STRATIFICATION IN THE ACCESS TO HIGHER

EDUCATION IN UKRAINE:

QUANTITATIVE ANALYSIS AND IMPLICATIONS FOR

EDUCATIONAL POLICIES

By

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APPENDIX VII: Sample Author's Declaration I, the undersigned ... Oleva Nikulina hereby declare that I am the sole author of this thesis. To the best of my knowledge this thesis contains no material previously published by any other person except where due acknowledgement has been made. This thesis contains no material which has been accepted as part of the requirements of any other academic degree or non-degree program, in English or in any other language. This is a true copy of the thesis, including final revisions. 14.06.2020 Date: OLENA NIKULINA Name (printed letters): Signature:

Abstract

This thesis investigates the horizontal stratification in access to higher education based on the socioeconomic disadvantage. The findings rely of evidence from Ukraine, specifically, large administrative data set on admission campaigns in 2015 - 2019, was used to evaluate the odds of students to access prestigious universities and fields of study, conditional on their residential location and secondary school type. Findings suggest that residential origin is significantly and positively associated with odds of application and admission in the selective institutions and programs. Chances of students from urban areas and graduates of elite schools are significantly higher, even when controlling for ability. Finally, the analysis considers policy interventions to equalize chances of students from different socioeconomic background in the higher education competition.

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List of Abbreviations

EIT - External Independent Evaluation

- HEI higher education institution
- MOESU Ministry of Education and Science of Ukraine
- PISA Programme for International Student Assessment
- SES socioeconomic status
- USEDU Unified State Electronic Database on Education

Introduction

In the recent decades, most countries, following Trow's classification of higher education systems (1973), have reached or are directed towards universal higher education with more than 50% enrollment rate. This worldwide trend has been followed by the academic and policy debates on whether the numeric increase in the sector really makes higher education more inclusive towards students of different origin. There are two dominant positions in this debate (Arum, 2007). The first one acknowledges the enormous growth in number of places in universities that to diverse categories of students. The second one, by contrast, emphasizes that, the emerging opportunities are often of lower value in terms of experiences, quality, credentials and labor market outcomes, compared to those that are offered by the elite higher education. In this regard, horizontal differences within the same level of education maintain social inequalities, even in expanded universal systems of higher education with nominally meritocratic admission rules (Lucas 2001; Kraaykamp et al. 2013; Gallacher 2006)

In my thesis, I investigate horizontal differences in higher education choice and admission in relation to socioeconomic inequality in Ukraine. The combination of more than 80% participation rate (World Bank, 2014) and persistence of educational inequalities, rooted in socioeconomic disparities, makes Ukraine an especially interesting puzzle for exploring horizontal stratification. Two research questions are addressed in the study: (1) What is the relationship between Ukrainian students' socio-economic characteristics and their preferences for a prestigious university and field of study? (2) What is the relationship between student socio-economic characteristics and their admission to a prestigious university and field of study? Furthermore, the analysis seeks to explore the link between the existing equity-oriented policies and qualitative inequalities in higher education.

This thesis builds upon the sociological theory of horizontal stratification in higher education (Shavit et al., 2007; Grodsky and Jackson, 2009) and contributes to the interdisciplinary discussion of the problem. The focus on the lower-middle-income country in the Eastern Europe country enables another contribution. Although there is a large body of evidence on horizontal stratification in the high-income Western countries (e.g., Munk and Thomsen 2017; Triventi 2013; Gerber and Cheung 2008), the relevant research for developing states, especially in regards to policy-making, is not numerous.

The empirical strategy of this research enables another contribution. Although the majority of studies on the topic that apply quantitative research design rely on survey data (e.g., Triventi 2013; Shavit et al. 2007, Ianelli 2018), there have recently been interesting investigations relying on the large administrative data sets (e.g., Chankseliani 2013; Hoxby and Avery 2012; Caner and Okten 2013). This analysis seeks to add to this group of literature, and highlight the promises of large observational data for evidence-based policy making. It is especially relevant for the country where representative surveys of students are missing. To the best of my knowledge, this analysis is the first study that applies quantitative methodology to explore the horizontal stratification in access to higher education in Ukraine.

This thesis consists of three sections. The first chapter overviews the literature on horizontal stratification in access to higher education, focusing on the relationship between stratification and social inequalities. The second chapter outlines the background of the Ukrainian educational system in order to map the most influential socioeconomic determinants of higher education choices and outcomes. Moreover, this section discusses the access policies in place and their relevance in tackling historical causes of educational inequality in the country. Finally, the last chapter utilizes the large administrative data sets on admission campaigns to explore higher education preferences and outcomes of Ukrainian students conditional on their socioeconomic origin.

Chapter 1. Horizontal Stratification of Higher Education Access: Literature Review

This chapter is dedicated to the overview of the literature on horizontal stratification in access to higher education with the particular emphasis on interactions between stratification and socioeconomic inequalities. It starts with discussing main concepts and proceeds to overview of horizontal stratification from the perspectives of institutions and individuals. Although this chapter mainly engages with the studies from sociology of education, it addresses questions of particular relevance for public policy, as: What are the mechanisms of the horizontal stratification? What are the implications for socioeconomic inequalities? Which higher education systems may support or mitigate horizontal differences in access to higher education?

1.1. Definitions

Before engaging with the topical literature, it is important to discuss the definitions. The main broader phenomenon, that is crucial for exploring access, is educational equality. It is often seen as an elimination of systematic differences in either outcomes (e.g., academic achievements, labor market positions), or opportunities (e.g., availability of academic resources, possibility to engage in the learning process). Both of them are relevant for this research since, in the nominally meritocratic higher education systems, admission is essentially the process of allocating different opportunities (places in universities and programs) based on the prior outcomes (examination results). It is important to additionally clarify the notion of equality of opportunities in this thesis, since it is a highly debated concept (Lazenby, 2016) and some scholars refer to it as equity (e.g., McCowan 2016, 3) in order to emphasize the core idea of fair, rather than equal, treatment. In this paper, the equality of opportunities is understood interchangeably with equity – as fair treatment of individuals within the educational system with acknowledgment of their prior backgrounds (Chankseliani, 2013).

Following sociologists Grodsky and Jackson (2009, 2347), I define the central concept of this research – social stratification in higher education – as "the link between differential rewards and accidents of birth". In turn, horizontal stratification in higher education is qualitative differences within the accessed level of education in terms of experiences and arise from the ascriptive characteristics of students (Lucas, 2001). The scope of this research limits this overview to studies of stratification based on socioeconomic origin, omitting the stratifying effects of race and gender (Zarifa 2012; Charles and Bradley 2002; Goyette and Mullen 2006).

1.2. Horizontal Stratification in Access to Higher Education: Students Perspectives

There is a general consensus in sociology of education that application and enrollment behavior are socially determined, although there are different positions regarding the extent of determination and key factors that shape individual educational preferences. The majority of studies focus on the ascriptive causes of stratification – lower educational achievements of disadvantaged students due to stratification in secondary education (Gamoran and Berends 2016); family budget constraints (Caner and Okten 2013); parental socioeconomic status (SES), including occupations and educational level (Bourdieu and Passeron 1977); residential and geographical origin (Chankseliani 2013). There is also literature that emphasizes how students self-select themselves into higher education based on the subjective perception of own belonging to certain type of institutions and/or fields of study (Reay et al. 2001; Liu 2018).

For the analysis of choice of prestige education, the Boudon's theory of primary and secondary effects (1974) is particularly relevant. Boudon argues that socioeconomic origin influences

higher education destination in two ways - through primary and secondary effects. Primary effects are differences in academic achievements between higher and lower SES students. They appear due to unequal starting positions: students from high SES families are more likely to receive extra-curriculum preparation and generally enjoy better learning environments at home (Jackson et al. 2007). However, academic achievements solely do not explain differences in higher education attainment. Secondary effects of socioeconomic origin, including family's financial constraints and expected value of higher education degree, determine higher education choices. In this regard, applicants and their families are seen as rational actors that make rational choices with the goal of maximizing well-being and social status (Breen and Goldthorpe 1997). Since higher education attainment holds economic risks for disadvantaged applicants as it leads to direct and indirect costs (e.g., tuition fees, living expenses, commuting), rational choice theory assumes that, for low-income students and their families to choose "safe" options, it is rational to choose accessible universities and programs that hold the promise of stable employment. For instance, Sianou-Kyrgiou (2010) in the study of horizontal stratification in the Greek higher education finds that students from lower classes prefer specific majors (economics and social science) in order to secure less competitive and more stable public service careers.

As Liu (2018) notes, there is no uniform vision on whether primary or secondary effects contribute the most to stratification. However, there are multiple studies that show unequal patterns of higher education choice between students of different origin, but same abilities. Hoxby and Avery (2012), using observational data set on applicants to higher education in the USA, revealed that disadvantaged students that are well qualified for entering selective institutions apply for second-tier colleges, demonstrating "undermatching" with the chosen degree. By contrast, students with more prior advantages and high test scores are more likely to make "achievement-typical" decisions and apply for selective universities.

Chankseliani (2013) applies the methodology of Hoxby and Avery to the admission data in Georgia and reveals similar trends. While the first study showed that type of school has a significant effect on application behavior (Hoxby and Avery 2012, 2), Chankseliani finds that, in the context of Georgia, geographical and residential origin matters the most for gaining admission to prestige universities. This paper adds to the discussion of the context-specific source of the primary effects – uneven distribution of the quality of public schools between urban and rural settlements.

The role of family's socioeconomic status and cultural capital in the selection of students to higher education received, perhaps, the most comprehensive overview in the social reproduction theory (Bourdieu and Passeron 1977; Bourdieu 1984). Family' cultural capital (collection of symbolic resources such as preferences, credentials, knowledge is the principle determinant of individual chances to enroll in a high-status university. Additionally to the impact on academic preparation and success in secondary school, cultural capital determines aspirations towards education in line with what is *"collectively felt"* and *"what is 'reasonable' to expect"* (Bourdieu and Passeron 1977, 226). The main distinction between Bourdieu's theory compared to Boudon's is the agency of students. While Bourdieu's assumes full social and cultural determination of educational choice as mechanism of reproduction, Boudon lives more room for the individual agency in the choice-making process.

1.3. Horizontal Stratification in Access to Higher Education: Institutional Perspectives

The stream of research on the institutional dimension of higher education stratification has been focusing on the differences in quality, skills sets, values of credentials, labor market opportunities and other associated rewards provided by different universities and fields of study (Gerber and Cheung 2008; van de Werfhorst 2008). Usually studies investigate either effect of

attending high-status universities (Triventi 2013; Jerrim, et al. 2015) or prestigious fields of study (Kraaykamp, et al. 2013; Davies and Guppy 1997; Zarifa 2012) for educational and noneducational outcomes. The common finding of these studies is that students from disadvantaged socioeconomic backgrounds are underrepresented in highly rewarding degree programs. Omitting the rich discussion on the dynamics of institutional differentiation (Huisman, et al., 2007), this section briefly overviews theories that provide explanations of the selection process on the side of institutions – diversion hypothesis and social reproduction theory.

The concept of the field, offered by the social reproduction theory (Naidoo, 2004) provides an insightful theoretical tool to understand the rationale of high-status institutions to engage in uninclusive admission. Bourdieu explains the field as a social space with specific internal rules and structures of power. Higher education is also a field and, to gain admission in the prestigious institutions, students have to adhere to formal and informal rules of the academic field. Hence, individuals that are coming from families with higher social and occupational statuses have an advantage in this competition or, as Bourdieu calls it "the game", knowing "the rules" in advance (Bathmaker 2015). In this regard, selective universities serve as vehicles of stratification, preserving the existing power structures and distribution of privilege within the society.

The diversion hypothesis (Shavit et al., 2007) assumes that, while expansion diminish numerical differences in attainment, some features of educational systems divert lower SES students towards second-tier institutions. Shavit and group of authors (Shavit et al. 2007, 1-35) offer the macro-perspective, discussing the characteristics of higher education systems with more and less risks of stratification. According to their findings, higher education expansion brings more inclusion to highly differentiated educational systems (US, Japan) and a little change into the persistent inequality in the unified systems (e.g., Italy). The second important

line of differentiation in the level of state funding for HEIs. In the heavily subsidized systems, "elite" universities are more likely to act as "status-seekers", applying different mechanisms to select "high quality" students. Quite the opposite, in the competitive systems with larger share of private institutions, even selective institutions act as "client-seekers", expanding admission for non-traditional students (Shavit et al. 2007, 7).

In a summary, stratification in access to higher education occurs at both supply and demand side. From the perspective of theories that focus on the application behavior of individual students, higher education choices are constrained by prior experiences, financial and cultural resources, subjective beliefs about own position within the educational systems. In turn, institutional framework for the stratification is set by the features of higher education system, such as funding, degree of admission competition. Respectively, the next chapter will continue with the overview of higher education in Ukraine.

Chapter 2. The Context of Education Policy and University Admissions in Ukraine

This chapter explores the educational system and university admission in Ukraine in the interaction with equality in access to educational opportunities. It starts reviewing how the expansion of higher education influenced the participation rates and university landscape in Ukraine. Then, the chapter outlines the admission system and the existing equity-oriented policies, discussing their capacities to address the historical causes of unequal access to higher education - differences in quality of secondary education conditional on place of residence and socioeconomic disparities. The descriptive facts, provided in this chapter are crucial for understanding the analytical setup for the empirical model of horizontal stratification in access to higher education in Ukraine, presented in the next chapter.

2.1. Higher Education System Expansion and Diversification.

Ukraine, a low-middle income Eastern European country with a Soviet past, has reached a universal level of participation in higher education in the early 2000s. In recent years, gross tertiary enrollment rate has been nearly 80% (World Bank, 2014). In fact, participation in higher education has been high in the country since the second half of the 20th century. In 1991, with 18.4% of the adult population holding tertiary degrees (Smolentseva 2012), Ukraine was among the most "educated" countries in the Eastern Europe. After gaining the independence in 1991, the higher education system has expanded in the circumstances of transition to the market economy and growing demand for degrees. The growth occurred in both the number of students and universities. Despite the emergence of multiple private institutions, the expansion did not change the prevalence of public higher education in Ukraine - 70% of universities are funded by the central or local governments. The growth in the public sector was fostered by the introduction of tuitions in public universities and the input-driven

funding scheme that was inherited from the Soviet system. Until 2020, financing was allocated based on the number of enrolled students, creating an incentive for universities to disproportionately grow admission, often compromising the quality of education and lacking capacities (Repko and Ruda, 2017). The lack of a quality assurance system and corrupted licensing processes for opening of private institutions (Stater et al. 2005, 14) also contributed to the expansion, but not to the quality. The increasing skills-jobs mismatch is an evident implication of this situation. 47% of the unemployed population are workers with tertiary degrees (Kupets 2016).

The peak of the expansion has happened in 2005 - 2007 years when more than 500 thousands students have been enrolled in tertiary educational institutions each year (State Office of Statistics of Ukraine, 2019). Since then, the absolute numbers of enrolled students has been decreasing (Figure 1) due to demographic reasons and, later, due to the annexation of the Crimea and occupation of territories in Donbass region. The higher education system has responded to the decline with moderate decrease in the number of universities – while the number of enrolled students has decreased by half, the number of universities has fallen by 20% (State Office of Statistics of Ukraine, 2019).



Figure 2.1. Number of Students Enrolled in Higher Education Institutions Yearly

Source: State Office of Statistics of Ukraine, 2019. The figure reports the numbers of admitted students for both undergraduate and graduate levels. Vocational educational institutions that issue short-cycle tertiary degrees are not included.



Higher

Education

Institutions

Yearly

Source: State Office of Statistics of Ukraine, 2019. The figure represents the number of both public and private HEIs. Vocational educational institutions that issue tertiary degrees are not included.

According to Shavit's (2007, 1- 35) classification of higher education systems, Ukraine could be categorized as binary system with the main line of differentiation occurring between universities and vocational tertiary educational institutions. However, looking only at universities, one can see significant differences in terms of quality, prestige, and target various groups of students. Except for some cases, the majority of prestigious and selective institutions are large comprehensive universities that were established in the Soviet period (Rumyantseva and Logvynenko, 2018). These institutions are located in one of the five largest Ukrainian cities (Kyiv, Dnipro, Lviv, Odessa, Kharkiv) or regional centers, and attract high-performing students from all over the country (Stadny, 2018). In the situation of demographic decline and decreasing number of school graduates, the gap between selective universities that enroll top performing students and other HEIs is growing. While even applicants with relatively low

Figure

2.2.

Number

of

scores have a chance to enroll in a degree program, admission to selective universities demands intense extra curriculum preparation and related investments on the behalf of families (OECD 2017, 56-57; World Bank 2019, 99).

Similarly, there are differences in the prestige and economic returns among fields of study (World Bank 2019, 10). Majors as Law, Medicine, Humanities, and International relations engage students from the top quartiles of the standardized test scores distribution, while the competition for programs in Engineering, Manufacturing, Agriculture, Education is low (Kavtseniuk, 2017).

2.2. Accessing University in Ukraine

In order to understand the context of access to higher education in Ukraine, it is important to familiarize with the basic admission setup. The process of admission is to the large extent digitized. Applicants submit their choices through the special electronic system, indicating the priority for each option. Then, accounting for preferences, application scores and the number of available places in universities, the system allocates applicants. The interesting feature of the admission system in the Ukrainian system is the mechanism of open competition. According to this, the automated system can adjust the number of available state funded places for programs based on the proportion of high performing students in the competition list. As a result, in 2019, 75% of students gained admissions to the universities of the first or second choice (MOESU, 2019b).

The admission competition in Ukraine is almost fully based on the admission test scores that account for nearly 90% of the overall application score. Since 2008, standardized tests - External Independent Evaluation (EIT) - are mandatory for all applicants to HEIs, besides rare exceptions¹. Similarly to other Post-Soviet states, Ukraine introduced standardized testing and

¹ Vulnerable social groups and students that can not participate in tests due to health conditions.

electronic admission systems to reduce corruption and favoritism in selection and evaluation (Smolentseva, Huisman, and Froumin 2018). The general appraisal of the admission reform by policy makers, experts (OECD 2017, 127,131) and public opinion² (Sociological Group «Rating», 2018) has driven the wider usage of standardized testing outside of admission. As for now, all school graduates, regardless whether they plan to apply to university or not, are obliged to participate in testing.

Due to the dual track tuition system, in which students compete not only for the place in a university, but also for a tuition waiver and scholarship, standardized tests define both gaining admission and access to funding. Traditionally, nearly 50% of available places in universities are offered with the full tuition waiver or/and state scholarship. While student funding is almost fully allocated by the perceived to be objective criteria of academic merit, only students from extremely poor households and some socially vulnerable groups³ receive need-based tuition waivers and scholarships. The recent changes in the student support system has made the stakes of application scores competition even higher. Since 2017, 40-45% of best-performing applicants receive state scholarships to partially cover living expenses by contrast to 75% previously. Taking into consideration that individuals from more advantageous backgrounds tend to perform better academically (Sirin, 2005), the public funding scheme favors better-off students and potentially overlooks those who need it the most.

2.3. Equal Access to Educational Opportunities in Ukraine.

Although there are no particular studies evaluating the effect of the admission reforms for equality in access in Ukraine, the research from the similar context suggests that transparent

 $^{^{2}}$ According to the representative opinion polls, 52% of respondents appraising the EIT driven competition as meritocratic.

³ Social scholarships are provided for specific social categories and youth from extremely poor households. The household is considered to be extremely poor if its incomes are equal or below the sum below the sum of minimum subsistence level for each household member. For now, the minimum subsistence level for adults is 2207 hryvnia (approximately 75 euro per month).

and digitized application procedures may increase social mobility of school graduates (Francesconi et al., 2019). Given that the majority of universities are located in the big cities and regional centers, the online application process eliminates difficulties and cost of traveling and staying for students from distant locations.

At the same time, the admission system based on standardized tests is not able to solve the historical socioeconomic inequalities in access to higher education, but it highlights the existing disparities. The inequalities based on social origin start early and persist during all levels of education in Ukraine. Ukrainian scholars (Oksamytna and Khmelko, 2007; Kohut and Samokhin, 2017) documented two main lines of differentiation - socioeconomic status and residential location. Initially, access to better quality primary and secondary education is stratified by family wealth, parental education and geographical origin (World Bank 2019, 11). In particular, regular non-selective schools, especially those that are located in the rural settlements and small towns are significantly under-resourced in terms of infrastructure and qualified teachers. By contrast, "elite schools" (i.e., gymnasiums and lyceums), have the capacities and resources to better prepare students, in particular, offering them additional hours of learning of specific subjects (e.g., math or English) to increase the chances of performing well in the tests. The status quo hurts children from poor households and disadvantaged backgrounds the most since their families are less likely to be able to compensate for gaps in learning with private tutors or other extracurricular activities (OECD 2017, 91-107).

In addition to the type of secondary educational institution, residential origin appears to be the most important factor for educational outcomes. The results of the international study PISA in 2018 (Mazorchuk Maria 2019) show the implications for educational outcomes: students from countryside score significantly lower in all competencies compared to their peers from urban schools. In particular, in math they lag behind for approximately 3 years of education. The disparities in academic outcomes exist among urban schools students as well. The PISA results

(Mazorchuk 2019, 81) show the positive relationship between settlement size and scores in reading and math, although the difference is less evident than between urban and rural students.

The outlined differences at the secondary level translate into the inequalities in standardized tests results. On average, rural students score 10-20 test points less on the standardized scale (conditional on the subject) than urban peers. In turn, studying in the "elite" school, that is associated with higher socioeconomic status, translates into an average increase in test scores of 13 points – for Ukrainian language and 14 points – in math (Kogut and Samokhin, 2016). In terms of the admissions to higher education and educational choices, these gaps can be decisive.

While the equal and transparent admission competition for all students has been the priority of MOESU since the admission reform in 2008, the problems with equality of opportunity are not among governmental priorities. The recent developments in promoting equity in education is the implementation of the nationwide schooling reform "New Ukrainian School" (MOESU, 2017) aimed at delivering quality comprehensive education in all public schools. Among the main changes introduced by the reform - establishment of well-resourced hub schools in rural areas where pupils from nearby villages provide better educational services than in their local small schools. However, the "New Ukrainian School" is a long-term commitment with implementation for the high school scheduled for 2027 (MOESU 2017a, 33). Meanwhile, the Government has been tackling the inequalities in access to higher education at the stage of admission, with compensatory mechanisms – quotas and compensatory coefficients.

Quotas for admission without competition are available only for students from narrow social categories (e.g. orphans, children of the victims of the war in Donbas, internally displaced population, students with disabilities). Each year, less than 1% of students are admitted through quotas. As it is a rather narrow and specific measure with little details available on the

admission process through quotas, this topic is out of the scope of this research. At the same time, I am focusing on the compensatory coefficients, introduced in 2017. These coefficients increase application scores by from 2% to 5% conditional on socioeconomic status and application behavior. As defined in the "Rules of Admission to Higher Education Institutions in Ukraine" (MOESU 2017b; 2018; 2019a), there are three types of coefficients: (1) rural coefficient is supporting students from countryside, and it is higher for those who apply for Agriculture and other fields of study of low prestige (e.g., Manufacturing, Pedagogy, Agriculture) that are considered to be important for the state; (2) regional coefficient advantages students that apply for universities in less economically developed regions, (3) subject-specific coefficients are available for all applicants to fields of study that receive state support. The coefficients are cumulative - an individual application score is multiplied by the product of all applicable coefficients.

	2017	2018	2019
Rural	Equals to 1.02 for graduates of	Same as in 2017.	Equals to 1.02 for
coefficient	rural schools, disregards of the		graduates of rural
	chosen educational program.		schools, disregards of the
	1.05 - for students that select		chosen educational
	programs in agriculture.		program. 1.05 - for
			students that select
			programs in agriculture
			or supported fields of
			study, defined by the
			state.
Regional	Equals to 1 for applications to	Equals to 1 for applications to	Same as in 2018.
coefficient	universities in the capital; 1.01	universities in the capital; 1.04 -	

Table X. Description of compensatory coefficients eligibility in 2017 - 2019.

	- in big cities (Kharkiv, Lviv,	to displaced universities, HEIs in	
	Dnipro, Odessa); 1.03 - in	Donetsk, Luhansk, Zhytomyr,	
	Donetsk and Luhansk regions,	Kirovograd, Mykolaiv, Rivne,	
	as well as for applications to the	Sumy, Kherson, Khmelnytskyi,	
	displaced universities; 1.02 -	Chernihiv, Cherkasy regions;	
	for all other applications.	1.02 - for all other applications.	
Subject-	Equals to 1.03 for applications	Equals to 1.02 for applications for	Same as in 2018.
Subject- specific	Equals to 1.03 for applications for supported fields of study	Equals to 1.02 for applications for the supported fields of study with	Same as in 2018.
Subject- specific coefficient	Equals to 1.03 for applications for supported fields of study with the indicated first priority.	Equals to 1.02 for applications for the supported fields of study with the indicated first or second	Same as in 2018.
Subject- specific coefficient	Equals to 1.03 for applications for supported fields of study with the indicated first priority. 1 - for all other applications.	Equals to 1.02 for applications for the supported fields of study with the indicated first or second priority. 1 - for all other	Same as in 2018.
Subject- specific coefficient	Equals to 1.03 for applications for supported fields of study with the indicated first priority. 1 - for all other applications.	Equals to 1.02 for applications for the supported fields of study with the indicated first or second priority. 1 - for all other applications.	Same as in 2018.

Source: Ministry of Higher Education and Science of Ukraine (2017b; 2018; 2019a)

Initially, only rural coefficient is aimed solely at supporting students of the specific origin. The other two are directed at reducing what is perceived to be disproportions in higher educational system – concentration of students within prestigious majors and institutions. It is worth acknowledging that targeted compensatory mechanisms to support specific groups of students and nudge them to select certain fields of study is not a particular new measure in the Ukrainian higher education system. Similar approaches with special quotas and additional scores have been applied in the Soviet admission system in order to favor applicants from rural areas and working class students (Oksamytna 2011, 162 - 165).

The officials from the MOESU multiple times stressed the temporal nature of the compensatory measures, describing it as the most available option in the circumstances of budget constraints. The former Minister of Education and Science, Liliya Hrynevych commented on the rural coefficient: *"We understand that we cannot ensure the equal access to education in rural and urban areas now, but we believe that it is necessary to support rural youth - a coefficient of 1.02 is set for them."*("Applicants to HEIs will receive coefficients - Hrynevych", 2017; my

translation). For now, it is not evident what the implications of the novice measures for the admission competition. Their biggest weakness of coefficients is that they are targeting inequalities at the admission stage, while the problem is rooted at the primary and secondary educational levels (EBRD, 2017). Furthermore, the existing evaluation of the coefficients' effect suggests that they are able to support only students in "grey zone" that lack a small number of points to get into the list of admitted. In 2017, each coefficient worked for 600 - 800 student (UCEQA and CEDOS, 2017). However, as the eligibility for the criteria widens, these numbers may be larger for the recent years.

The overview of the Ukrainian higher education system revealed interesting puzzles in regards to horizontal inequality in higher education. Firstly, both elite and second-tier sector of higher has expanded in the recent thirty years. In the light of Shavit's argument (2007, 1-35) about two possible outcomes of differentiation, it is not evident whether Ukraine is the example of more diversion of the disadvantaged students into second-tier higher education or more inclusion to the new educational opportunities within the first-tier sector. Secondly, while there are evidence of differences in educational achievements conditional on socioeconomic origin, it is has not been explored yet whether and to which extent these disparities may channel certain groups (e.g., rural poor) into the prestigious institutions and fields of study. Finally, the introduction of compensatory measures that, by design, incentives students to pursue less ambitious higher education choices may have controversial implications for the equality of educational opportunities. The next chapter seeks to address these questions.

Chapter 3. Quantitative Exploration of Horizontal Stratification in Higher Education Choice in Ukraine

3.1 Research Design

This thesis applies large-N research design to explore the link between socioeconomic characteristics and students' preferences for prestigious universities and fields of study, as well as chances for admission. Presuming that socioeconomic characteristics determine educational chances, a data modeling approach was chosen to estimate the probabilities of students to enroll in the most selective institutions and fields of study, conditional on their residential status, school type and exposure to the compensatory coefficients. Simplified assumption of the reality for the model is that students can choose where to submit an application from all available range of options with the goal of maximize quality and prestige of the attended education, as it is associated with higher labor market and other outcomes in the future (Jerrim et al., 2015). The hypotheses for the analysis are the following:

1. Students from disadvantaged socioeconomic backgrounds are more represented in the less prestigious and profitable fields of study, such as Agriculture, Manufacturing, Education, Services, and less often apply and being admitted to the prestigious fields, as Information Technologies, and Law, Business and Administration. Unequal patterns of participation are expected to be double, meaning that disadvantaged students are also less often enter prestigious universities.

2. The probabilities of applying and being admitted to the prestigious institutions and fields of studies are conditional on socioeconomic characteristics.

4. The eligibility for compensatory coefficients depends on educational choices. Therefore, they narrow application and admission options of eligible students, and divert them from the prestigious institutions and fields of study.

3.1.1. Operationalization

The research design requires operationalization of two central concepts - disadvantaged socioeconomic background, and prestige of universities and fields of study. Sociologists documented numerous indicators of prior disadvantage - e.g., education and occupation of parents (Li and Qiu, 2018), cultural and social capital of the family (Bourdieu, 1986), residential location (Roscigno et al., 2006). Building upon studies of inequality in access to higher education in Ukraine (Muliavka and Oksamytna 2015; World Bank 2019; Kohut and Samokhin, 2017), two context-specific variables - residential origin and type of secondary school are used as the indicators of prior disadvantages streaming from poor access to educational opportunities in the certain location, educational and occupational statuses of parents', family's income.

Prestige of universities and fields of study is defined through the measure of selectivity, following the distinct body of literature that uses selectivity as a dependent variable to estimate the horizontal stratification in higher education (e.g., Ayalon and Yogev, 2005; van de Werfhorst et al., 2003). Building upon methodology proposed by Chenkseliani (2013), and Guppy and Davies (1997), I calculate the selectivity score based on the mean of standardized test scores of admitted applicants for each university. An important distinction of my approach is that I calculate the selectivity score separately for the group of public and private institutions. For the latter one, test scores of all admitted students were used, while for the first - only of those who received a state-funded tuition waiver. This decision is justified by two reasons. Firstly, for students of lower socioeconomic status, the availability of financial resources is likely to be an important factor for enrollment (Breen 1997). Secondly, the introduction of the admission on the paid basis, together with diminishing public funding, incentivized universities to attract large numbers of tuition-paying students as a source of income. Consequently, the competition for the tuition-paying places is smaller. Finally, based on the selectivity scores, a

variable with 5 levels corresponding to percentile ranks was created. The group of universities with selectivity scores above 80th percentile are considered as the most prestigious institutions. Table 3.1. Higher Education Institutions Selectivity Rank.

	Selectivity Rank	Ν	Mean	Max	Min
1	Below 20th percentile (least prestigious)	89	127.25	132.27	109.00
2	20th-40th percentile	87	135.84	139.917	132.27
3	40th-60th percentile	88	144.59	149.34	139.99
4	60th-80th percentile	88	154.50	160.29	149.35
5	Above 80th percentile (most prestigious)	89	170.02	186.59	160.46

Source: Author's calculations based on the USEDU data.

The top rank group of universities includes large, comprehensive institutions in the big cities and regional centers, as well as a few small and recently established universities⁴. It also appeared to be the leader group in terms of numbers of received applications and admitted students. 54%⁵ of applicants gained admissions in prestigious universities. This finding recalls argument developed by Shavit and colleagues (2007, 7) regarding client-seeking behavior of the first-tier institution in the circumstances of differentiation (Arum, 2007).

Similarly, the selectivity score for the fields of study was derived from mean test scores of students admitted to the tuition-free places. Four fields stands out in terms of applicants' scores - Health and Welfare, Information and Communication Technologies (ICT), Social Sciences,

⁴ Kyiv Mohyla Academy, Ukrainian Catholic University and Kyiv School of Economics.

⁵ Authors' calculations based on the USEDU data.

Journalism and Information, Business, Administration and Law. Respectively, these fields are considered as the prestigious in this analysis.

3.1.2. Method and variables

As common in studies of educational stratification (e.g., Shavit et al. 2007, Chankseliani 2013; Hoxby and Avery 2012; Triventi 2013), this thesis utilizes the logistic regression method to estimate odds ratios of applying to and gaining admission in the prestigious universities and fields of study conditional on socioeconomic origin of applicants. In line with the substantive theory, the dependent variables capture facts of applying and being admitted to the certain universities and fields of studies, while independent variables include application-specific indicators and characteristics of the individual socioeconomic background.

Variable name	Variable role	Variable definition
Application var	riables	
Admission	Dependent variable	A binary variable that indicates whether the application gained admission or not.
University selectivity	Dependent variable	Ordinal categorical variable with 5 levels established by the percentile rank of the selectivity score. The selectivity is calculated in the two steps: (1) calculation of the average of the subject-specific EIT scores for each applicant, (2) calculation of the average score for each university/field of study and ranking them into categories with fourth quantile corresponding to the most selective institutions and academic fields.
Selective fields of study	Dependent variable	A binary variable indicating whether the field of study is among the most selective group $(y = 1)$ or not. The selective group includes Health and Welfare, Information and Communication Technologies (ICT), Social Sciences, Journalism and Information, Business, Administration and Law
Regional Coefficient	Independent variable	A binary variable denotes whether the coefficient was applied $(y = 1)$ or not $(y = 0)$.
Subject- Specific Coefficient	Independent variable	A binary variable denotes whether the coefficient was applied $(y = 1)$ or not $(y = 0)$.
First choice	Independent variable (control)	A binary variable denotes whether the application was submitted as a first choice $(y = 1)$ or not $(y = 0)$.

Table 3.2. Overview of the variables used in analysis.

Mean EIT score	Independent variable (control)	A continuous variable (on a scale of 100–200) calculated as the mean of subject-specific standardized test scores for each applicant.
School GPA	Independent variable (control)	Grade point average represented as a continuous variable (on a scale of 1-12).
Socioeconomic	c variables	
School location type	Independent variable (control)	Established on the school level. A categorical variable with 4 levels corresponding to rural settlements ($y = 1$), small and middle sized towns ($y = 2$), regional centers ($y = 3$), big cities and the capital ($y = 4$).
School type	Independent variable (control)	A binary variable indicating whether an applicant graduated from a regular, not selective school $(y = 1)$ or from an elite school $(y = 0)$.

The study relies on the large administrative data set, coming from the Unified State Electronic Database on Education (USEDU). It contains the information on applications and admission outcomes for all entrants to higher education institutions that submitted applications through the open electronic procedure in 2015 - 2019. The original data consists of nearly 5 million applications for more than 700 thousand individuals. The data includes application-specific variables, as well as school-level indicators - school identifier, location, and type. The data preparation stage and selection of the most complete and relevant records are described in the Annex A. The descriptive statistics table is also available in the Annex A.

3.1.4. Limitations

The main limitation of the research is the descriptive nature of the findings due to the unavailability of components of individual socioeconomic status, that are usually used in the research on higher education inequality (e.g., family income, parental education and occupation). Therefore, this analysis does not account for the range of unobservable individual-level characteristics. The related constraint is that the research focuses only on structural

factors, and does not explain self-selection or any other psychological mechanisms of the horizontal stratification (Reay et al. 2001; Liu 2018).

Although the data source provides rich information on individual applications, including outcome, it is documented at the stage of the end of the admission campaign. Therefore, there is the risk that some students have changed their choices after the open competition was over and have never used the gained admission. To conclude on limitations of the data, 15% of observations did not include sufficient complete information to be used in the analysis.

It is also important to acknowledge the limitations of using the single measure of selectivity, as it does not allow to capture the full complexity of prestige of institutions and fields of study. However, in the absence of the sufficient and valid data on quality of institutions and programs, timely statistics about labor market outcomes (World Bank 2019, 12), or reliable national rankings of HEIs, the selectivity measure was chosen as the available option to capture the correlation between socioeconomic background and chances for the selection into hierarchy of higher education (Iannelli et al., 2018).

3.2 Data Analysis and Results

The first hypothesis is addressed by looking at the descriptive statistics. Shares of applications and admissions of rural and urban⁶ students were calculated and grouped by the field of study. <u>Table C2</u> reveals unequal patterns in educational choice between the two groups. The largest differences are observed within ICT, Agriculture and Education. ICT, as the most lucrative field, shows the prevalence of urban applicants - 12.7% of urban schools graduates submitted applications to ICT programs and 8.6% were admitted, by contrast to 7.3% and 4.9% respectively among rural graduates. Meanwhile, the share of rural students entering low

⁶ "Urban" category here includes urban settlements disregarding size and type.

prestige fields of Agriculture and Education is two times larger than among their metropolitan peers. The pattern of higher education choices and admissions are more similar among urban students, grouped by the size of the city. The biggest gap again occurring in the field of ICT (<u>Table C3</u>). This finding is consistent when comparing applicants from the regular and elite schools - the second group outperforms the first in terms application and admission to ICT by 4%. Similar to the comparison of rural and urban applicants, the largest gap is observed for Education. 17.35% of students from regular schools entered this field compared to 12.2% among elite schools graduates. Looking at the dimension of university choice, as expected, elite schools graduates more often enter the most prestigious universities. 63.4% of them gained admissions from the highest selectivity rank compared to 51% of applicants coming from regular schools. Overall, the descriptive analysis has supported the hypothesis 1 regarding differences in patterns of applications and admissions among groups of students conditional on socioeconomic profiles. To further explore this relationship, the analysis proceeds with the model of application behavior.

3.2.1. Model of Applying to the Prestigious Universities and Fields of Studies

The binary logistic regression model was fitted on two outcomes - applying to a prestigious university and a field of study. Table 3.4 reports the average odds ratios. The reference groups are students from large cities and capital (residential location variable), and graduates of the elite schools (type of school variable). Thus, the odds ratio values less than one indicate lower probabilities of applying for students of less advantageous socioeconomic origin.

In line with the theoretical expectations, for both outcome variables, residential location and type of school appear to be significant predictors of submitting the ambitious application. Students of non-selective secondary schools are about 11% less likely to apply to prestigious universities and fields of study, holding other factors constant. Among residential location

categories, both models estimated the lowest odds of competing for the selective degrees for the rural applicants. Their odds of submitting an applications are by almost a half lower than among urban students.

Consistent with the findings of the similar studies (Davies and Guppy, 1997; Chankseliani, 2013), controlling for academic achievements (Table 3.3, column 6; models with and without academic achievements controls are provided in the Table <u>B1</u>) increases the odds associated with applying to a selective university for applicants from disadvantaged backgrounds. However, the odds ratio remains significant and lower than one, indicating that, even in the hypothetical situation of achieving the same scores as more advantageous peers, students from smaller settlements are less likely to submit applications to the prestigious universities. The closest to one (or absence of differences) is the group of regular school students, compared to elite schools graduates, holding else equal. It is important to acknowledge that, students from regular school are expected to be the most diverse group in this analysis in terms of socioeconomic status since public education is prevelant and it engages not only students of lower and middle classes.

Interestingly, in the model of application to the prestigious fields of study, the odds of socioeconomic indicators remain almost unaltered for students from three residential categories with the addition of academic achievements and compensatory coefficients controls (Table 3.3, column 2). The possible explanation is context-specific. Higher education expansion with no quality assurance system has led to the situation when credentials became more important than quality and relevance of acquired skills (World Bank 2019, 10). Therefore, Ukrainian students and their families may perceive receiving the degree from the prestigious university as more important factor of future success than enrolling in the program in the certain field, so the academic competition is higher for places in universities than within the fields. This finding is also aligned with the literature on educational choice, suggesting that , when the choice of

institution is influenced by the composition and hierarchy of educational system (Boliver 2015), as well as determined by individual test scores, the choice of a field is more likely to derive from individual prior experiences, abilities and preferences (Mcmaster 2019). The test for goodness of fit reveals supports this argument - the model of application to a prestigious university fits data better (McFadden $R^2 = 0.10$) than the model of application to the selective fields (McFadden $R^2 = 0.04$), indicating that available socioeconomic and application-specific indicators do not fully explain the variations in educational choices.

Table 3.3. Binary Logistic Model of Application to a Prestigious University and Field of Study.

	Dependent variable:					
	Prestigious	Prestigious University		ous Field		
	Coefficients	Odds ratio	Coefficients	Odds ratio		
	(1)	(2)	(3)	(4)		
Rural	-0.566***	0.568***	-0.458***	0.633***		
	(0.023)	(0.023)	(0.011)	(0.011)		
Small and Mid-Sized Cities	-0.370***	0.690***	-0.267***	0.766***		
	(0.022)	(0.022)	(0.010)	(0.010)		
Regional Centers	-0.349***	0.705***	-0.229***	0.795***		
C	(0.032)	(0.032)	(0.014)	(0.014)		
Regular Schools	-0.113***	0.893***	-0.118***	0.888***		
	(0.019)	(0.019)	(0.010)	(0.010)		
Mean EIT Score	0.026***	1.027***	0.003***	1.003***		
	(0.0004)	(0.0004)	(0.0002)	(0.0002)		
School GPA	0.129***	1.138***	0.107***	1.113***		
	(0.007)	(0.007)	(0.004)	(0.004)		
Regional Coefficient	-1.073***	0.342***	0.057***	1.059***		
	(0.018)	(0.018)	(0.013)	(0.013)		
Subject-Specific Coefficient						
Regional Coefficient	-0.602***	0.548^{***}	-3.910***	0.020		
	(0.012)	(0.012)	(0.042)	(0.042)		
Constant	-4.532***	0.011	-1.047***	0.351***		
	(0.039)	(0.039)	(0.030)	(0.030)		
Year	Yes	Yes	Yes	Yes		
Observations	4,348,111	4,348,111	4,348,111	4,348,111		
Log Likelihood	-2,620,746.0	-2,620,746.0	-2,849,857.0	-2,849,857.0		
Akaike Inf. Crit.	5,241,518.0	5,241,518.0	5,699,741.0	5,699,741.0		

Model of Application

CEU eTD Collection

*p<0.1; **p<0.05; ***p<0.01

Note: Table reports coefficients and odds ratios. Standard errors are clustered at the school level. The number of observations dropped due to missing values in the school type variable.

3.2.2. Model of Admission to a Prestigious University and Field of Study

The analysis proceeds with modeling the admission outcome. Using the same analytical setup of binary logistic regression, the model explores the relationship between students' socioeconomic characteristics and enrollment to the institutions and fields of study of the highest prestige (Tables 3.4). The admission models include a new control variable – binary indicator of whether the application was submitted as the first choice. It is a significant predictor of admission since the automated system of sorting of applicants adjusts the number state-sponsored places considering the number of entrants with the high test scores and indicated first choice in the application list.

Overall, the odds of admission to a prestigious university and a field of study are larger than odds of applying, suggesting self-selection. It is a likely scenario, considering that the electronic admission system allows students to see scores and positions of other applicants in the list, and evaluate own chances before the submission.

Consistent with the hypothesis 2, students' residential location is significantly and meaningfully associated with odds of admission to a selective university. In particular, the odds of students from the five largest cities are 1.32 times higher for gaining admission in a prestigious university, compared to rural applicants. In line with the expectations, the odds are closer to one for students from periphery cities and regional centers. As was observed in the application models, the negative effect of attending regular school diminishes once academic achievements, residential status and compensatory coefficients variables are controlled.

Since the main goal of the compensatory coefficients is to mitigate the systematic disparities in academic achievements of students and provide applicants with chance to get a place in the university, it is important to look at their effect for the odds of gaining admission, when academic achievements are not included in the model (Tables <u>B3</u> and <u>B4</u>). The associated coefficients are statistically significant and directions of coefficients is as expected: subject-specific measure negatively effects the probability of admission to a prestigious field, regional – to a prestigious university. However, the inclusion of these variables into the model does not result in notable changes in odds ratio values.

In a summary, both sets of models suggested statistically significant and positive relationship between residential location and odds of applying or gaining an admission in a prestigious university or field of study. The probabilities of entering a selective higher education is the lowest for rural students, the most disadvantaged group in terms of prior educational opportunities. The negative effect of residential location does not disappear even when academic achievements are controlled. It suggests that, in addition to lower test scores, students outside of large metropolitan areas, especially in rural settlements, experience other factors of diversion from the first-tier schools and programs. The attendance of regular school is also associated with lower odds of gaining admission, and, the gap is diminishing once academic achievements are controlled.

The models also showed the evidence of double stratification effect of socioeconomic origin. Smaller settlement size and attendance of non-selective schools results in lower odds of getting into prestigious higher education in regards to both fields of study and universities. Although the associated coefficients for compensatory measures are significant, the analysis did not reveal the evidence of a meaningful stratification effects for these variables.

		Depender	nt variable:	
	Prestigious	s University	Prestigio	us Field
	Coefficients	Odds ratio	Coefficients	Odds ratio
Durol	0 275***	0 697***	0 217***	0 729***
Kulai	-0.373	(0.087)	-0.317	(0.120)
	(0.012)	(0.012)	(0.010)	(0.010)
Small and Mid-Sized Cities	-0.278***	0.757***	-0.178***	0.837***
	(0.009)	(0.009)	(0.009)	(0.009)
Decional Contara	0 161***	0.951***	0 0 5 0***	0.051***
Regional Centers	-0.101	(0.020)	-0.030	(0.012)
	(0.020)	(0.020)	(0.012)	(0.012)
Regular Schools	-0.016	0.984^{***}	-0.035***	0.965***
	(0.010)	(0.010)	(0.008)	(0.008)
Mean FIT Score	0.014***	1 014***	0 002***	1 002***
Wear LTT Score	(0.0002)	(0,0002)	(0.002)	(0.0002)
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
School GPA	0.021***	1.021***	0.007^{**}	1.007^{***}
	(0.002)	(0.002)	(0.003)	(0.003)
Regional Coefficient	-0.129***	0.879***	0.278***	1.320***
	(0.013)	(0.013)	(0.014)	(0.014)
	(0.013)	(0.013)	(0.011)	(0.011)
Subject-Specific Coefficient	0.215***	1.240***	-3.045***	0.048
	(0.014)	(0.014)	(0.060)	(0.060)
First Choice	2.269***	9.670***	1.997***	7.366***
	(0.009)	(0.009)	(0.009)	(0.009)
Constant	-5.553***	0.004	-3.668***	0.026
	(0.034)	(0.034)	(0.028)	(0.028)
Year	Yes	Yes	Yes	Yes
Observations	4,348,111	4,348,111	4,348,111	4,348,111
Log Likelihood	-733,347.30	-733,347.300	-674,952.30	-674,952.30
Akaike Inf. Crit.	1,466,723.0	1,466,723.000	1,349,933.0	1,349,933.0

Table 3.4. Binary Logistic Model of Admission to a Prestigious University and Field of Study

Model of Admission

Note: Table reports coefficients and odds ratios. Standard errors are clustered at the school level. The number of observations dropped due to missing values in the first choice variable.

3.3 Policy Implications

While the presence of stratification appears to be inevitable even in the societies with high levels of social mobility (Isopahkala-Bouret et al. 2018), the efforts towards mitigating its negative impact can yield certain benefits for individuals and societies as a whole (Huang et al., 2010). Specifically, for the Ukrainian society, stratified access to higher education may contribute to sustaining of existing social (Oksamytna 2011) and geographical inequalities (OECD 2018), labor market inequalities and low level of the internal labor mobility (Koettl et al., 2014), as well as public distrust as a result of evident inequality of opportunities (Protsenko, 2018).

McCowan proposes analytical tool to assess the fairness of access policies in higher education - three equity dimensions of availability, accessibility and horizontality. All three of them should be fulfilled in order to consider higher education system as fair. Looking at the Ukrainian higher education system, one can see the fulfillment of the first premise, efforts directed towards the second, and know interventions aimed at horizontal disparities in access to education. Specifically, the policy and public debate regarding the access in higher education in Ukraine has been concentrated on the topic of accessibility meaning, transparency and elimination of corruption in admission. The treatment with acknowledging the prior backgrounds is applicable only for students from extremely poor households, socially vulnerable groups, and, since recently, rural youth and those who fulfill the eligibility criteria for compensatory coefficients. In turn, the horizontal axis of inequality is not acknowledged among policy priorities. Even nominal notion of the problem of this kind is missing in the position documents of the Ministry of Education and Science (MOESU) and the Ukrainian Government generally. Given that the horizontal stratification in the access to higher education occurs due to factors outside of the individual control, as residential origin and attained public secondary school, it is unfair and socially inefficient since individuals are limited from fulfilling their best. This research argues for the necessity of interventions targeted at the horizontal dimension of inequity in education, especially, at the sage prior to admission. The existing measures, in particular, compensatory coefficients, even if they are not allocated based on educational choice (as rural coefficient), have limited capacities to reduce stratification since they address only primary effects (Boudon, 1974) of socioeconomic inequalities – gaps in academic achievements. Acknowledging the ongoing progress in the comprehensive schooling reform in Ukraine, the possible interventions also include:

- (1) Needs-based distribution of state financial support for students from disadvantaged backgrounds, by contrast to prevailing merit-based allocation leading to streaming governmental payments to rich, rather than to poor (Caner, 2013).
- (2) Providing high school students, especially those who are coming from low SES families, with career advice. Informing applicants about opportunities in different careers should be beneficial as informational barriers contribute to stratification in access to higher education (Abbiati et al. 2018).
- (3) Recognizing prior disadvantaged experiences and limited access to educational opportunities in some areas in admission, providing students with compensatory courses before starting undergraduate studies education.

Finally, this research advocates for the importance of consistent and representative data for education policy making. Despite the availability of observational data on applications and admission, there is a need for representative surveys to obtain an individual-level picture on socioeconomic status, family background and educational experiences of applicants. The only survey of this kind has been only conducted once in 2016, while panel data is the standard in studies of horizontal stratification. Sevidence is crucial to develop the effective targeted measures, in particular, student funding allocation, career guidance, and accessible compensatory opportunities. Furthermore, the policy-makers and scholars would benefit from the possibility of exploring admission data in the linkage with other observational governmental data.

Conclusion

Contributing to the interdisciplinary domain between policy studies and sociology of education, this research explored whether higher education applicants' preferences for prestigious institutions and fields of study are associated with their socioeconomic origin. The quantitate analysis of general trends, based on the large data set on applications to higher educational institutions, suggests the significant association between residential location and type of attended school, and individual odds for applying and gaining admission in a prestigious university and field of study. Applicants from rural areas are almost 50% less likely to apply and about 30% - to attend a selective university, even when the academic achievements are controlled. The stratification is double as it occurs both in the selecting of students to universities and fields of study. The analysis did not find meaningful effects of the novice measures, compensatory coefficients that multiply application scores of students by up to 5% conditional on educational choice, for stratification.

Given the numerous benefits of attending high-status institutions and lucrative fields, the evidence of constrained access based on characteristic outside of individual control should be aknowledged and tackeled by the educational and social policies targeted at the provision of prior educational opportunities.

Revealing general trends, this study highlights the need for further quantitative and qualitative research of horizontal stratification in higher education in relation to socioeconomic inequalities and educational policies.

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Appendices

Annex A. Data Source

In addition to basic cleaning and unification of the records, data processing included restricting the sample and handling missing values. The final data set for analysis contains only variables with less than 50% of missing. For this reason, variables with school graduation year and sex were omitted. Missing values in school GPA variable were imputed using median value.

The missing rates for school characteristics were inconsistent through the available time range with more observations missing in 2016, 2017 and 2018 years. Observations where school name was available with other school-level variables missing were still considered in analysis, if it was possible to match these observations with the information from additional sources - standardized results database of the Ukrainian Center for Educational Quality Assessment, data on public secondary institutions from the Ministry of Finance of Ukraine and the Education Management Information System of Ukraine.

I omit records without any standardized test scores available, as well as those where identification of educational destination (field of study and university is missing). One more restriction is coming from the research design. For the development of the selectivity measure for institutions, only universities that admitted at least 10 students in the academic year were selected. Finally, the scope of this research did not allow to explore not numerous, but distinct groups of the students from vocational institutions entering higher education through the open application procedure. To focus only on horizontal dimension of stratification, their records were restricted from the sample. 4,557,963 observations remained (85 % of the initial data set).

Statistic	Ν	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max	Missing rate
Mean of individual EIT scores	4,557,963	154.44	20.64	100.00	139.00	170.67	200.00	0%
School GPA	4,557,963	9.28	1.30	1.00	8.50	10.30	12.00	12%
School location type	4,557,963	2.38	1.18	1.00	2.00	3.00	7.00	0%
School Type	4,348,111	2.26	0.51	1.00	2.00	3.00	3.00	4.3%
Year	4,557,963	2016.88	1.43	2015	2016	2018	2019	0%
University selectivity rank	4,557,963	4.43	0.86	1.00	4.00	5.00	5.00	0%
Selective field	4,557,963	0.56	0.5	0	0	1	1	0.9%
Regional Coefficient	4,557,963	0.16	0.37	0.00	0.00	0.00	1.00	0%
Subject-Specific Coefficient	4,557,963	0.33	0.47	0.00	0.00	1.00	1.00	0%
Admission	4,557,963	0.13	0.34	0	0	0	1	0%
First preference	4,557,963	0.16	0.37	0.00	0.00	0.00	1.00	26.2%

Table A.1. Descriptive statistics for variables used in the analysis.

Annex B. Regressions' Results

Table B1. Binary Logistic Model of Application to a Prestigious University.

		Dependent variable:					
		A	pplication to a	Prestigious U	Jniversity		
	Mod	lel 1	Mod	lel 2	Model 3		
	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	
Rural	-0.713***	0.490^{***}	-0.661***	0.516***	-0.566***	0.568^{***}	
	(0.027)	(0.027)	(0.026)	(0.026)	(0.023)	(0.023)	
Small and Mid-Sized Cities	-0.426***	0.653***	-0.396***	0.673***	-0.370***	0.690***	
	(0.026)	(0.026)	(0.025)	(0.025)	(0.022)	(0.022)	
Regional Centers	-0.378***	0.685***	-0.332***	0.718^{***}	-0.349***	0.705^{***}	
	(0.037)	(0.037)	(0.036)	(0.036)	(0.032)	(0.032)	
Regular Schools	-0.344***	0.709^{***}	-0.338***	0.714^{***}	-0.113***	0.893***	
	(0.023)	(0.023)	(0.022)	(0.022)	(0.019)	(0.019)	
Mean EIT Score					0.026^{***}	1.027***	
					(0.0004)	(0.0004)	
School GPA					0.129***	1.138***	
					(0.007)	(0.007)	
Regional Coefficient			-1.165***	0.312***	-1.073***	0.342***	
			(0.020)	(0.020)	(0.018)	(0.018)	
Subject-Specific Coefficient			-0.697***	0.498***	-0.602***	0.548***	
			(0.012)	(0.012)	(0.012)	(0.012)	
Constant	1.048***	2.851***	1.010***	2.744***	-4.532***	0.011	
	(0.034)	(0.034)	(0.033)	(0.033)	(0.039)	(0.039)	
Year	Yes	Yes	Yes	Yes	Yes	Yes	
Observations	4,348,111	4,348,111	4,348,111	4,348,111	4,348,111	4,348,111	
Log Likelihood	-2,838,103	-2,838,103	-2,815,019	-2,815,019	-2,620,746	-2,620,746	
Akaike Inf. Crit.	5,676,224.0	5,676,224.0	5,630,060.0	5,630,060.0	5,241,518.0	5,241,518.0	

Model of Application

*p<0.1; **p<0.05; ***p<0.01

Note: Table reports coefficients and odds ratios. Standard errors are clustered at the school level. The number of observations dropped due to missing values in the school type variable.

		Мо	del of Applica	tion				
	Dependent variable:							
		Ap	plication to Pr	estigious Field	of Study			
	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio		
	(1)	(2)	(3)	(4)	(5)	(6)		
Rural	-0.468***	0.626^{***}	-0.461***	0.631***	-0.458***	0.633***		
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)		
Small and Mid- Sized Cities	-0.266***	0.766***	-0.269***	0.764***	-0.267***	0.766***		
	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)		
Regional Centers	-0.229***	0.795***	-0.232***	0.793***	-0.229***	0.795***		
	(0.015)	(0.015)	(0.015)	(0.015)	(0.014)	(0.014)		
Regular Schools	-0.177***	0.838***	-0.180***	0.835***	-0.118***	0.888^{***}		
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)		
Mean EIT Score					0.003***	1.003***		
					(0.0002)	(0.0002)		
School GPA					0.107***	1.113***		
					(0.004)	(0.004)		
Regional Coefficient			0.010***	1.010***	0.057***	1.059***		
			(0.013)	(0.013)	(0.013)	(0.013)		
Subject-Specific Coefficient			-3.932***	0.020***	-3.910***	0.020		
			(0.043)	(0.043)	(0.042)	(0.042)		
Constant	0.457***	1.579***	0.458^{***}	1.581***	-1.047***	0.351***		
	(0.013)	(0.013)	(0.013)	(0.013)	(0.030)	(0.030)		
Year	Yes	Yes	Yes	Yes	Yes	Yes		
Observations	4,348,111	4,348,111	4,348,111	4,348,111	4,348,111	4,348,111		
Log Likelihood	-2,927,719.0	-2,927,719.0	-2,866,856.0	-2,866,856.0	-2,849,857.0	-2,849,857.0		
Akaike Inf. Crit.	5,855,455.0	5,855,455.0	5,733,733.0	5,733,733.0	5,699,741.0	5,699,741.0		
Note:	*p<0.1; **p<0.05; ***p<0.01							

Table B2. Binary Logistic Model of Application to a Prestigious Field of Study.

Note: Table reports coefficients and odds ratios. Standard errors are clustered at the school

level. The number of observations dropped due to missing values in the school type variable.

Model of Admission											
	Dependent variable:										
	Admission to a Prestigious University										
	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)			
Rural	-0.386***	0.680^{***}	-0.483***	0.617***	-0.375***	0.687^{***}	-0.348***	0.706***			
	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.012)	(0.011)	(0.011)			
Small and Mid-Sized Cities	-0.295***	0.745***	-0.326***	0.722***	-0.278***	0.757***	-0.260***	0.771^{***}			
	(0.010)	(0.010)	(0.011)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)			
Regional Centers	-0.114***	0.892***	-0.169***	0.845***	-0.161***	0.851***	-0.149***	0.861***			
	(0.020)	(0.020)	(0.021)	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)			
Regular Schools	-0.105***	0.900^{***}	-0.135***	0.873***	-0.016	0.984^{***}	0.112***	1.119***			
	(0.011)	(0.011)	(0.012)	(0.012)	(0.010)	(0.010)	(0.011)	(0.011)			
Mean EIT Score					0.014^{***}	1.014^{***}	0.014***	1.014***			
					(0.0002)	(0.0002)	(0.0002)	(0.0002)			
School GPA					0.021***	1.021***	0.020^{***}	1.020***			
					(0.002)	(0.002)	(0.002)	(0.002)			
Regional Coefficient			-0.243***	0.785***	-0.129***	0.879^{***}	-0.126***	0.882^{***}			
			(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)			
Subject-Specific Coefficient	u		0.106***	1.112***	0.215***	1.240***	0.473***	1.605***			
	ollecti		(0.015)	(0.015)	(0.014)	(0.014)	(0.029)	(0.029)			
First Choice	D CC		2.258***	9.568***	2.269***	9.670***	2.489^{***}	12.055***			
	EU eT		(0.010)	(0.010)	(0.009)	(0.009)	(0.019)	(0.019)			
Regular Schools X First Choic	eÖ						-0.321***	0.725***			
							(0.021)	(0.021)			
Rural X First Choice							-0.428***	0.652***			

Table B3. Binary Logistic Model of Admission to a Prestigious University.

							(0.038)	(0.038)
Small and Mid-Sized Cities X First Choice							-0.343***	0.710***
							(0.035)	(0.035)
Regional Centers X First Choice							-0.242***	0.785***
							(0.050)	(0.050)
Constant	-2.373***	0.093***	-2.943***	0.053***	-5.553***	0.004	-5.644***	0.004
	(0.013)	(0.013)	(0.013)	(0.013)	(0.034)	(0.034)	(0.034)	(0.034)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,348,111	4,348,111	3,146,563	3,146,563	3,146,563	3,146,563	3,146,563	3,146,563
Log Likelihood	-1,129,373.000	-1,129,373.000	-742,362.40	-742,362.40	-733,347.30	-733,347.300	-732,670.200	-732,670.200
Akaike Inf. Crit.	2,258,763.000	2,258,763.000	1,484,749.0	1,484,749.0	1,466,723.0	1,466,723.000	1,465,376.000	1,465,376.000

*p<0.1; **p<0.05; ***p<0.01

Note: Table reports coefficients and odds ratios. Standard errors are clustered at the school level. The number of observations

dropped due to missing values in the first choice variable.

CEU eTD Collection

Model of Admission										
	Dependent variable:									
	Admission to a Prestigious Field of Study									
	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Odds ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
Rural	-0.259***	0.772^{***}	-0.336***	0.715***	-0.317***	0.728***	-0.307***	0.736***		
	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)		
Small and Mid-Sized Cities	-0.173***	0.841^{***}	-0.187***	0.829***	-0.178***	0.837***	-0.171***	0.843***		
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)		
Regional Centers	-0.008	0.992***	-0.052***	0.949***	-0.050***	0.951***	-0.044***	0.957***		
	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)		
Regular Schools	-0.025***	0.975***	-0.057***	0.944***	-0.035***	0.965***	0.082***	1.086***		
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)		
Mean EIT Score					0.002***	1.002***	0.002***	1.002***		
					(0.0002)	(0.0002)	(0.0002)	(0.0002)		
School GPA					0.007^{**}	1.007***	0.006^{*}	1.006***		
					(0.003)	(0.003)	(0.003)	(0.003)		
Regional Coefficient			0.258***	1.294***	0.278^{***}	1.320***	0.280^{***}	1.323***		
			(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)		
Subject-Specific Coefficient	u		-3.064***	0.047***	-3.045***	0.048	-2.325***	0.098		
	ollecti		(0.060)	(0.060)	(0.060)	(0.060)	(0.094)	(0.094)		
First Choice	ЪС		1.999***	7.381***	1.997***	7.366***	2.218***	9.192***		
	EU eT		(0.009)	(0.009)	(0.009)	(0.009)	(0.018)	(0.018)		
Regular Schools X First Choice	eÖ						-0.320***	0.726***		
							(0.020)	(0.020)		
Rural X First Choice							-1.713***	0.180		

Table B4. Binary Logistic Model of Admission to a Prestigious Field of Study.

							(0.166)	(0.166)
Small and Mid-Sized Cities X First Choice							-1.066***	0.345***
							(0.120)	(0.120)
Regional Centers X First Choice							-0.998***	0.369**
							(0.188)	(0.188)
Constant	-2.763***	0.063***	-3.193***	0.041***	-3.668***	0.026	-3.744***	0.024
	(0.011)	(0.011)	(0.011)	(0.011)	(0.028)	(0.028)	(0.029)	(0.029)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,348,111	4,348,111	3,146,563	3,146,563	3,146,563	3,146,563	3,146,563	3,146,563
Log Likelihood	-1,022,982.000	-1,022,982.000	-675,224.80	-675,224.80	-674,952.30	-674,952.30	-674,351.800	-674,351.800
Akaike Inf. Crit.	2,045,981.000	2,045,981.000	1,350,474.00	1,350,474.00	1,349,933.0	1,349,933.0	1,348,740.000	1,348,740.000
Note:							*p<0.1; **p<0	0.05; ***p<0.01

Note: Table reports coefficients and odds ratios. Standard errors are clustered at the school level. The number of observations dropped due to

missing values in the first choice variable.

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Annex C. Descriptive statistics



Figure C1. Distribution of Institutions' Selectivity Scores.

Source: Authors' calculations based on the USUEDU data.

Note: the figure represents distribution of selectivity score calculated based on the standardized scores of admitted students.

Table C2. Proportions of applications and admitted students from rural and urban areas, grouped by a field of study.

Field of study	Selectivity Score (on scale 100-200)	Share of admitted rural schools graduates	Share of admitted urban schools graduates	Share of rural schools graduates that applied	Share of rural schools graduates that applied
Health And Welfare	176.13	5.75	8.99	5.74	6.23
Information and Communication Technologies	175.91	4.86	8.58	7.32	12.73
Social Sciences, Journalism and Information	174.45	10.97	12.57	14.29	16.34
Business, Administration and Law	171.89	19.18	20.08	22.05	22.37
Arts and Humanities	167.7	7.96	13.19	8.37	12.01
Natural Sciences, Mathematics and Statistics	164.4	4.14	3.52	4.23	3.44
Services	159.03	4.8	5.2	5.9	5.61
Education	154.02	24.25	12.9	17.6	9.48
Engineering, Manufacturing and Construction	152.42	12.48	12.31	9.86	9.47
Agriculture, Forestry, Fisheries and Veterinary	146.45	5.62	2.66	3.39	1.55
Total, %		100	100	100	100

Source: Author's calculations based on the USUEDE data.

Note: The Table reports the shares of applicants and admitted students grouped by rural/urban origin for each field of study. The statistics show evident differences in choices of application and admission destination between two groups. For instance, a share of rural applicants that applied to Agriculture is almost twice as large as a share of urban students that applied to this field.

Table C3. Proportions of applications and admitted students, grouped by a size of urban area and a field of study.

Field of study	Selectivity Score (on the scale 100-200)	Share of admitted, small and mid sized towns	Share of admitted, regional centers	Share of admitted, large cities and capital	Share of applications, small and mid sized towns	Share of application, regional centers	Share of applications, large cities and capital
Health And Welfare	176.13	6.72	6.31	5.18	6.67	6.4	4.15
Information and Communication Technologies	175.91	8.6	10.29	11.78	11.48	12.4	15.49
Social Sciences, Journalism and Information	174.45	11.95	12.88	14.95	15.27	16.67	19.02
Business, Administration and Law	171.89	20.5	19.54	20.72	22.88	21.55	23.65
Arts and Humanities	167.7	13.35	13.29	13.95	12.37	11.83	11.05
Natural Sciences, Mathematics and Statistics	164.4	3.61	3.13	4.19	3.54	3.22	3.63
Services	159.03	5.68	4.94	4.91	5.73	4.77	4.73
Education	154.02	14.69	16.27	10.03	10.59	12.68	7.26
Engineering, Manufacturing and Construction	152.42	12.05	10.67	12.54	9.7	8.69	9.97
Agriculture, Forestry, Fisheries and Veterinary	146.45	2.84	2.69	1.75	1.77	1.79	1.05
Total,%		100	100	100	100	100	100

Source: Author's calculations based on the USUEDE data.

Note: The statistics show that differences in the field choice among rural students are moderate. The biggest gap occurs in Education with the lowest share of applicants to this field in the group of students from large cities and the capital. Table C4. Proportions of applications and admitted students, grouped by a type school and a field of study.

Field of study	Selectivity Score (on scale 100- 200)	Share of admitted, elite schools	Share of admitted, regular schools	Share of applications, elite schools	Share of applications, regular schools
Health And Welfare	176.13	6.34	5.76	5.5	5.49
Information and Communication Technologies	175.91	11.93	7.51	14.82	10.33
Social Sciences, Journalism and Information	174.45	13.43	12.57	17.13	16.12
Business, Administration and Law	171.89	20.79	20.02	22.61	22.79
Arts and Humanities	167.7	12.1	12.08	11.18	11.32
Natural Sciences, Mathematics and Statistics	164.4	4.41	3.6	3.84	3.6
Services	159.03	4.35	5.79	4.57	6.23
Education	154.02	12.19	17.35	9.37	12.45
Engineering, Manufacturing and Construction	152.42	12.28	11.78	9.65	9.51
Agriculture, Forestry, Fisheries and Veterinary	146.45	2.2	3.54	1.34	2.15
Total,%		100	100	100	100

Source: Author's calculations based on the USUEDE data.