et al., 2019). Over time, young people have an increasing influence on the choice and location of their schools. The demand and supply of places at reputable schools are not balanced. This is linked to the interests and intellectual capacity of young people, but also to the financial situation of their families, especially in higher education, e.g. university. The distance between successive schools is usually increasing, especially among young people living outside of academic centers. This increases the mobility of young people, understood as travelling from home to school, or the need to rent accommodation for the duration of their studies. There may be regional conditions for school selection and mobility in different countries, but the path itself is similar, as it involves having to complete one school in order to sign up for another. Each school is located in a certain geographical space and has a unique address. Mobility between these addresses can be presented in both time and geographic space. It has been called a geographical educational path.

The geographical educational path includes a collection of successively completed schools and links between them during the period of education, taking into account the type of school and its geographical location. Depending on the number of schools, it may vary in length and number of items. It consists of school address points and lines connecting successive schools (simple or using transport networks) and may optionally include point or line attributes. It can be specified as (Jażdżewska et al., 2022):

$$GEP = \{S_1, S_2, \ldots S_n; L_{1,2}, L_{2,3}, \ldots L_{n-1,n}; A_n S_1, A_n S_2, \ldots A_n S_m; A_{n-1,n} L_1, A_{n-1,n} L_2 \ldots A_{n-1,n} L_r\}$$

Where *GEP (Geographical Educational Path), Sn*= address point of school *n (POIn), Ln-1, n*; line connecting points S_{n-1} and S_n; $A_m S_n$ – school attributes, $A_r L_{n-1}$, *n* – line attributes; *n* – number of schools completed; *m* – number of school attributes, *r* – number of line attributes.

The main purpose of the article is to propose a geographical educational path research on a selected group of people. The social group selected for the study included students, and the article indirectly presents their mobility linked to their learning cycle and its spatial extent. The studies were retrospective in nature; the first examined the spatial extent of the origins of the surveyed students, as well as the time of their travel to the faculty. In the second phase, the entire geographical educational path of the student group was analysed.

This retrospective research is intended to illustrate one application of the methodology.

2. Study area

A geographical educational path may be studied at any time during the life of selected persons and during any stage of their education. It should be kept in mind that the education cycle may vary from country to country and that it can undergo reforms within a single country. In Poland between 1999 and 2016, the following order of education was in place (Fig. 1): pre-primary education (only mandatory for 6-year-olds), primary education – six years, junior high school (middle school) – three years, and secondary schools: high school (three years) or technical college (four years). In their last year of education, students take a compulsory exam, which verifies their skills obtained during education (Hnatiuk, 2016). Higher education is carried out in accordance with the Bologna Declaration[1] in a three-cycle system of bachelor-master-doctorate (bachelor 3-3.5 years, master 1.5-2 years, doctorate 4 years). Specific study fields like medicine or law have master cycles of 5 years (Kwiek, 2013).

The study of the geographical educational path was carried out among students of geoinformation studying at the Faculty of Geographical Sciences of the University of Lodz (Poland) in the academic year 2016/2017. In that year, the total number of geoinformation students in bachelor and master programs was 151 (70+81). There were no big gender differences between different years, with the share of women ranging from 41.77% to 58.6%. These were people born between 1989 and 1997, that is, between the ages of 20 and 28.

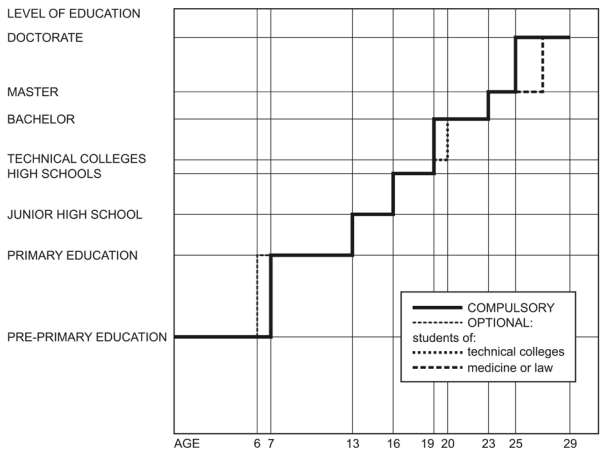

Fig. 1. The cycles of the Polish education system (macro level) (1999-2016)
Source: own elaboration

The geographical educational path of the students examined in the first cycle consisted of at least three schools: primary, middle, and secondary (high school/technical college). In the case of second-cycle students, they had to have completed at least four stages of study.

3. Data and research methods

Tracking students' geographic pathways required obtaining information about where they lived at the time of recruitment. Thanks to the kindness of the faculty management, a database was obtained from the USOS computer system of the University of Lodz. Detailed data on graduate schools were then obtained directly from students in the selected field of study. One of three data acquisition options was considered: an email survey, an in-person interview, and a telephone interview (Frankfort-Nachmias & Nachmias, 2000). The email survey was chosen. The advantage of this type of survey is mainly easy access to the target group. The survey was emailed to all geoinformation students through the university's USOS platform. The survey was created using Google Docs Forms. This survey method generated low costs, access to the entire population, and anonymity, which is an important aspect for respondents. Additionally, it gave them time to think about the correct answers or to check their answers in relevant sources (e.g., the question about the school address). However, its main disadvantages are usually low response rates and lack of control over one's answers. The survey questions were answered by 55.6% of the students (58.6% (of first-degree students and 53.1% of second-degree students). It can be assumed that the results obtained on this basis will be representative (Table 1).

The survey questions are as follows.

- first, information on your educational path and completed schools: primary, middle (junior high school) and secondary (high school or technical

Table 1. Percentage of respondents by sex, degree of study (N=83)

Degree	Sex		
	Female	Male	Total
	%	%	%
I (bachelor)	59.4	57.9	58.6
II (master)	62.2	41.7	53.1
Total	61.0	50.0	55.6

Source: author's own work.

college). The full name of each finished school and its address (street name, building number, postal code, town, province) had to be given.

- second, the address of permanent residence and possible temporary residence for the duration of the study (voivodeship, postal code, town, street, optional block/house number).
- third, the time it takes them to get to the university
- fourth, basic student information's, demographic data (gender, year of birth, year of study), completed undergraduate studies by master's students (major and school).

The second data type was geospatial data, these were:

- Google/Open Street Map (POI) address database,
- state registry of the boundaries and surface areas of the territorial subdivisions of the country and roads, downloaded in shp format from the government's geodesy and cartography institution at www.codgik.gov.pl.

In ArcGIS 10.4.1, a file geodatabase was created, which included acquired external files, pre-processed survey files, and those created during the study, such as the learning path, standard deviation ellipse. The study methodology covered issues related to the use of GIS to carry out the research project. It was decided that the entire research process would be carried out using GIS tools. This involved planning and using the relevant data, pre-processing, creating databases, and selecting relevant statistics and visualisation methods (Jażdżewska et al., 2022)

Spatial analyses were based on maps. It was found that the centrographic measures, centroid and standard deviation ellipse, would work well for analyzing the distribution of points of address (POI) (Sviatlovsky & Eells, 1937) . This basic spatial "centroid" statistic has been discussed and developed over the past 90 years (Aboufadel & Austin, 2006), (Plane & Rogerson, 2015), (Jażdżewska, 2018).

The time taken for the students to reach the university was presented using network analysis (Network Analyst available in ArcGIS), for which address points and the class of road objects were required.

Cartographic methods were used to visualise student residence results: point signatures, circular and vector cartodiagrams, and simple descriptive statistics such as minimum, maximum, arithmetic mean, standard deviation have been calculated.

4. Results

The first part of the spatial analyses presents the spatial distribution of student permanent and temporary address. The travel time to the Faculty of Geographical Sciences was also checked. It can be concluded that more than 75% of them come from the Lodzkie Voivodeship (about 25% from Lodz), 9% from Mazowieckie Voivodeship, and 5% from Wielkopolskie Voivodeship (Fig. 2). In a straight line, the farthest address point was in Suwałki, almost 350 km northeast of the Faculty of Geographical Sciences, while the closest was 0.2 km. This means that those who were more mobile and came to study from other regions of Poland were only a handful and most of them came from the immediate vicinity of Lodz. This is also evidenced by the size and shape of the standard deviation ellipse, which covers the area of Lodzkie Voivodeship and only slightly includes the part of the neighbouring Mazowieckie Voivodeship (Fig. 2). Almost half of the students (40%) lived in a rural municipality before beginning their studies, 31% in small or medium towns.

Based on the questionnaire survey (N=83), it was found that all students who lived outside the Lodzkie Voivodeship moved to Lodz for study time. The others either commuted daily or rented a flat in or near Lodz. Of the students surveyed, 38.6% temporarily changed their place of residence (Fig. 3), the remaining 61.4% did not change their place of residence during their studies, of which 28.4% lived

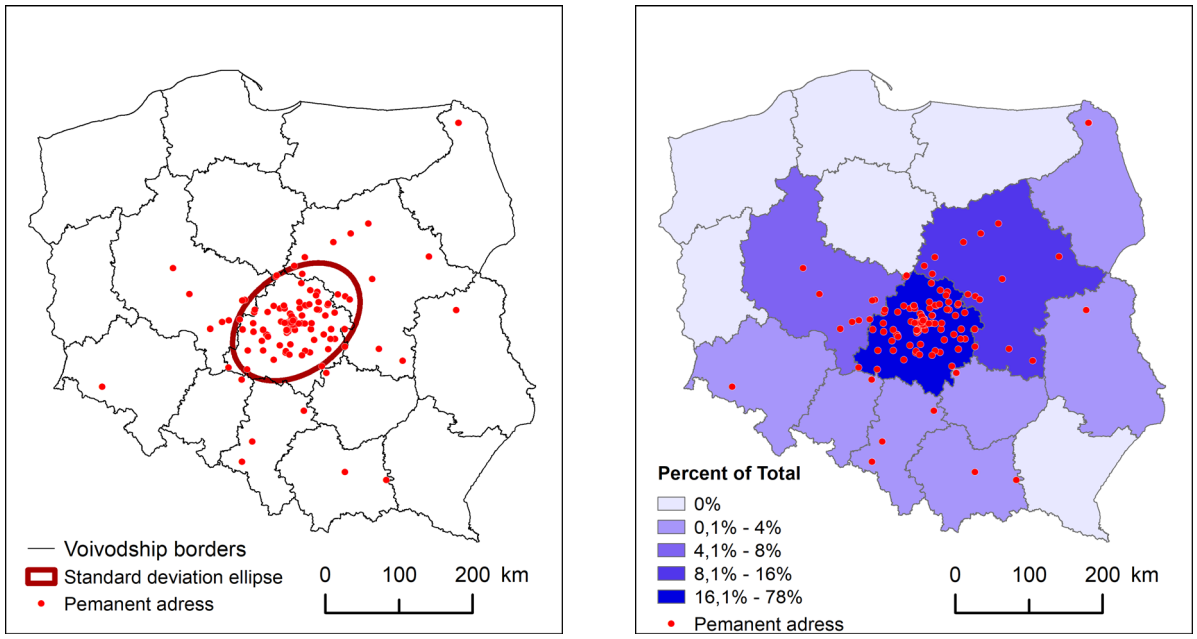

Fig. 2. Place of residence of geoinformation students (N=151) University of Lodz in the academic year 2016/2017 in the administrative division of Poland
Source: own elaboration

in Lodz and 33% commuted to the university from outside the city.

Some students commuted daily from towns located about 60-80 km from the buildings of the Faculty of Geographical Sciences (road distance). However, it is worth noting that the distance from where students live from the university is not always proportional to the time it takes them to get there; what mode of transport they use is also important. Often those who live further away take less time to get there by car than those who live closer but use public transport. The buildings of the Department of Geographic Sciences are located on State Road 14 and are fairly well connected to the surrounding towns. The average travel time to the department was about 21 min, the shortest travel time was 0.5 min, and the longest was 80 min.

Based on the survey (N=83), it was found that it uses a variety of modes of transportation. In the question on the modes of transport that geoinformation students used most frequently, no more than three variants could be chosen, as an assumption was made that there was a choice of modes of transport (tram or bus) and an ability to switch, for example, from train to city bike or tram. The following types of transport could be indicated: walking, cycling, car, urban tram or bus, rail, bus or suburban bus, or other. The vast majority of the 73.9% surveyed chose urban tram or bus as their main mode of transport, one third of the students also walked, but a small group used a bicycle (10%). Commuters from further distances have identified trains (15%), bus or suburban bus (14%), and passenger cars (25%).

At this point in the research, it was known where the young people came from to study at the University of Lodz. The next part of the study concerned the entire geographical educational path of the students.

In the beginning, the distance between the address of the completed primary school and the address of the student during university enrolment (permanent address) was checked. This knowledge was needed to describe the spatial extent of migration during education from the age of 7 to 19 (Fig. 1). It was noted that only three respondents changed their residential address at the same time, one came permanently from abroad (Greece), and two moved about 100 km. In rural areas, students had to travel longer distances from their homes to the primary school (up to 4.5 km), while in cities the distance was much shorter (up to 1 km). The exception was a student who commuted about 2 km to the music school. An analysis of the address points of the schools indicated by the respondents shows

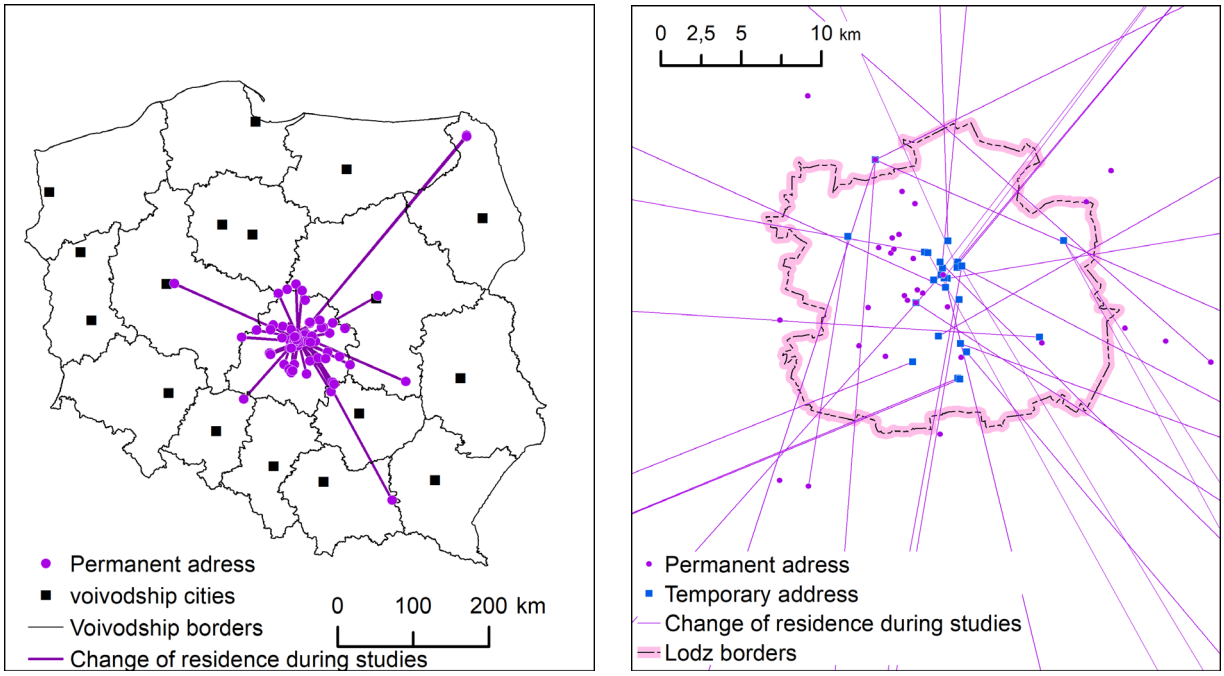

Fig. 3. Change of residence of geoinformation students at the Faculty of Geographical Sciences in the academic year 2016/2017
Source: own elaboration

that they attended primarily schools located near their homes.

After finishing primary school, young people are required to complete high school. They could choose their school. The research showed that the next stage of education was completed close to the completion of the primary school. Half of the respondents attended a junior high school located within 1 km of the primary school (Fig. 4). It was probably the closest junior high school. Analysis of the map (Fig. 5) allows for the conclusion that some people - especially in Lodz - decided to choose a junior high school located at a distance of several kilometers from the primary school. This probably required commuting to school by public transport. It may be assumed that these schools offered a more interesting educational offer. These results are in agreement with another study from 2012, which found that in urban municipalities 67% of primary school children attended a district school (usually the closest) and 90% in rural municipalities. The situation was very similar for lower secondary schools (Herbst & Sobotka, 2014). In the case of two persons, a distance of more than 100 km between schools was observed, and it can be assumed that they changed their place of residence, which resulted in the choice of those junior high schools.

In Poland, there was no obligation to continue education after completing secondary school, but most young people continue it. They have the option to choose a secondary school. In 2012, in Poland, almost 60% of young people graduated from high school and almost 30% from technical college (Herbst & Sobotka, 2014). They are located in larger towns, which results in rural teenagers having a longer way to reach them (Figs. 4 and 6). In a big city, there are many of them, and they offer specialised teaching (mathematics, biology and chemistry, humanities, computer science, and others). For this reason, young people look for a school that meets their requirements, and the distance criterion is not the most important. On the other hand, reputable schools do not accept all applicants but choose the best. The research showed that for 20 % of the respondents the next stage of their education took place in the vicinity of the completed junior high school. However, for most, the distance between schools was longer (Fig. 4). Young people from the Lodz suburb area often commuted to this large city. For two people, more than 100 km between schools was recorded.

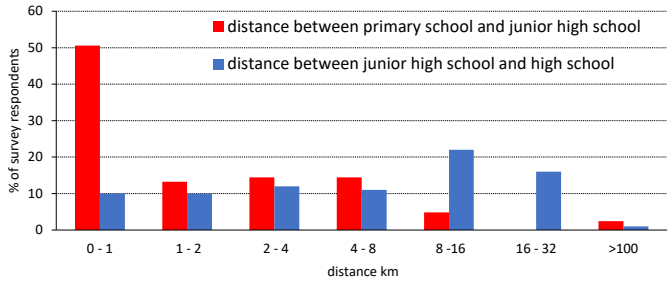

Fig. 4. Frequency distribution of distance [km] between schools of different levels among respondents.
Source: own elaboration

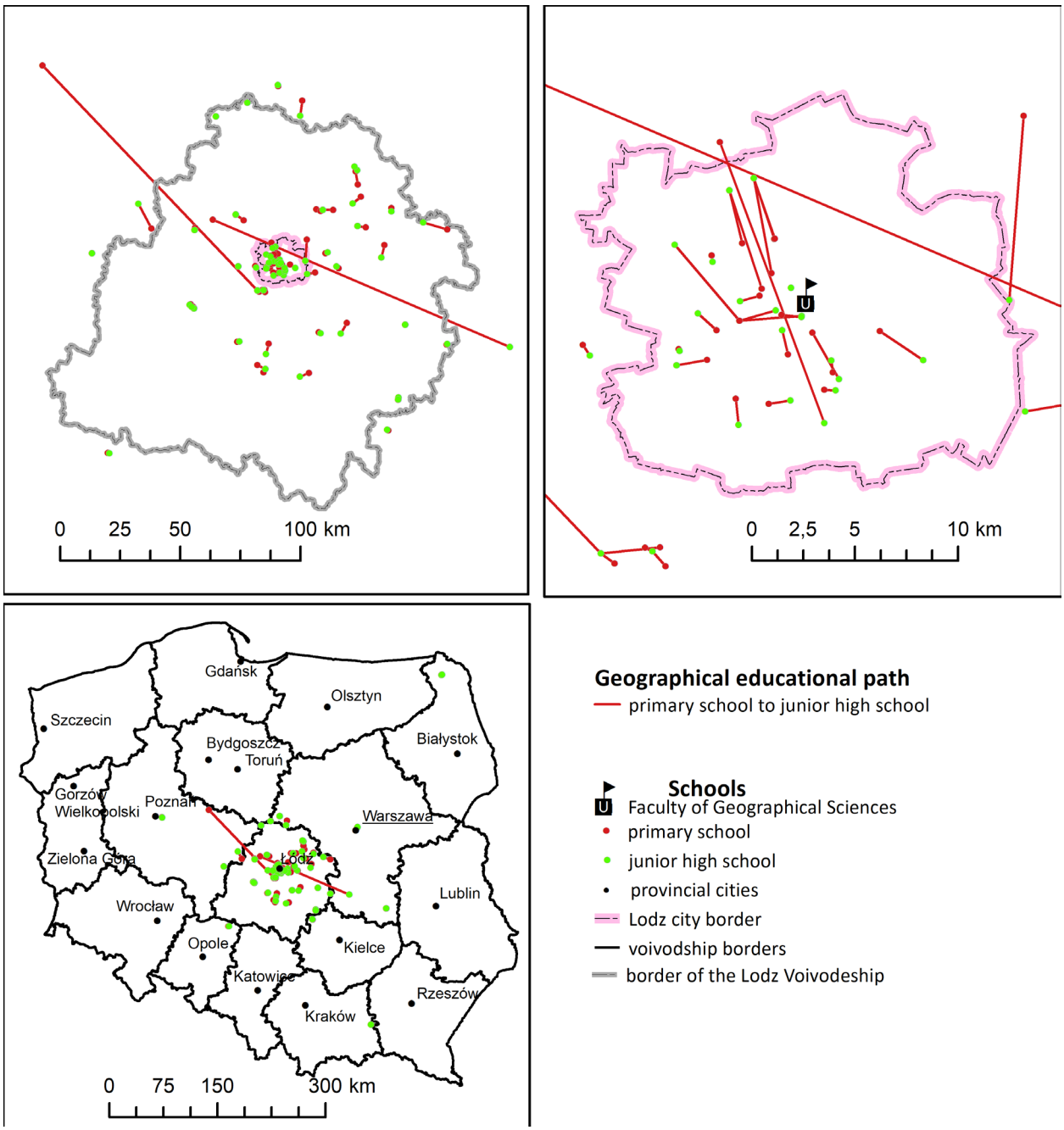

Fig. 5. Geographical educational path of students between primary school and junior high school on the map of Poland, Lodz Voivodeship and Lodz (excluding the person educated in Greece).
Source: own elaboration

One of them moved from Athens (Greece), so the distance between schools was unusual (1600 km), the other from a neighbouring voivodship. Almost everyone completed public schools, with only a handful educated in Catholic schools. High schools dominated among students, with seven people completing the geodesic technical school.

The distributions of the standard deviation ellipses calculated and plotted for each level of education (excluding the person educated in Greece) almost coincide and their centroids are located within the boundaries of Lodz (Fig. 7). This may mean that in the study sample neither the students nor their parents exhibited greater mobility during the 12 years of education. Only single cases of change of place of residence during that period were noted.

Secondary school ends with the matriculation examination, which is one of the requirements for admission to university. Beginning higher education is an important moment in an educational career, also from the perspective of spatial mobility. As the students were surveyed, each of them had to obtain the Matura exam and decided to study

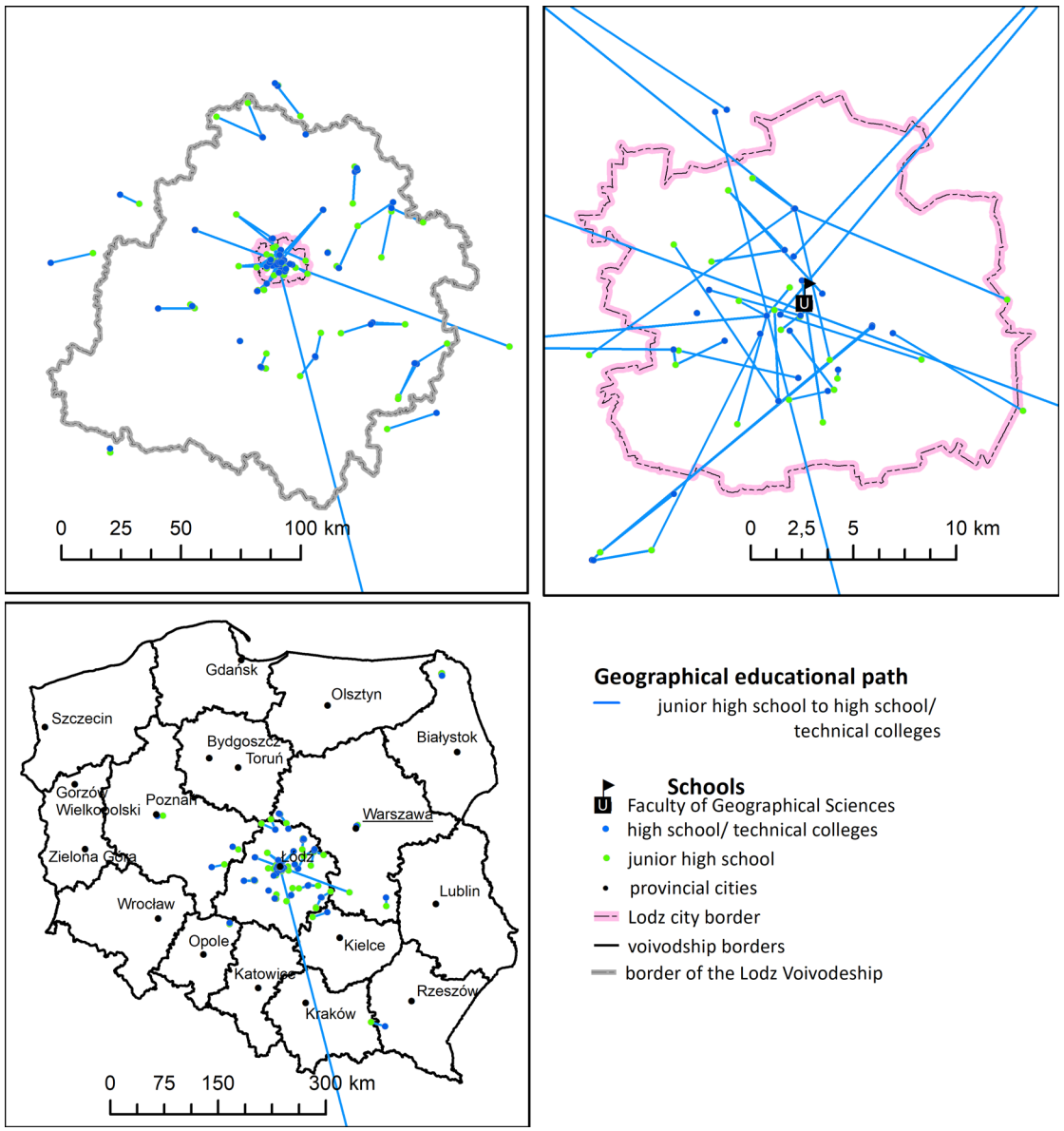

Fig. 6. Geographical educational path of students between the junior high school and the high school (technical colleges) on the map of Poland, Lodz Voivodeship and Łódź.
Source: own elaboration

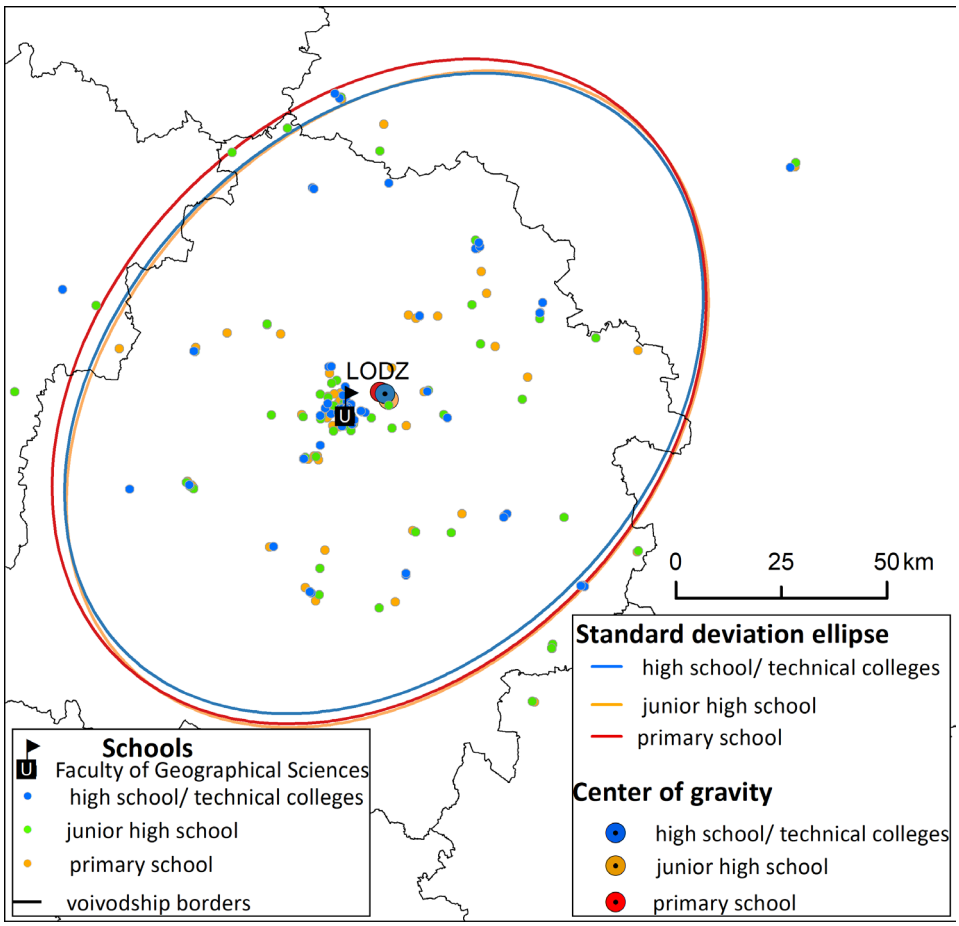

Fig. 7. Distribution of schools completed by the students studied (excluding the person educated in Greece)
Source: own elaboration

at the University of Lodz. It is the largest higher education institution in Lodz. In addition, there were 19 others, among them: Lodz University of Technology; Medical University; the Grazyna and Kiejstut Bacewicz Academy of Music; the Strzeminski Academy of Fine Arts; and the Polish National Film, Television, and Theatre School.

The Faculty of Geographical Sciences is located almost in the geometric center of the city of Lodz. For this reason, graduates (approx. 40%) of Lodz secondary schools (Figs. 8 and 9) could easily continue their education and the distance from their school to the university did not exceed 8 km. The remaining secondary schools in Lodzkie Voivodship were located at distances of up to 64 km, and their graduates accounted for more than 40%. Three secondary schools were the furthest away. A graduate of the Suwałki school located in northern Poland travelled about 400 km and chose to study in Lodz, one from Jasło in southern Poland (about 300 km) and one from Poznań (about 200 km).

The research was summarized by presenting the mobility and geographical educational path of the studied group of students, expressed as a straight-line distance [km] between all stages of study (school's address points were connected with lines (Fig. 9). The smallest distance differences occurred when changing from primary school to middle school, which may be because the middle school was located in the same building or near the primary school. Only one person changed their place of residence and study by more than 100 km during this period. The completion of high school was mandatory for young Poles, while further education was voluntary. In Poland, there are fewer secondary schools than middle schools and they are located in towns with more residents and administrative functions. Students selected secondary schools near

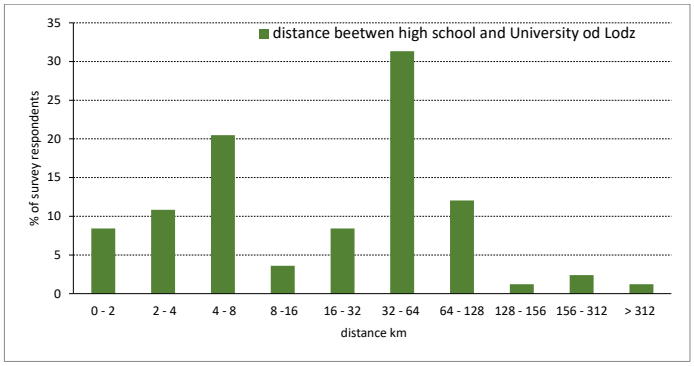

Fig. 8. Frequency distribution of the distance between high school and the Faculty of Geographical Sciences of the respondents.
Source: own elaboration

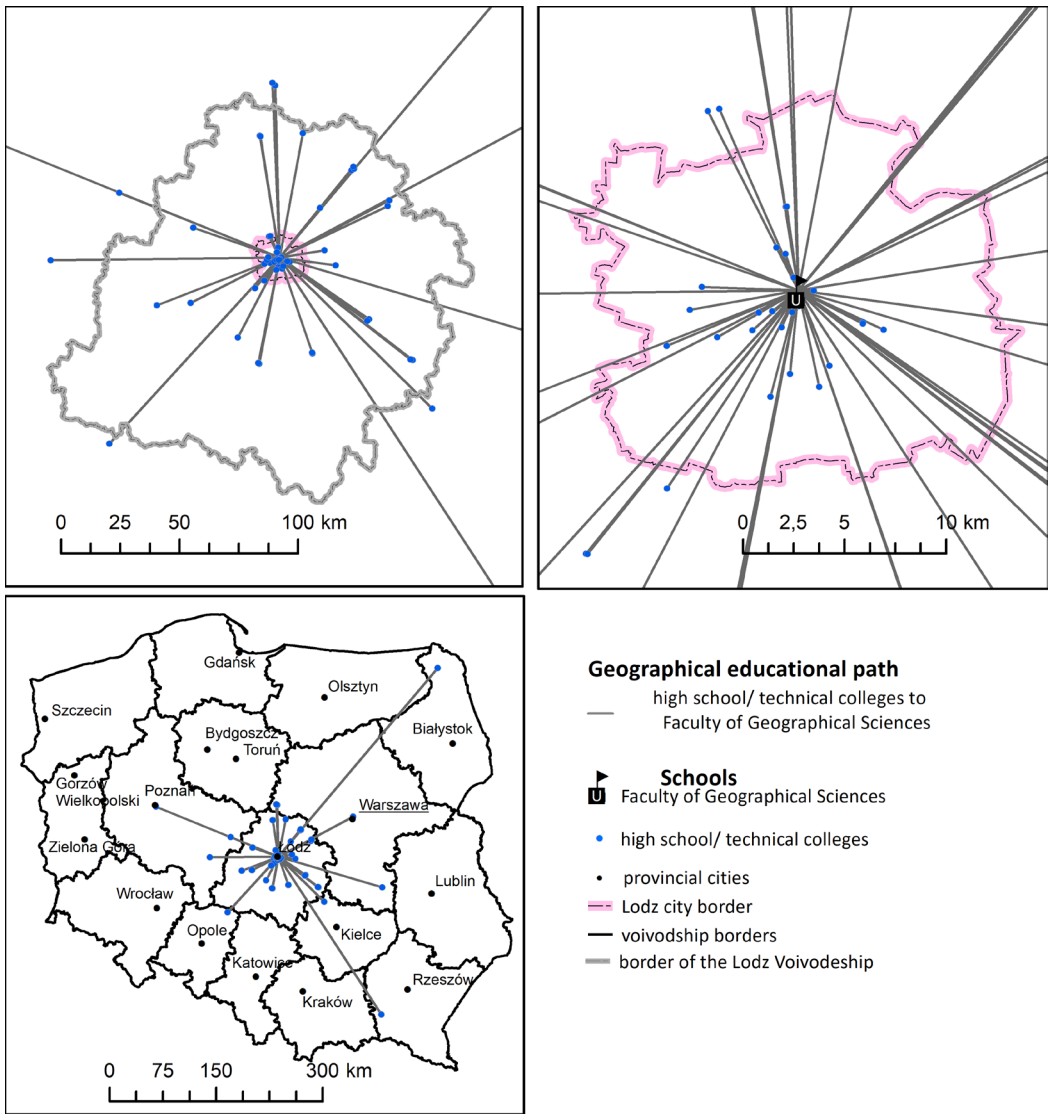

Fig. 9. Frequency distribution of the distance between high school and the Faculty of Geographical Sciences of the respondents.
Source: own elaboration

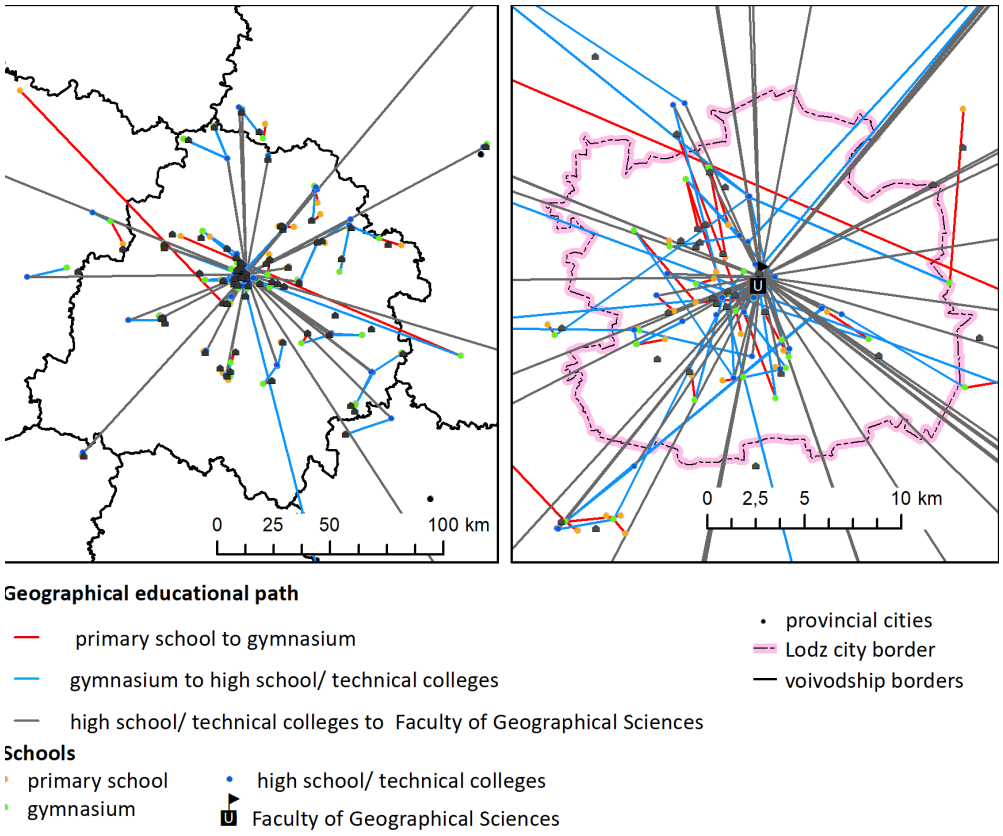

Fig. 10. The geographical educational path of the students, on the Lodzkie Voivodship and Łódź map.
Source: own elaboration

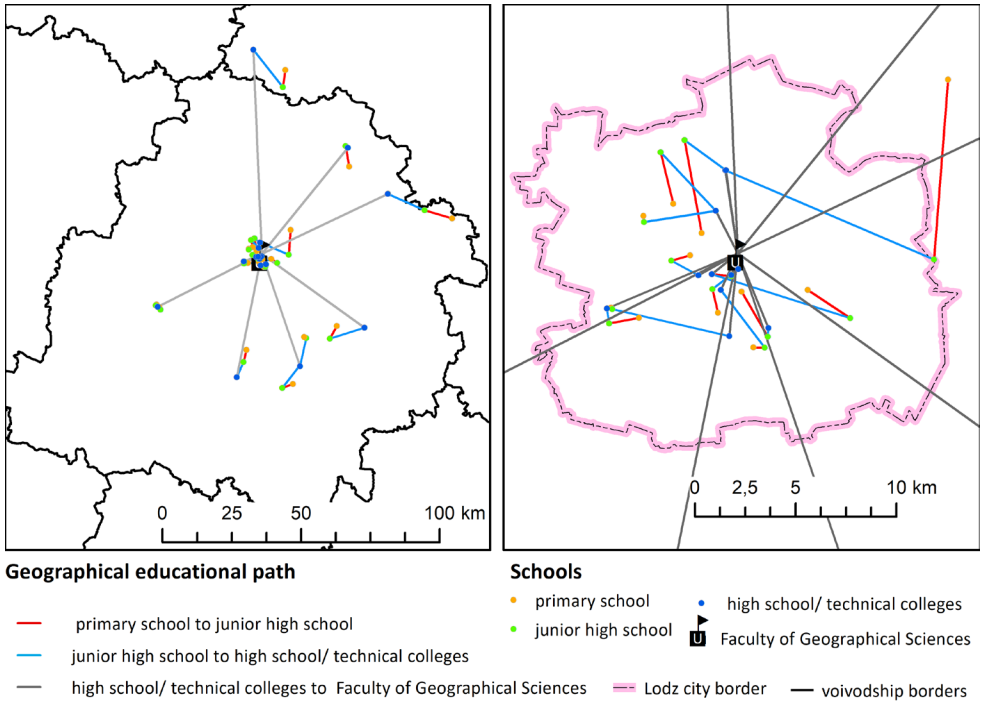

Fig. 11. Selected examples of students' geographical educational paths, on the Lodzkie Voivodship and Lodz map.
Source: own elaboration

their places of residence, only one person moved from Athens (Greece) to Lodz (more than 1600 km). This may have affected the results of statistics sensitive to outlier values and, therefore, has not been included in the calculations.

Geoinformation students had to take the longest route in the last stage of their education, though this mobility was not huge and can be considered regional, as most people come from the Lodzkie Voivodeship (Fig. 10), and only a few came from the rest of Poland. Quite surprising to the researchers were the results of choosing a university for a second master's degree. About half of the respondents studied geoinformation at level II. They were all Level I graduate from the University of Lodz, so they did not show mobility when they were between the ages of 21-25 and could have made this decision on their own. Most of them chose to continue their education in the same field of study at the University of Łódz.

Some selected examples of a geographical educational path are presented in Fig. 11. They confirm the typical geographical way to study for the surveyed students. The students under study attended the primary school closest to their place of residence. The choice of a lower-secondary school - especially in Lodz - did not depend on the distance from the student's place of residence, and often the institutions were not situated nearest to it. In the case of secondary schools, it was similar. This caused the geographical educational path to be longer, as students had a longer daily commute to school than if they had chosen the nearest educational facilities. The entire path of the inhabitants of Lodz did not exceed 10 km in a straight line and that of the Lodzkie Voivodship 70 km. Considering that they made up most of the students surveyed, it may be concluded that it was not a difficult distance for young people to travel. The results are like those obtained in other studies on youth mobility in Poland (Herbst & Rok, 2014).

What were the motivations of the students to choose the nearest academic centre? Only in-depth research can answer this question. It can be assumed that, as in Sweden, the role of geographic variables was significant in individual decisions about higher education. In particular, educational attainment and proximity to university seem to have a measurable effect on individual decisions. These effects may be related to the role of neighbourhood peers, labour market demand, and the cost of attending college (Rephann, 2002).

5. Conclusions and discussion

The geographical educational path can be explored between different social groups at any stage of their education, as well as after graduation. Comparative research across different countries and education systems may produce interesting results. The results may depend on the economic level of the country or region, population density, settlement networks, and school networks. It may be interesting to use it in social research covering different social classes. The concept of a geographic education path made more sense in the pre-pandemic world, but it does not undermine the methodology proposed in this article.

The participants in this study were geoinformation students at the Faculty of Geographical Sciences, University of Lodz. It is likely that their educational path was typical of young people studying in Poland, and the geographic educational path showed that most of them attended schools near their place of residence and decided to choose the nearest university. The results showed low mobility of students and indirectly of their families during the education period. Only a few cases where the educational path was greater than 300 km and one greater than 1600 km (overseas migration) were observed. The participants in this study were geoinformatics students at the Faculty of Geographical Sciences, University of Lodz. It is likely that their educational path was typical of young people studying in Poland, and the geographic educational path showed that most of them attended schools near their place of residence and decided to choose the nearest university. The results showed low mobility of students and indirectly of their families during the education period. Only a few cases were reported where the educational path was more than 300 km and one more than 1600 km (overseas migration). It was also noted that the choice of elementary school was determined by its closest distance from the place of residence (except for specialized, for example, music schools). At successive stages of education, relatively close

schools that met adequate educational requirements were probably selected. Surprisingly, there was a lack of mobility when entering a master's degree program. The results of the study are consistent with the research results (Herbst & Rok, 2014), who noted that the spatial mobility of Poles under 30 years of age is low and strongly influenced by the size of their place of origin. Every tenth high school graduate, while commencing studies, changes his place of residence at the same time. Although only one in ten high school graduates changes their place of residence at the same time, about 40% of those who have moved at least once before turning 30, did so due to commencing education.

The surveys did not include questions about the socioeconomic situation of the students or their motivation to choose subsequent schools. However, address data allowed us to conclude that almost half of the students (40%) lived in a rural municipality before beginning their studies, 31% in small or medium towns. In a way, this may explain the low mobility during education. The income of the inhabitants of rural areas and small towns in Poland is usually lower than that of large cities. Mobility during education may have an economic aspect, such as the cost of education, the cost of living (in Lodz, these are lower than in Warsaw, located 100 km to the east). The cost of renting a room or apartment may have been a certain argument for choosing to study in Lodz, knowing that almost 40% of the respondents changed their address during their studies and almost 30% commuted daily from other towns.

The research carried out on the geographic educational pathway gave a proposal for the first stage of consideration of the geographic route that young learners take. It can be used for comparative studies of other groups of students and to draw wider conclusions. In particular, from a regional perspective, e.g. with students of one university, from a national perspective, e.g. researching the geographical educational path in a particular country, and from an international perspective. The results of a geographical educational path study may be used for a comprehensive study of spatial mobility: daily, temporary, and permanent. Another issue related to mobility during education may be related to the choice of the temporary residence place during the studies and its combination with the problems of gentrification in an academic city. The results of the study may be useful to university authorities for marketing purposes, for example, to attract students from other areas and to seek answers to the question why young people chose other academic centres.

The second stage of consideration of the geographical educational path should be combined with an in-depth socioeconomic analysis and motivations for choosing schools of the studied population and requires supplementing the survey questionnaire with additional questions. It will then be possible to relate the results to the social issues, conditions, and quality of life of young people.

References

Aboufadel, E. & Austin, D. (2006). A new method for computing the mean center of population of the United States. *Professional Geographer*, 58(1): 65–69. DOI: https://doi.org/10.1111/j.1467-9272.2006.00512.x.

Bruno, J.E. (2000). Geographical space surrounding school settings as an issue of social justice. *Equity and Excellence in Education*, 33(2): 50–60. DOI: https://doi.org/10.1080/1066568000330208.

Cairns, D. (Ed.). (2010). *Youth on the move: European youth and geographical mobility*. Springer Science & Business Media.

Crivello, G. (2011). 'Becoming somebody': Youth transitions through education and migration in Peru. *Journal of Youth Studies*, 14(1): 395–411. DOI: https://doi.org/10.1080/13676261.2010.538043.

Ebrahimpour, Z., Wan, W., García, J. L. V. & Cervantes, O. (2020). Analyzing Social-Geographic Human Mobility Patterns Using Large-Scale Social Media Data. *ISPRS International Journal of Geo-Information*, 9(2): 125. DOI: https://doi.org/10.3390/ijgi9020125.

Findlay, A. M., King, R., Smith, F. M., Geddes, A. & Skeldon, R. (2012). World class? An investigation of globalisation, difference and international student mobility. *Transactions of the Institute of British Geographers*, 37(1): 118–131. DOI: https://doi.org/10.1111/j.1475-5661.2011.00454.x.

Frankfort-Nachmias, C. & Nachmias, D. (2000). *Research Methods in the Social Sciencess* (6th ed.). Worth.

Freeman, E. (2010). The shifting geography of urban education. *Education and Urban Society*, 42(6): 674–704. DOI: .**Gulson, K.N. & Symes, C.** (2007). Knowing one's place: space, theory, education. *Critical*

Studies in Education, 48(1): 97–110. DOI: https://doi.org/10.1080/17508480601123750.

Hägerstraand, T. (1970). What about people in Regional Science? *Papers of the Regional Science Association*, 24(1): 7–21. DOI: https://doi.org/10.1007/BF01936872.

Hamnett, C. & Butler, T. (2011). "Geography matters": The role distance plays in reproducing educational inequality in East London. *Transactions of the Institute of British Geographers*, 36(4): 479–500. DOI: https://doi.org/10.1111/j.1475-5661.2011.00444.x.

Herbst, M. & Rok, J. (2014). Drivers and patterns of students' and graduates' mobility in Poland. Evidence from social media network. *Center for Public Policy Research Papers Series*, 76: 1–25.

Herbst, M. & Sobotka, A. (2014). Mobilność społeczna i przestrzenna w kontekście wyborów edukacyjnych." Warszawa: Instytut Badań Edukacyjnych.

Hnatiuk, M. (2016). Qualitative and Quantitative Changes of Upper Secondary Education in Poland. *Comparative Professional Pedagogy*, 6(2): 74–80. DOI: https://doi.org/10.1515/rpp-2016-0022.

Jażdżewska, I.A. (2018). The use of centrographic measures in analysing the dispersion of historic factories, villas and palaces in Lodz (Poland). *Folia Geographica*, 60(1): 50–61.

Jażdżewska, I. A., Lechowski, Ł. & Babuca, D. (2022). Geo-Information GIS-Based Approach for the Analysis of Geographical Education Paths. *ISPRS International Journal of Geo-Information*, 11(1): 41. DOI: https://doi.org/10.3390/ijgi11010041.

Jones, G. & Jamieson, L. (1997). Young People in Rural Scotland: getting out and staying on. Centre for Educational Sociology, University of Edinburgh. Available at: https://www.ces.ed.ac.uk/old_site/PDFFiles/Brief013.pdf (Access 15 January 2022)

Kiniorska, I. & Brambert, P. (Eds.). (2021). Migracje pomaturalne na obszarach wiejskich województwa świętokrzyskiego. WydawnictKomitet Przestrzennego Zagospodarowania Kraju PAN.

Kučerová, S. R., Trnková, K. & Meyer, P. (2019). Changing Structures and the Role of Education in the Development of the Educational System in Czechia. In H. Jahnke, C. Kramer, & P. Meusburger (Eds.), *Geographies of Schooling*, 119–138, Springer Open.

Kwiek, M. (2013). Changing Degree Structures and Economic Returns to Higher Education in Poland. The Impact of the Bologna Process. CPP RPS Volume 62. Available at: http://unesco.amu.edu.pl/pdf/CPP_RPS_vol.62_Kwiek.pdf (Access 15 January 2022).

Machin, S., Salvanes, K. G. & Pelkonen, P. (2012). Education and mobility. *Journal of the European Economic Association*, 10(2): 417–450. DOI: https://doi.org/10.1111/j.1542-4774.2011.01048.x.

Myck, M., Nicinska, A. & Morawski, L. (2009). Count your hours: returns to education in Poland. In IZA Discussion Papers (Institute, Vol. 4332). Available at: http://nbn-resolving.de/urn:nbn:de:101:1-20090909292 (Access 15 January 2022).

Plane, D.A. & Rogerson, P.A. (2015). On Tracking and Disaggregating Center Points of Population. *Annals of the Association of American Geographers*, 105(5): 968–986. DOI: https://doi.org/10.1080/00045608.2015.1066742.

Rephann, T.J. (2002). The importance of geographical attributes in the decision to attend college. *Socio-Economic Planning Sciences,* 36(4): 291–307. DOI: https://doi.org/10.1016/S0038-0121(02)00006-X.

Sharmeen, F., Artentze, T. & Timmermans, H. (2014). Dynamics of face-to-face social interaction frequency: role of accessibility, urbanization, changes in geographical distance and path dependence. *Journal of Transport Geography*, 34: 211–220. DOI: https://doi.org/10.1016/j.jtrangeo.2013.12.011.

Stromquist, N.P. & Monkman, K. (Eds.). (2014). *Globalization and education: integration and contestation across cultures*. Rowman&Littlefirld.

Sviatlovsky, E.E. & Eells, W.C. (1937). The Centrographical Method and Regional Analysis. *Geographical Review*, 27(2): 240–254. DOI: https://doi.org/10.2307/210093.

Taylor, C. (2009). Towards a geography of education. *Oxford Review of Education*, 35(5): 651–669. DOI: https://doi.org/10.1080/03054980903216358.

Warf, B. & Arias, S. (Eds.) (2009). *The spatial turn: Interdisciplinary perspectives*. Routledge. DOI: https://doi.org/10.4324/9780203891308.

Wolbers, M.H.J. (2000). The effects of level of education on mobility between employment and unemployment in the Netherlands. *European Sociological Review*, 16(2): 185–200. DOI: https://doi.org/10.1093/esr/16.2.185.