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Veröffentlichungsversion / Published Version
Zeitschriftenartikel / journal article

Empfohlene Zitierung / Suggested Citation:
Maleszyk, P. (2021). Outflow of Talents or Exodus? Evidence of youth emigration from one of the EU's peripheral regions in Poland. *Region: the journal of ERSA*, *8*(1), 33-51. https://doi.org/10.18335/region.v8i1.283

REGION
The Journal of ERSA
Powered by WU

Volume 8, Number 1, 2021, 33–51
DOI: 10.18335/region.v8i1.283

journal homepage: region.ersa.org

Outflow of Talents or Exodus? Evidence of youth emigration from one of the EU's peripheral regions in Poland

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Received: 8 October 2019/Accepted: 7 December 2020

Abstract. Human capital migration and its consequences for regional development are among the central issues discussed in migration and regional literature. A growing interest has been recently observed in student migration as a driver of brain exchange between regions and countries. Furthermore, poor sending areas are often considered to be severely affected by the brain drain. Nevertheless, firm empirical evidence on the degree of the human capital selectivity of youth migration is actually scarce due to measurement and methodological limitations.

This paper sheds some light on human capital redistribution across regions and countries by estimating the intensity and human capital selectivity of youth emigration from the Lubelskie Region (Poland) – one of the poorest, peripheral EU regions. A survey of ten thousand secondary school graduates allowed an analysis of mobility patterns in relation to school-leaving exam results being a proxy for human capital, as well as to sex, type of school, and former place of residence.

This study revealed, that roughly 20% of graduates leave their home region and predominantly continue education on higher education institutions. Migration rates across the youth characteristics followed by the results of logit regression model confirm that migration outflows, and particularly interregional moves, are a highly selective phenomenon. With regard to international mobility, student migration is positively selected as well, but economic migration among graduates electing not to continue education turns out to be adversely selected. Overall, the brain drain on the EU's peripheral areas in Poland with respect to the emigration of secondary school graduates should be regarded as a selective outflow of the most talented graduates to the leading academic centers, rather than massive migration of all graduates.

Key words: youth migration, student migration, brain drain, human capital, peripheral regions, interregional migration, international migration, regional development

1 Introduction

Migration is a highly selective phenomenon, as recognised by Ravenstein (1885, 1889) in his famous 'laws of migration'. Although the assumption that more educated and skilled individuals are more willing to migrate is now widely accepted, firm empirical evidence on human capital selectivity appears to lag behind. Concerning youth mobility, some major research-related issues deserve a mention. First, administrative sources or representative

surveys usually fail to capture the selectivity of human capital migration across regions. Second, migration selectivity measures often rely on the level of education, which in fact is a poor indication of actual human capital (Wößmann 2003). Third, most studies on regional mobility patterns investigate the migration of university graduates, whereas the mobility of secondary school graduates remains less explored. In the latter case, most contributions analyse only migration related to university enrolment, i.e., student migration, leaving the mobility of non-students unexplored. In the absence of nationwide data in many countries (including Poland), local research might shed some light on this issue.

Furthermore, youth emigration from less developed regions and cities in Poland deserves attention because of its country-specific context. Given the inclusive tertiary education system, considerable regional economic disparities and massive emigration after Poland's accession to the EU in 2004, one would expect to see youth exodus from less developed, peripheral areas with adverse effects on regional growth trajectories.

In this regard, the article aims to estimate the intensity of post-secondary school emigration from the peripheral Lubelskie Region as well as the patterns of human capital selectivity of youth mobility, considering both interregional and international moves. The research data was collected in three cross-sectional tracking studies conducted since 2016 on a total of approximately ten thousand secondary school graduates in Lublin (Poland).

Being a census rather than a sample study, the presented research offers several important contributions to the literature. Firstly, it analyses data on actual (rather than potential) youth emigration, allowing for precise estimations of migration intensity and selectivity among secondary school graduates. Secondly, it offers a thorough insight into post-secondary school mobility, entailing interregional and international student mobility as well as the moves of graduates who decide not to enter tertiary education. Thirdly, the article sheds light on post-secondary emigration from the perspective of the sending areas, which is also uncommon.

Another valuable contribution of this paper stems from the analysis of the migrants' human capital, which is measured by considering the school-leaving examination results, rather than the most commonly used and more general proxies based on the education level, years of schooling, or the quality of educational institutions. Finally, the article provides an in-depth analysis of emigration from peripherally located, poor EU region, adding new findings to the ongoing discussion about brain drain affecting less developed areas.

The remainder of the article is structured as follows: Section 2 presents the related literature pertaining to the size and selectivity of youth migration and its regional economic consequences. Section 3 provides a snapshot of the specific sending area: the Lubelskie Voivodeship with the capital city in Lublin, located in the eastern peripheries of the EU. Section 4 presents data and the adopted empirical strategy, while Section 5 provides descriptive statistics and regression logit model results. Section 6 contains a discussion of the main findings and concluding remarks.

2 Literature overview

2.1 Youth migration: intensity and regional differentiation

One of the most commonly recognised stylised facts about migration selectivity pertains to its strong age profile (Bailey 2009). Studies on migration intensity conducted across a variety of countries and at various spatial scales found that, in almost any society and regardless of strong country-to-country variations, the emigration rate follows a distinct pattern and peaks for young adults in their late teens and twenties, after which it steadily declines with increasing age all the way to the retirement level (e.g., Clark 2013, Findlay et al. 2015, Bernard, Bell 2015).

Literature offers considerable evidence for the prevalence of intra-regional mobility among migrating secondary school graduates, and the increasing distance of migration in subsequent life-cycle stages (e.g., White, Lindstrom 2005, Winters 2011, Ahlin et al. 2018). Nevertheless, as university enrolment continued to grow in recent decades, there has been a significant increase in the magnitude of international student migration (OECD 2018).

Many studies recognise increasing students' interregional mobility rates (e.g., Lundholm 2007 for Sweden, Smith, Sage 2014 for England and Wales, De Angelis et al. 2017 for Italy), despite parallel stable or even declining internal mobility trends observed in many developed countries (Champion et al. 2017).

Given the research scope of this paper, works offering evidence on the intensity of youth migration across regions deserve particular attention. The overwhelming majority of contributions offering such a perspective have been focused on individuals who completed tertiary education. Some examples include: Faggian, McCann (2009) for the UK, Venhorst et al. (2011) for the Netherlands, Haapanen, Tervo (2012) and Kotavaara et al. (2018) for Finland, Ahlin et al. (2018) for Sweden, Parey et al. (2017) for Germany, Oggenfuss, Wolter (2019) for Switzerland, Corcoran et al. (2010) for Australia, Capuano (2012) and Marinelli (2013) for Italy, Whisler et al. (2008) for the US, Herbst et al. (2017) for Poland, or the book edited by Corcoran, Faggian (2017). These studies generally confirm that university graduates who enter the labour market are more likely to leave less developed and peripheral regions and tend to move to economically developed areas, particularly to growing metropolitan cities.

In contrast, the empirical evidence of regional differentiation in migration intensity of the secondary school graduates is modest. Most contributions focus on interregional student migration and confirm high youth mobility as well as its significant regional differentiation.

Ciriaci (2014) analysed data on tertiary education enrolment in Italy and confirmed that in the northern regions, more than 95% of secondary school graduates remained in the region where they had lived before enrolling at university, while the respective rates for the southern regions varied from approximately 50% for Molise and Basilicata to 80% for Sicily, Sardinia and Campania.

In their work on interregional student migration in Greece, Psycharis et al. (2019) found that the number of students migrating out of their region of residence amounted to 66.7% in 2010 and 56.7% in 2012, with Athens and Thessaloniki identified as the main student destinations.

McClelland, Gandy (2012) examined student mobility between the UK regions and confirmed that 56% of UK students studied in their home region in 2008, but the situation varied for individual regions. Scotland and East of England were two extreme cases, with the percentage of students choosing their home region equal to 93% and 32%, respectively.

Smith, Sage (2014) presented a regional net migration rates in England and Wales calculated in absolute numbers and proved that the populations of 16-24-year-olds were declining in almost all regions with the exception of London, Yorkshire, and the Humber.

Kodrzycki (2001) estimated that inter-state migration rate in the US for all high school graduates was 25.5% for all graduates and 26.8% for graduates proceeding to continue their education at college. She also found regional differences in graduate outflows across nine US Census Divisions, although the exact rates should be interpreted with caution due to the small sample size. Later contributions pertaining to the US by Cooke, Boyle (2011), Winters (2011) and Faggian, Franklin (2014) confirmed the uneven geographical distribution of the migration of high school graduates applying for college admission.

In Poland, given the absence of reliable and publicly available statistics, research on the regional mobility patterns of secondary school graduates is scarce and usually takes the form of sample studies investigating the intention to move rather than actual migration. The notable exceptions are works by Herbst (2009) and Herbst, Rok (2016) who examined student migration by using a large and unique dataset from a Polish networking site. Their works revealed that, at least until 2008 when the data ends, roughly 70% of Polish students studied in their home regions, while at the same time, student mobility from rural areas and small towns to academic centers within said regions remains significant. They also confirmed that less developed and peripheral eastern regions are less successful in retaining their graduates, although cross regional differences (except for Mazowieckie Voivodeship with the Capital City of Warsaw) are not large. Nevertheless, their research does not incorporate any measure of the individual human capital of graduates.

Finally, it should be recognised that research on the migration of secondary-school graduates within a regional framework is hampered by serious data limitations, which

presumably explains its minor representation in literature compared to post-university mobility. Secondary school graduates who migrate within a given country often do not register a change in their place of residence, so official registries are in fact a useless source of information on youth mobility in general and student mobility in particular. Furthermore, nationally representative household surveys usually collect only basic migration data and migrant samples tend to be too small to reliably capture regional mobility patterns, particularly with respect to young people[1]. Last but not least, while the studies summarised above provide a fairly good depiction of differences in migration intensity across age-groups or particular areas in one country, rigorous cross-country comparisons are impeded by multiple measurement and methodological issues, as discussed more extensively by Bell et al. (2015).

2.2 Human capital selectivity of youth migration

A well-established fact on migration is that more educated and skilled individuals are usually more willing to migrate, particularly when a long-distance move is considered. Literature on the economics of migration usually explains this phenomenon by regarding migration as a decision of rational individuals who are maximizing returns on their human capital (Roy 1951, Sjaastad 1962, Borjas 1987). Although numerous migration studies have suggested multiple factors other than strictly economic gains that influence the decision to migrate[2], the positive human capital selection is prevalent both in the case of interregional and international migration (Greenwood 1975, Belot, Hatton 2012, Corcoran, Faggian 2017, Dao et al. 2018)[3]. Moreover, it is in the positive selection of migration that the popular concept of brain drain is embedded. However, research on brain drain tends to focus primarily on migration outflows from less-developed countries and offers cross-country, rather than cross-regional approach to the human capital selectivity of migration.

One drawback of research on migration is that human capital selectivity is usually measured relative to the migrants' educational level or, at best, number of years of schooling. Although such data are the most readily accessible indicators, these are in fact very poor proxies of human capital endowment, particularly given huge variation in quality of education institutions (Wößmann 2003, Folloni, Vittadini 2010).

Against this backdrop, there is a growing strand of literature analysing human capital selectivity of post-university migration which provides conclusive evidence that graduates with higher final grades are generally more willing to migrate (e.g, Faggian et al. 2007, Venhorst et al. 2010, Capuano 2012, Ahlin et al. 2018) and less prone to return to their home region (e.g., Marinelli 2013, Herbst et al. 2017). In contrast, evidence on the selectivity of post-secondary school migration is scarce, with only a handful of studies introducing some method of measuring human capital.

Tosi et al. (2019) investigated student mobility across Italian regions with a dataset based on secondary school graduation marks. They found that interregional migration inflows to the North are positively selective in terms of individual skills, while no such pattern occurs in the South. Overall, the predicted probability for interregional mobility in Italy gradually increases from 8.6% for students in the lowest grade band to 15.1% for top graduation marks students. Nevertheless, a precise estimation of the degree of human capital selectivity in the context of migration from individual Southern regions was hampered by the small sample size.

Psycharis et al. (2019) examined patterns of interregional student migration in Greece relative to the quartiles of students based on their exam grades, and found evidence on adverse migration selectivity. While the majority of Greek students enter the university outside their prefecture (NUTS III), students in the upper two quartiles (with higher

[1] See Bilsborrow (2016) for a comprehensive discussion on the limitations of household surveys in migration research.

[2] Factors underlying young people's decisions to migrate are not summarised here, however, the theoretical background of migration-related decision-making was discussed by Hagen-Zanker (2008), Corcoran, Faggian (2017) discussed empirical evidence pertaining thereto, while Dotti et al. (2013) and Beine et al. (2014) analysed the drivers of student migration.

[3] However, there are a few notable exceptions, as indicated in the studies on international migration (Moraga 2011, Beine et al. 2011).

grades) were more likely to stay within their home area or move shorter distances in comparison with low-performing students. Students with higher exam scores are more selective and able to choose a high-performing university in their home region, while those with lower scores have more limited choices and often have to move away. According to the Authors' explanations, the former group's preference to stay might results from the additional costs of studying away from home that some families cannot sustain, whereas the decision to move of the latter group may possibly stem from overall strong emphasis on the importance of university education in Greek society.

Faggian, Franklin (2014) used the Integrated Post-Secondary Education Database to analyse the interstate mobility of high-school leavers applying for college admission in the US. In the absence of precise measures of the graduates' human capital, they associated the quality of students with the quality of their respective high schools. Further, they compared states by net-inflows of students rather than emigration rates. Nevertheless, their study confirms significant regional differences in retaining and attracting high-school graduates showing, with a few exceptions, a West-East divide, with the Eastern states remaining firmly ahead in the race for high-quality students, particularly when the 'students' quality' is considered.

Findlay et al. (2010) investigated the international student mobility of graduates in the UK and found that pupils with the highest GCSE (The General Certificate of Secondary Education) results were over two times more likely to apply to study abroad (5.2% versus 2.3%), although this result was obtained for a non-representative sample of 1400 final-year pupils from schools in only two regions of England.

2.3 Regional consequences of human capital migration

Human capital accumulation was recognized as an important driving force of economic growth by the neoclassical growth theory and subsequently by the endogenous growth theory (Mankiw et al. 1992, Lucas 1988, Barro, Sala-i Martin 1995). The literature confirming its contribution to growth is already extremely extensive (see e.g., Fratesi 2014, Faggian et al. 2019). Consequently, given the fact that high-skilled individuals are more willing to migrate, human capital migration should have a significant impact on the development prospects of local and regional economies.

Most empirical research on the consequences of human capital migration is focused predominantly on international migration (see e.g., Nathan 2014). Nonetheless, some of its reported findings might be relevant also to the issue of interregional migration. Research studies on the consequences of migration for the sending countries, often conceptualized as a brain drain, deserve attention. In earlier contributions it was claimed that skilled migration contributes to the widening gap in human capital endowment between more affluent host countries and less developed sending areas, with adverse effects on the growth of the latter (Bhagwati, Hamada 1974, Miyagiwa 1991). Later works on brain drain suggested that skilled migration need not be a zero-sum game, as migration prospects can raise the expected returns to education and foster investment in human capital in the origin country, which subsequently enhances its growth prospects (Beine et al. 2001, Stark 2004, Kanbur, Rapoport 2005, Docquier, Rapoport 2012). Nonetheless, many empirical works confirm the overall negative effects of high-skilled emigration on growth. For example, Beine et al. (2008) found that although countries combining relatively low levels of human capital and low emigration rates are more likely to experience a beneficial brain drain, most countries experience negative net effects of emigration and, more importantly, their loss is more significant than the gains of countries enjoying positive net effects. Apart from increasing educational investment, literature on international migration indicates also other potential gains for the sending country, e.g., the remittances and the 'skilled diaspora effects' which might facilitate trade, capital flows, and knowledge diffusion between the host country and the country of origin (De Haas 2010, Bahar, Rapoport 2018).

Some of the abovementioned beneficial mechanisms revealed in international migration studies might be possibly applicable to interregional migration, although the specificity of the latter must also be taken into account. Compared to differences between countries, wage disparities or language and cultural differences within one country are usually less

pronounced. Consequently, the gains obtainable from increasing educational investment, remittances, or diaspora should not be substantial. Faggian et al. (2017) conclude that potential benefits from emigration for sending regions are yet to be examined in regional literature, but most recent research has not found any evidence on such positive outcomes in Southern Italy (Nifo et al. 2020). On the whole, the negative effects of emigration on the human capital accumulation and growth of the origin region appear to be prevalent.

The majority of recent empirical studies on the regional consequences of interregional migration indeed tend to highlight positive consequences for the host region and adverse effects for the sending areas. A meta-analysis conducted by Ozgen et al. (2010) confirms small, but statistically significant positive effects of net interregional migration on the growth of real income per capita within the regions. The authors also stress the need to incorporate the skill composition of migrant populations in further research. Winters (2011) proved that migration inflows attributable to university enrolment significantly contribute to the faster growth of American 'smart cities' relative to low human capital cities. Fratesi, Percoco (2014) investigated the impact of interregional migration on convergence among Italian NUTS 3 regions and found that although in general migration flows were usually a balancing factor, selective migration seemed to constitute a diverging force in the regional convergence process, while significant highly-skilled emigration deteriorated the growth of southern regions. Notably, in their study, human capital was quantified in relative terms to the years of attained education. Kubis, Schneider (2016) analysed the effects of regional migration on regional convergence and growth in post-reunification Germany. Their dynamic panel data model confirmed a negative, but modest effect of emigration on regional growth. Their results also revealed a decreasing regional skill level in the East Germany Regions. However, the migrants' human capital was not directly observed, therefore a variable representing the share of employees with an academic degree in the regions' workforce was designed instead. Faggian et al. (2017) presented a comprehensive review of recent research and highlighted the beneficial effects of high-skilled interregional migration on productivity, innovativeness, and wages in the destination region. When discussing the outcomes for sending areas, they focused on the adverse effects, particularly in terms of reduced growth and brain drain. However, they stressed that impact studies of migration on the origin regions are extremely limited due to data constraints. Fischer, Pfaffermayr (2018) found that migration increases convergence of income within the EU on the NUTS 2 level, however, their data did not include measures of migrant's human capital. Nonetheless, they admitted that the amount of human capital possessed by migrants determines the positive or negative impact of migration on income convergence.

3 Local and regional background for the migration of Lublin school graduates

As empirical evidence clearly confirms considerable regional differentiation of migration outflows, a short description of the sending area will allow for a better understanding of the applicable migration patterns. Lublin is the capital city of Lubelskie Voivodeship – a peripheral NUTS 2 region located on the eastern boarder of the EU (see Figure 1), neighbouring with Ukraine and Belarus.

The Region is one of the poorest in Poland and remains among the 20 poorest regions in the whole EU, with the GDP per capita at the level of 69% relative to the Polish average and 48% to the respective value for the EU (in PPS standards, 2017). Since Poland's accession into the EU in 2004, the rate of GDP growth in Lubelskie Voivodeship has remained, on average, below the nationwide rate, which might be partially explained by the region's predominantly agricultural profile. While the unemployment rate only slightly exceeds the national rate, wages continue to be ranked at the bottom of Polish regional statistics. The low job finding rate and sluggish non-agriculture employment growth clearly confirm the weakness of the region's labour demand. The predominance of rural population and underdeveloped transport infrastructure have further contributed to the region's peripherality. Not surprisingly, Lubelskie is therefore one of the most migratory Polish regions in terms both international and interregional migration outflows, and at

Figure 1: Location of Lublin and Lubelskie Voivodeship in the European Union

the same time one of six voivodeships in Poland clearly struggling with depopulation since Poland's accession into the EU.

Although Lubelskie Voivodeship clearly exhibits the characteristics of a peripheral area[4], the development patterns of Lublin, the region's capital city and 9th largest city in Poland by population size, are seemingly more favourable. The local GDP estimates indicate that, at least since 2008, GDP per capita has remained above the national average (Ciołek 2017, Makarewicz, Maleszyk 2018). The unemployment and wage changes are roughly in line with recent improvements observed nationwide, although demonstrate more favourable performance against Polish cities of similar size. Given the fact that teen mobility is largely driven by the university enrolment process, one of the distinct traits of the city is its strong academic profile with nearly one-fifth of the resident population studying at one of its nine academic institutions. On the downside, 'Perspektywy' - the most popular ranking of academic institutions in Poland - ranks the four leading universities in Lublin only in the third and fourth tenths out of 94 classified institutions. At the same time, the city continues to secure top positions in quality-of-life rankings, particularly in terms of safety, clean and green environment, and human and social capital, as well as cultural offerings.

4 Data and methods

Research on secondary-school graduate migration in Poland is hampered by the absence of publicly available statistics or representative surveys. This research aimed to partly fill this gap as it entails three waves of a cross-sectional tracking study conducted since 2016 in partnership with the local government in Lublin. The scope of the project covered 19-21-year-olds graduating from 33 secondary schools[5]. Graduates were interviewed 6 months

[4]See Flaga, Wesołowska (2018) for further discussion and empirical evidence.

[5]Specifically, 32 public secondary schools (20 three-year comprehensive schools and 12 four-year technical schools) and one private comprehensive school. Other private schools (approximately 5% of all graduates) refused to partake in the research. The study did not include special needs schools (less than 0.2% of graduates) and adult schools.

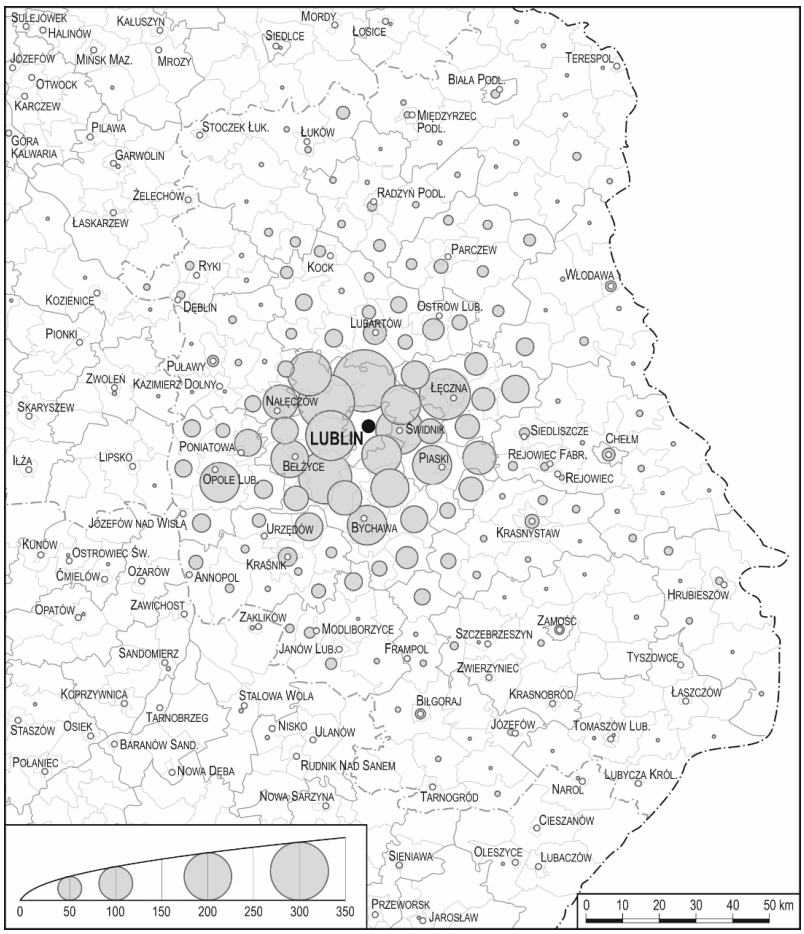


Figure 2: Spatial distribution of graduates residing outside Lublin before secondary school enrolment

after sitting the school-leaving examination (matura), which conditions the possibility of taking up further study at tertiary education institutions. The interviews were conducted by the respondent's former form tutors. The gathered information comprised the graduates' answers regarding their current place of residence and information on further tertiary education or work, matched by their tutors with individual school records including information on sex, place of residence before secondary school enrolment, and school-leaving exam results (on a 0-100% scale)[6]. During three editions of the survey, information was gathered on the place of residence of 91.2% of graduates from schools taking part in the research (see Table 1 for summary statistics) and approximately 85% of graduates from all public and private schools in Lublin. It is noteworthy that almost 45% of the young people were non-Lublin residents who came mostly from functional urban areas around Lublin (see Figure 2) Overall, graduates sitting the school-leaving examination whose mobility patterns were recognized accounted for over 20% of the respective graduates from the whole voivodeship. A summary of respondent statistics is presented in Table 1.

With a focus on human capital emigration from peripheral areas and its implications for local and regional development, the empirical part of the study aimed to address two research questions:

1. What is the intensity of secondary school graduate migration from the home region?
2. What is the degree of the human capital selectivity of the migration of secondary school graduates?

[6]Specifically, the exam result is the score obtained in the compulsory, written, advanced-level exam.

Table 1: Summary statistics

	observations	%
Graduates with identified mobility patterns	10,113	100.0
Type of school		
Comprehensive schools	7,164	70.8
Technical schools	2,949	29.2
Sex		
Male	4,295	42.5
Female	5,803	57.4
No answer	15	0.1
Residence before school		
Lublin	5,568	55.1
Outside Lublin	4,532	44.8
No answer	13	0.1
Continuing education?		
Yes	8,487	83.9
No	1,615	16.0
No answer	9	0.1
Survey year		
2016	3,198	31.6
2017	3,626	35.9
2018	3,289	32.5
No information on mobility	971	–

The following empirical analysis consists of two parts. The first presents a descriptive analysis of interregional and international migration rates across migrant characteristics. The second outlays the results of the logit regression model of graduate mobility with a set of available regressors: exam result adopted as a discrete variable, followed by dummy variables regarding sex, type of school, graduates' former residence and survey year. The results and some limitations of the study are then elaborated in the discussion.

My first hypothesis assumed that graduate migration rates from less developed, peripheral areas of the EU will be large in comparison to the migration rates in other regions. The second hypothesis was that youth emigration from peripheral areas is positively selected in terms of individual human capital endowment. If those hypotheses are proven correct, secondary school migration constitutes an important channel of human capital redistribution from less developed, peripheral areas to more prosperous ones, which might adversely affect the growth prospects of the former. In other words, the higher the migration rates, particularly among graduates with the highest potential productivity, the stronger the brain drain affecting the sending area. My results might also shed some light on the potential role of the academic role of regional capitals in poorly developed areas in terms of retaining talented young people within the region, which has important implications for urban and regional development policies.

Migration research offering a regional approach usually has to deal with some interpretative problems. In the remainder of this article, it will be assumed that migration intensity is measured by migration rates expressed as the relation between the number of respondents who left the region and the total number of surveyed graduates with identified post-graduation mobility patterns. As the definitions of 'a region' vary for one study to another (see e.g., Faggian et al. 2017, for discussion), emigration is interpreted as a movement outside the NUTS 2 Lubelskie Voivodeship, either to other voivodeships in Poland (interregional migration) or other countries (international migration). However, providing a precise definition of 'a migratory movement' in terms of residence duration poses a far greater challenge, particularly when student migration is considered. In fact, many students who migrate to other regions might spend much of their time in their

hometown. Nevertheless, I elected to associate the graduate's place of residence with the location of the university for several reasons. Firstly, the distinction between being 'a guest' and 'a settler' in the university's location is largely subjective and difficult to address empirically. Even more importantly, in this case, cross-regional commuting to universities on a daily basis is usually hardly feasible given the central location of Lublin and Warsaw (Lublin's closest and most popular destination for interregional migrants) within its regions' borders coupled with the low quality of cross-regional transport infrastructure. The case of students applying for part-time or extramural courses at universities located outside their home region is more ambiguous: they might either spend the rest of their time in their home area or permanently move to the university's location and seek employment there. The problem was partly explored by adding the question on type of studies, which revealed that approximately 90% of graduates continuing education chose full-time studies, while the overwhelming majority of those opting for weekend courses or external studies elected to stay in Lublin and combine education with work.

5 Results

5.1 Descriptive statistics

This section presents migration rates for the surveyed graduates across respondent characteristics. From the perspective of the first research question regarding migration intensity, one of the key findings concerns the total emigration rate which amounted to 20.5%. It is noteworthy that the rate calculated only for student migration did not differ greatly, and amounted to 21.6%. Almost one in six migrating graduates were moving abroad. Finally, each wave of the tracking study showed similar results. Table 2 presents the emigration rates across the different characteristics of the surveyed respondents.

As follows from the presented data, graduate mobility is intertwined with student migration: more than 80% of graduates continued their education and were 50% more likely to leave the region compared to those discontinuing formal education. However, the values of total emigration conceal strong differentials between interregional and international migration. Almost one in five graduates continuing education moved to other regions of Poland, while the corresponding rate for those discontinuing education was only 3%. International mobility patterns were completely the opposite, with young people not continuing education being roughly five times more likely to leave the country than those entering post-secondary education.

Furthermore, decisions concerning further education and migration were differentiated by the type of school: comprehensive school graduates were more likely to continue education and tended to leave the region more often than their peers from technical schools who were relatively more likely to immediately enter the labour market. The empirical evidence on emigration selectivity with regard to sex turned out to be inconclusive, with men slightly more likely to migrate to other Polish regions, although less prone to migrate abroad. Additionally, the role of place of residence in mobility patterns appeared to be secondary at best with slightly lower than the average migration rates for city non-residents.

Presumably the most valuable findings regarding mobility patterns pertained to the exam results, addressing the second research question concerning the degree of emigration selectivity. Emigration rates across exam results deciles (Figure 3a) clearly displayed distinctive positive human capital selection of graduate emigration, as the overall rate for graduates with the top 10% of exam results was three times higher than the rate for the middle deciles and more than 6 times higher compared to the values for graduates in the lowest deciles. The risk of migration remained low for the half of graduates with poorer exam results and gradually increased for higher deciles.

Furthermore, selectivity of migration resulted mostly from interregional migration, whereas international mobility is less selective. Referring to the latter (see Figure 3b), the overall migration rates across deciles do not vary substantially. Migrants seemed to be both positively and negatively selected, as graduates from top and bottom deciles were more likely to migrate than those with average results. The distinction between student and non-student mobility explains this U-shaped distribution well: migrants with the

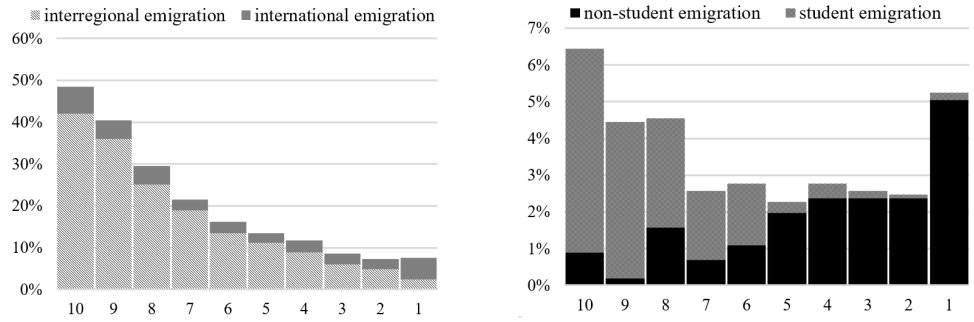
Table 2: Migration rates by selected respondent characteristics

Graduate characteristics	Interregional emigration rate	International emigration rate	Total emigration rate
Total	16.9	3.6	20.5
by type of school			
Comprehensive schools	19.5	3.5	23.0
Technical schools	10.5	3.8	14.2
by sex			
Male	18.1	3.3	21.4
Female	16.0	3.9	19.9
by former place of residence			
Lublin	17.7	3.7	21.4
Outside Lublin	15.9	3.5	19.4
by further education			
Yes	19.5	2.1	21.6
No	3.0	11.6	14.6
by survey year			
2016	16.1	3.3	19.4
2017	17.2	3.9	21.0
2018	17.3	3.6	20.9

highest scores continued their education in foreign higher education institutions, while those in the lowest grade band usually entered the labour market.

5.2 Logit regression model

The relationship between the set of respondent characteristics and their propensity to migrate was modelled with the use of a logit regression employing maximum likelihood estimation. The dependent variable is a dummy indicating whether the individual migrated from the Lubelskie Voivodeship (coded as 1) or stayed there (0). Given the fact that the migration patterns of Lublin residents might differ from those of young people coming from elsewhere in the region, I ran two regressions: one for all graduates of Lublin schools and one for Lublin residents only. To address the second hypothesis regarding positive human capital selection of migrants, explanatory variables included school-leaving examination result (discrete variable), followed by other available dummy-type variables regarding such characteristics as sex, type of school (comprehensive versus technical), and,



(a) Emigration rates (b) International emigration rates

Note: 10^{th} decile represents the 10% of graduates with the highest exam result.

Figure 3: Migration rates across exam results deciles: emigration rate (a) and international emigration rates (b), with its components

Table 3: Logit regression model results for total emigration from the region

Variables	Coefficients	Standard errors (SE)	Average marginal effects (AME)
	Model 1: all graduates		
Exam result	3.293***	0.117	0.0046
Sex(a)	-0.174***	0.055	-0.025
Place of residence(b)	0.196***	0.054	0.028
Type of school(c)	0.109	0.071	0.016
Survey year(d)	0.023	0.033	0.003
Constant	-3.332***	0.104	–
Observations	10,088		
P	0.000		
McFadden pseudo R^2	0.107		
Log-pseudo likelihood	-4,571.39		
χ^2	1,091.51		
	Model 2: Lublin residents		
Exam result	3.654***	0.166	0.0052
Sex(a)	-0.048	0.073	-0.007
Type of school(c)	0.082	0.106	0.012
Survey year(d)	0.023	0.044	0.003
Constant	-3.651***	0.143	–
Observations	5,552		
P	0.000		
McFadden pseudo R^2	0.121		
Log-pseudo likelihood	-2,536.25		
χ^2	697.66		

Note: Reference group: (a) men; (b) Lublin residents; (c) comprehensive schools; (d) 2016.
p-values for coefficients: * p<0.05; ** p<0.01; *** p<0.001

only in the first model, the former place of residence (Lublin vs. outside Lublin). The regressions also controlled survey year dummy variables (2016-2018). Thus, the model allows us to examine whether the selectivity patterns indicated in the previous section persist when other available variables are controlled. I calculated the average marginal effects (AME) and ran statistical significance tests and goodness of fit tests. Table 3 presents the results obtained from these models.

Initial analysis of the results suggested that the two estimated models yielded similar results concerning AME of 'examination results.' This led to the conclusion that migration patterns of graduates from Lublin and those from the region in terms of human capital selectivity are quite similar, although Lublin residents' human capital emigration seems slightly more selective. The low AME of place of residence on the likelihood to move in the first model additionally supported this interpretation. Furthermore, the variables for type of school and for survey year proved insignificant in both models. The female variable was negative and significant in the first model with respect to all graduates, however turned out to be insignificant in the second model for Lublin residents only. The survey year variable was insignificant in both models. Overall, the most telling results were found for human capital selectivity. As expected, the exam result variable was positive and significant. The extent of this effect, however, proved somewhat more unexpected: an increase in the exam result by 1 pp. (in 0-100% scale) correlated with an increase in the probability of a graduate's migration outside their home region by 0.46 pp. on average in the model regarding all graduates and by 0.52 pp. in the model for Lublin residents only.

As stated in the descriptive analysis in section 5.1, selectivity patterns concerning interregional and international migration seem to be different. To further explore this issue, I performed a separate logit regression estimation for international migration carried out

Table 4: Logit regression model results for international migration

Variables	Coefficients	Standard errors (SE)	Average marginal effects (AME)
Exam result	0.736***	0.209	0.0003
Sex(a)	0.243**	0.115	0.008
Place of residence(b)	-0.039	0.110	-0.001
Type of school(c)	0.338**	0.135	0.012
Survey year(d)	0.036	0.067	0.001
Constant	-3.943***	0.192	–
Observations	10,088		
P	0.004		
McFadden pseudo R^2	0.006		
Log-pseudo likelihood	-1,561.05		
χ^2	17.544		

Note: Reference group: (a) men; (b) Lublin residents; (c) comprehensive schools; (d) 2016.
p-values for coefficients: * p<0.05; ** p<0.01; *** p<0.001

for all graduates (see Table 4). The exam result variable appeared significant, nevertheless the value of AME was low. This might suggest that the positive selection to international migration is no more than moderate, which seems consistent with the earlier results found in the decile analysis. Nevertheless, the interpretation of the low AME value should be with caution since international migration rate was also low.

6 Discussion and conclusions

With respect to the first research question concerning emigration intensity, my research shows that one-fifth of secondary school graduates left their home region, with the interregional and international emigration rates at 16.9% and 3.6%, respectively, while student emigration rate equalled 21.6%. Bearing in mind the peripheral location of Lublin and poor economic development of the region, one might wonder whether such migration rates are indeed high? The answer is difficult, as any comparisons to the findings of other studies are hampered due to differences in measurement approaches. It should also be acknowledged that my research provided representative emigration figures for the region's capital or the graduates of schools located in the city, rather than graduates from the entire Lubelskie Voivodeship. Nevertheless, given the region's characteristics, as well as the rather average size of Lublin compared to other regional capital cities in Poland, I consider its emigration intensity as low. This tentative conclusion is consistent with other studies on youth mobility referred to in the literature review, which show generally greater emigration rates. Specifically, the rates of interregional student emigration from southern regions ranged from 20% to 50% in Italy (Ciriaci 2014), exceeded 50% in Greece (Psycharis et al. 2019), and varied between 30 and 70% for most UK regions (McClelland, Gandy 2012), while inter-state emigration rate for US high school graduates was 25.5% (Kodrzycki 2001). Moreover, graduate mobility revealed in this study seems low compared to earlier findings for Polish regions, as presented by Herbst (2009). Therefore, my results do not support the first hypothesis regarding the significant post-secondary migration outflows from peripherally located Lubelskie Region. Conversely, the results seem to confirm the stylised fact as to the dominance of local and regional moves among secondary school graduates, which turns out to be relevant even for poorer and peripheral areas.

One potential explanation for the low mobility of graduates from the Lubelskie Region relates to the drivers of student mobility. Poor economic development of the sending region might not be a decisive factor for moving away if a regional capital with an average economic performance could offer a wide range of studies, affordable costs of living, and vibrant cultural life. From this perspective, the beneficial role of universities in backward regions should not be limited only to creating educational spill-overs, but also to retaining human capital.

This assumption, although requiring further evidence, might have important implications for regional and urban policies and highlights the value of regional universities even if they do not excel on the national scale. However, the low out-migration rate of graduates compared to other countries could also be related to a relatively low overall internal mobility in Poland (Maleszyk, Kędra 2020).

Finally, I signalled that Poland has undergone a shift from elite to a mass tertiary education, which could exacerbate the interregional brain drain through student migration. Based on the empirical evidence, I assume that although emigration is clearly related to a decision regarding higher education studies, easing the access to tertiary education in Poland apparently has not led to a youth exodus from poorer, peripheral areas.

Regarding the second research question on the degree of human capital selectivity of youth emigration, results indicate the positive selection of migrants, which is not unexpected. My findings corroborate the second research hypothesis while at the same time providing several additional and more interesting insights into the correlation between mobility patterns and exam results. The evidence firmly indicates that the pattern of strong positive selection in the context of migration applies to interregional mobility, while international migration seems to be a more complex issue, with a moderately higher likelihood of migration attributable to respondents with the highest and the lowest exam results. This U-shaped relationship can be explained by considering the economic versus education dichotomy of migration motivation: the most talented graduates with the highest scores are more likely to continue their education at foreign universities, while those on the lower end of the grade scale face exam failure preventing further education at public universities and thus making them more prone to move abroad and seek employment. In other words, student migration from Poland is indeed positively selected, while the economic migration among secondary-school graduates turns out to be adversely selected. In terms of the latter, adverse selection can be linked to the empirical works by White (2013) who proved that young migrants from Poland often rely heavily on networks of friends and relatives, which makes them feel relatively secure about going abroad; as well as to the conclusion of Beine et al. (2011) who found that larger diasporas in the host countries might negatively influence the skill composition of new migrants.

The degree of youth emigration selectivity, and particularly the selectivity of interregional migration driven almost entirely by student migration, seems large also in the international context. Migration rates across exam result deciles obtained in this study confirm stronger human capital selectivity of migration relative to the results reported for Italy (Tosi et al. 2019), where emigration rate for top students was only two times higher than the rates for students with the average or low scores, or Greece, where a negative selection in student migration was observed (Psycharis et al. 2019). Furthermore, international student migration alone (see Figure 3b) is also more selective than that in the UK as analysed by Findlay et al. (2010). Finally, the estimated logit models prove that strong positive human capital selectivity of migration persists when other available variables (i.e., sex, place of residence, or type of school) are controlled.

This evidence might thus suggest that student migration could be an even more selective phenomenon than the scarce empirical literature on the subject would have us believe. Therefore, the brain drain through the channel of student migration affecting the peripheral Lubelskie Region should be regarded more as a highly selective outflow of most talented graduates to the leading academic centres in Poland, rather than massive exodus of all graduates.

The observed level of selectivity seems to have an adverse effect on the regional and local development prospects, although this general conclusion deserves further examination. In particular, I argue that empirical studies on brain drain which either do not incorporate human capital selectivity or introduce only very general measures of human capital endowment might severely understate the actual loss of human capital suffered by the sending regions. Nevertheless, the real extent of human capital redistribution, and subsequently the impact of emigration on the long-term growth potential of a given sending area, is also determined by the size of return migration, which has not been explored. The return of talented young people to their home region after graduating from one of the leading universities would be highly beneficial for the regional human capital.

Nevertheless, the selectivity of return migrants is rarely studied due to the lack of data, while the empirical findings are host–source-country specific (Wahba 2014). This issue requires further research, but I remain tentatively sceptical given the existing empirical evidence on the selectivity of Polish return migrants. Anacka, Fihel (2016) observed that migrants moving back to Poland are usually negatively selected, while Herbst et al. (2017) posited that migrants studying at leading universities in Poland's capital city of Warsaw are less likely to move back if they find employment during the last year of their university studies.

A major caveat regarding the results of this study refers to the short list of variables affecting the decision to move, which might be a source of bias in logit models (Mood 2010). This survey gathered limited information to ensure high response rate, therefore graduates were not asked questions on several additional characteristics. In particular, the model did not include variables regarding the graduate's household, such as parent educational background or income. Literature acknowledges that those variables correlate with both young people's school achievements and their propensity to migrate (e.g., Davis-Kean 2005, Capuano 2012, Tosi et al. 2019). In this context, the logit model presented in this study examines migration selectivity only when a number of other variables remain controlled (sex, former place of residence, type of school, and survey year), and therefore must not be considered a comprehensive model explaining migration. It should be noted that a logit model explaining migration with a larger set of variables could offer other AME values for exam results. Last but not least, the local geographical scope of this study calls for a follow-up research focusing on other areas or countries.

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