











# “The impact of the forced displacement of universities due to the occupation of certain territories of Ukraine on the effectiveness of their activities: “Top 200 Ukraine” universities ranking”

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### SPECIAL ISSUE "UKRAINIAN UNIVERSITIES IN NEW REALITIES: 10 YEARS OF WAR"

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# THE IMPACT OF THE FORCED DISPLACEMENT OF UNIVERSITIES DUE TO THE OCCUPATION OF CERTAIN TERRITORIES OF UKRAINE ON THE EFFECTIVENESS OF THEIR ACTIVITIES: THE ANALYSIS BASED ON THE DATA FROM THE "TOP 200 UKRAINE" UNIVERSITIES RANKING

## Abstract

The study targets temporarily displaced universities that changed their location due to the outbreak of the armed military conflict in Ukraine in 2014 and Russia's full-scale military aggression in 2022. This paper focuses on the leadership of universities in implementing their third mission, which is critical to fostering the economic and social development of the regions. The purpose is to assess the impact of forced, urgent, and unplanned relocation of universities (due to the potential or actual occupation of certain territories of the country by enemy forces) on their effectiveness.

According to the rating of Ukrainian universities, "Top 200 Ukraine", the rating indicators for the last 10 years of temporarily displaced universities from the occupied territories were analyzed. A comprehensive analysis of the challenges faced by temporarily displaced universities in Ukraine was done.

Statistical analysis has confirmed the decline in ranking positions by displaced higher education institutions. The findings indicate a minimum five-year decrease in performance metrics for all institutions following relocation, with the success of adaptation to new conditions being contingent upon the institution's capacity and resources. The data suggest that displaced universities face existential threats and require enhanced support from both governmental and international communities. A review of scholarly research on the strategic management of higher education institutions and their leading role in regional development underscores the necessity of preserving these institutions to facilitate the socio-economic reconstruction of war-affected territories.

## Keywords

temporarily displaced universities, preservation of human capital, higher education management, restoration of de-occupied territories, university rankings, third mission

**JEL Classification** I25, I28, O15

## INTRODUCTION

In the 21st century, the global community is increasingly realizing the leadership role of universities and other research institutions in the economic and social development of their respective regions. The concept of "university as an anchor institution" is gaining recognition in the United States and has garnered support in the United Kingdom and the European

Union. The expanded mission of universities to use their human, scientific, and economic resources for the development of their region is called the third mission. Considering European integration, it is crucial for Ukraine to develop research infrastructures and enhance the brand and leadership functions of its universities. However, the specific circumstances in which Ukrainian society finds itself following the onset of the war pose new challenges for Ukrainian universities. Numerous universities have been forced to relocate due to the temporary occupation of Ukrainian territories by Russia.

In less than a decade, Ukraine has experienced two significant waves of displacement affecting its higher education institutions (HEIs). The initial wave occurred in 2014 when the war against Ukraine began. The country has lost control of 7% of its own territories, compelling 19 state higher education institutions from the annexed Crimea and Luhansk and Donetsk regions (combat zone) to relocate (Cabinet of Ministers of Ukraine, 2015). Nine universities from these regions have already been displaced twice. The destruction of infrastructure, loss of human resources, and the resumption of the educational process under martial law have become significant challenges. The negative consequences include the loss of leadership potential among displaced universities, a decline in the quality and capacity of their educational and research activities, and, in some cases, the complete cessation of their operations. Nevertheless, the preservation of these universities holds strategic significance for the successful socio-economic recovery of de-occupied territories.

## 1. LITERATURE REVIEW

Recognizing the pivotal role of scientific and technological knowledge generated by universities in driving economic and social development and enhancing the living standards of communities underscores the imperative to preserve displaced higher education institutions. This critical issue has been extensively addressed. Compagnucci and Spigarelli (2020) define the core concept of third mission, its potential, limitations, and stages of implementation based on the analysis of 134 articles on the topic. Muscio et al. (2012) and Blenker et al. (2006) consider the entrepreneurial role of universities and the factors of universities' development as anchor institutions.

Frondizi et al. (2019) and Agasisti et al. (2019) examine the evolving function of universities within the current socio-economic environment and evaluate the concept of third mission on the example of Italian universities. Agasisti et al. (2019) investigated the relationship between Italian universities and the economic development of the regions in which they operate. Agasisti and Bertolotti (2022) analyzed the impact of regional higher education systems on economic growth based on a study of 284 European regions over an 18-year period (2000–2017). Abanto et al. (2022) concluded the significant contribution of universities to the protection of human rights, peace, and democracy

during military conflicts. Fallanca (2019) emphasizes the importance of universities in promoting environmental security during war conflicts.

This issue has garnered significant attention from Ukrainian scholars. Sych (2022) considers state management of higher education in Ukraine in terms of directing the activities of universities to fulfill the third mission. Orzhel (2022) explores the conceptualization of the third mission of Ukrainian universities during wartime and post-war reconstruction. The implementation strategies of the third mission under wartime conditions and post-war reconstruction of the country are considered by Petrushenko et al. (2023). Key works that provide valuable insights into the impact of military aggression on the national education system and the essence and unique characteristics of displaced universities as a new type of higher education institution in Ukraine include those by Kurylo et al. (2019).

After the full-scale outbreak of the war in 2022, a large number of articles has documented the hardships encountered by Ukrainian scientists in Kharkiv, Kyiv, Donetsk, and other Ukrainian cities during the Russian invasion. Scholars from various Ukrainian regions describe the peculiarities of the work of their higher education institutions during the Russian army's full-scale invasion of Ukraine.

Research is also devoted to evacuation and setting up the work of higher education institutions that were forced to relocate. Peregudova (2023) describes the first days of the war and the evacuation of Berdyansk State Pedagogical University. The experience of the displaced Melitopol Bohdan Khmelnytskyi State Pedagogical University was described by Bukrieieva and Afanasieva (2023) and Falko and Zhukov (2023).

Ukrainian scientists from displaced universities have analyzed how the scientific and educational activities in these institutions change. Suchikova et al. (2023) outline the factors that reduce the effectiveness of scientific activity during wartime and reduce the scientific potential in Ukraine. Gurenko and Suchikova (2023) emphasize the importance of the transformational experience of Ukrainian institutions operating under the “university without walls” model in war and displacement.

There have been several studies devoted to mental health during wartime and the search for ways to the post-war restoration of the potential of university teachers and human resources of Ukraine. Kurapov et al. (2023) confirmed the negative effects of the war on the mental and emotional well-being of Ukrainian civilians – university students and faculty. Ma et al. (2023) conclude that there is a need for targeted post-war restoration of the potential of university teachers for the sustainable development of Ukraine. Kozhyna et al. (2022), and Ponomarenko and Pysarchuk (2024) identify the main directions of human resources development in Ukraine in the context of post-war reconstruction.

Several significant publications analyze the current state of the national education system and its prospects for restoration in the post-war period, proposing methods to reconstruct higher education. In the Paris Report, Horodnichenko et al. (2022) delineated a comprehensive vision of Ukraine’s reconstruction after the war and analyzed the educational reform during and after the conflict. Nikolayev et al. (2023) outlined the challenges confronting the higher education system of Ukraine due to the consequences of the pandemic and the war. Scientists evaluate the experience and decisions of the authorities and universities

to respond to these challenges and provide information about the current state of the Ukrainian higher education system in the context of war and its primary and prospective needs. The editorial article by Nature (2023) and Irwin (2023) address the issue of supporting scientists and rebuilding the research infrastructure of Ukraine. Maryl et al. (2022) discuss the support mechanisms and opportunities available to Ukrainian scholars affected by the war.

Several studies propose the development of Ukraine’s higher education system by reducing the number of institutions. Ponomarenko (2022) proposes a modification in the distribution system of the state order for specialist training, which should lead to the necessary optimization of the higher education network. Kremen et al. (2022) suggest optimizing the national network of HEIs, primarily through their consolidation. Their conclusion is based on the analytical review of the national network of 176 public HEIs. A comprehensive analysis of Ukraine’s education in wartime by the end of 2022 is presented in the information-analytical collection edited by Shkarlet (2022). This work outlines the prospects and primary objectives for the development of higher education. However, it does not propose strategies for preserving displaced higher education institutions. Consequently, the future of these institutions appears uncertain and lacks promising prospects.

Lugovyi et al. (2022) identified the factors of effectiveness of associative unions for ensuring the leadership of universities and the feasibility of implementing this experience in Ukraine. This study is based on the analysis of the Shanghai Ranking for 2002–2022. The analysis constitutes a critical methodology to identify trends, forecast the development of the higher education system, and inform strategic decision-making. Recent publications have highlighted various aspects of applying ranking assessments for higher education institutions: as a tool for evaluating the international competitiveness of HEIs (Kvitka & Starushenko, 2021) and as a mechanism for assessing the quality of higher education and the competitiveness of institutions (Kryvoruchko, 2022; Poplavskyi, 2022; Vorobyovya et al., 2019). Woźnicki (2019) indicated that rankings indicate a university’s success and the outcome of effectively implementing

its development strategy. The limited representation of Ukrainian universities in global rankings stems from the conditions and resources available to these institutions, which should motivate government authorities to increase investments to support their development.

A literature review demonstrates that during the war and post-war reconstruction period, HEIs played a significant role in fostering the socio-economic development of their regions. Numerous studies describe the experiences of displaced universities in evacuating and adapting to wartime conditions, as well as various factors that diminish their educational and research efficiency. Studies addressing the development of higher education systems often focus on reducing the number of HEIs, whereas the specific challenges faced by displaced universities remain underexplored.

Given the critical role universities play in regional development and the threats to the functioning of Ukraine's temporarily displaced universities under current conditions, the purpose of this study is to assess the impact of forced, urgent, and unplanned relocation of universities (due to the potential or actual occupation of certain territories of the country by enemy forces) on the effectiveness of their operations.

## 2. METHODS

The desk research was used to clarify the essence of the third mission of universities and the importance of its implementation for the restoration and socio-economic development of the de-occupied regions in Ukraine. An analysis of regulatory documents was performed to elucidate the status of temporarily displaced universities. Data from the Unified State Electronic Database on Education (USEDE), along with statistical reports from Ukraine's Ministry of Education and Science (MESU) on expenditure distribution under the "Training of Personnel in HEIs and Support for Their Practical Bases" formula for 2020, 2021, and 2022 was examined.

The research period encompassed eleven years (2013–2024), unveiling the dynamics of university ranking positions before the outbreak of military

conflict in 2014 and until now. The sample included HEIs at accreditation levels III-IV that were listed in the "Top-200 Ukraine 2024" ranking and had been displaced from Luhansk, Donetsk, Zaporizhzhia, Kherson regions, and Crimea due to military events in 2014 and full-scale aggression in 2022.

Comparing 13 displaced universities from 2013 to 2020 and nine twice-displaced universities from 2013 to 2024, statistical analysis of ranking dynamics for displaced HEIs was conducted using the Wilcoxon signed-rank test for dependent samples. Correlation analysis (Spearman's and Kendall's rank correlations) was also applied to these two groups.

The study's limitations include potential biases in university rankings, which are inherent to a greater or lesser extent in any rating evaluation system. The national ranking of higher education institutions, which has been chosen as a basis, has certain limitations regarding the completeness of the assessment of these types of universities.

It is also necessary to stress the limitations of official statistical information in Ukraine. The State Statistics Service of Ukraine has suspended the publication of statistical information during martial law or a state of war and for three months after its termination.

## 3. RESULTS

### 3.1. Displacement of universities in Ukraine (2014–2022)

The first wave of university relocation occurred in Ukraine in 2014, when Russia annexed Crimea, and Luhansk and Donetsk regions became part of the conflict zone. These events led to the emergence of displaced HEIs in the autumn of 2014. The process of displacement was not regulated by the authorities and is characterized by scholars as self-evacuation of universities and evacuation of HEIs "from below", an example of social mobilization (Dmytryk & Servachak, 2020). It was the initiative of an active segment of the faculties and students to relocate 19 HEIs from the occupied territories to the government-controlled areas.

The majority of the displaced HEIs relocated to their own branches in the government-controlled areas of Donetsk and Luhansk regions, while a minority continued their educational process in Vinnytsya, Kryvyi Rih, Kharkiv, and Kyiv. Resuming educational activities in the 2014/2015 academic year presented a significant challenge for these HEIs, as they lost their premises, equipment, machinery, dormitories, library collections, equipment, documentation, archives, and most critically, a significant part of the faculty, student population, and in some institutions, even the management. Educators have encountered significant difficulties in establishing the educational process, including a lack of classroom facilities and the necessity to create new teaching materials and develop distance learning. Due to legal uncertainty, teachers did not receive salaries for several months, and students did not receive scholarships (Dmytryk & Servachak, 2020). The outflow of people from the uncontrolled areas of Donetsk and Luhansk regions in various directions and informational confusion with universities-duplicates jeopardized the subsequent year's admission process. Adaptation in the new territories occurred with minimal assistance from the government and was based on the dedication of their staff.

Such social activity prompted the MESU to make appropriate decisions. According to the Resolution of the Cabinet of Ministers of Ukraine (CMU) # 935 (2015), 18 state HEIs of Donetsk and Luhansk regions were relocated from the area of the anti-terrorist operation. Only one of the most prominent HEIs in the region, Vernadsky Taurida National University, relocated from the Autonomous Republic of Crimea.

The universities were transferred to six regions of Ukraine. The status of the temporarily displaced HEIs and the primary issues related to the activi-

ties of these institutions under new conditions were determined in 2016 (Verkhovna Rada of Ukraine, 2016). In 2019, amendments to the Law of Ukraine "On Higher Education" (Verkhovna Rada of Ukraine, 2014) prescribe the right of the Central Executive Body in the field of education and science to initiate the reorganization of temporarily displaced HEIs, temporarily displaced research institutions through merger or accession. The orders of the CMU do not specify why a particular institution is being reorganized, liquidated, and merged (Table 1) (Bondar, 2021).

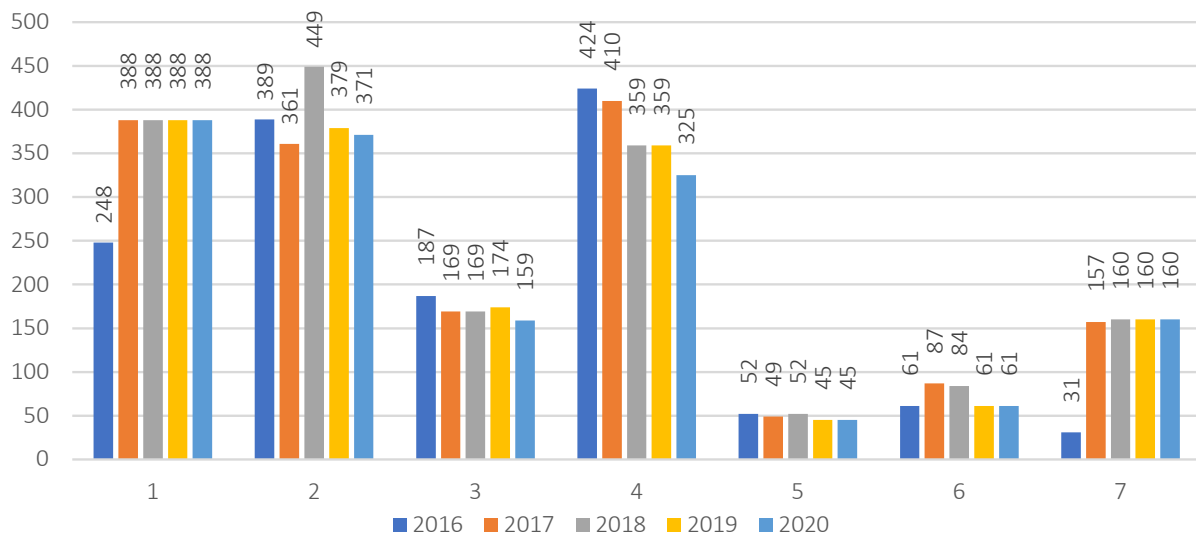
In 2019, the Minister of Education and Science H. Novosad announced plans of the MESU to conduct an audit of the network of HEIs displaced from the temporarily occupied territories of Ukraine. The audit results had to be taken considered for decisions to unite these HEI (Ukrinform, 2019).

For the academic staff and students of HEIs, the initial shock of actual losses, evacuation from the occupied territories, and difficulties in adapting to new living conditions gradually changed to uncertainty regarding the institution's future prospects. Displaced HEIs are increasingly compelled to focus on local applicants, although it is complicated due to the high competition with the local HEIs operating under normal conditions at their permanent locations.

Faculty turnover is characteristic of all displaced HEIs, as the faculty who relocated in the fall of 2014 are displaced persons whose life plans have become less clear to them over the years in the context of the ongoing armed conflict in eastern Ukraine. However, there is virtually no analytical data in official statistical resources on the number of losses of displaced HEIs, the decrease in applicants, or research and academic staff in accordance with the Law of Ukraine "On Protection of

**Table 1.** Reorganized, liquidated, and merged universities (2018–2021)

Year	Reorganized university	University to which another higher education institution was attached
2018	Donbas State Technical University	Volodymyr Dahl East Ukrainian National University
2018	Prokofiev Donetsk State Music Academy	Vernadsky Taurida National University (which had been transferred from Crimea to Kyiv)
2021	Donetsk State University of Management	Mariupol State University
2021	Luhansk National Agrarian University	Volodymyr Dahl East Ukrainian National University
2021	Luhansk State University of Internal Affairs named after E.O. Didorenko	Donetsk State University of Internal Affairs



Note: The X-axis shows the HEIs: 1 – Luhansk Taras Shevchenko National University, 2 – Volodymyr Dahl East Ukrainian National University, 3 – Donetsk National Technical University, 4 – Vasyl Stus Donetsk National University, 5 – Donbas National Academy of Civil Engineering and Architecture, 6 – Mykhailo Tugan-Baranovsky Donetsk National University of Economics and Trade, 7 – Vernadsky Taurida National University. The Y-axis presents the number of full-time employees.

**Figure 1.** Dynamics of changes in the number of full-time employees in public HEIs of the first wave of relocation

the Interests of Subjects of Submission of Reports and Other Documents during the martial law or state of war” (Verkhovna Rada of Ukraine, 2022).

Based on the reports of the MESU regarding the results of modeling the formula for allocating expenditures for 2020, 2021, 2022 (Ministry of Education and Science of Ukraine, 2020), the data on the number of full-time employees state-funded students for the period from 2016 to 2020 were summarized. However, with the introduction of martial law, the application of this cost allocation formula was suspended, and therefore, data for each institution are no longer available.

Figure 1 presents the number of full-time employees in state HEIs subordinated to the MES of Ukraine and displaced since 2014. Unfortunately, these data cannot be compared with the first years of displacement due to its absence.

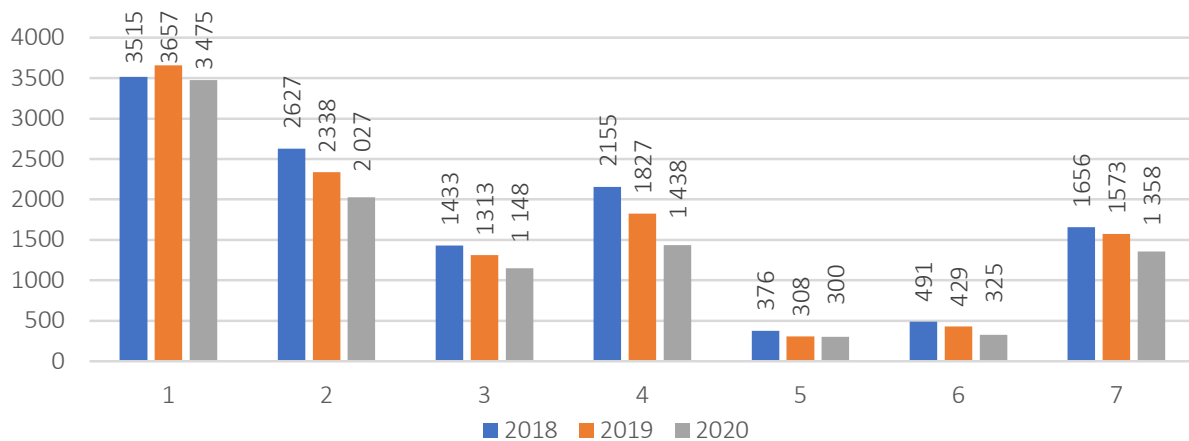
Three of the seven HEIs (1, 6, and 7) had the lowest number of employees in 2016. Since 2017, the number of employees in these institutions has been increasing and staying almost constant. Such dynamics can be assumed to be the consequences of displacement, and it took the universities two years to stabilize and restore their staff.

Other institutions show a constant gradual decrease in the number of employees. The exception is the Volodymyr Dahl East Ukrainian National University (2), which demonstrated a significant increase in the number of employees in 2018 due to the merger with Donbas State Technical University that year.

The obtained data may reflect the general crisis in the country’s economy and higher education system, manifested in the reduction of funding for HEIs and a drop in the overall standard of living. This assumption is also confirmed by comparing the number of students enrolled in state-funded higher education in 2018, 2019, and 2020 (Figure 2), which is gradually decreasing in the vast majority of HEIs.

Figure 2 shows that in every temporarily relocated HEI of the first wave of relocation, the number of students enrolled in state-funded programs is gradually decreasing, which indicates a decrease in budgetary revenues.

Education institutions are unable to provide information on the number of higher education students studying on a contract basis. However, this category of students was at risk. There is also



Note: The X-axis is the HEI: 1 –Luhansk Taras Shevchenko National University, 2 – Volodymyr Dahl East Ukrainian National University, 3 – Donetsk National Technical University, 4 – Vasyl Stus Donetsk National University, 5 – Donbas National Academy of Civil Engineering and Architecture, 6 – Mykhailo Tugan-Baranovsky Donetsk National University of Economics and Trade, 7 – Vernadsky Taurida National University. The Y-axis demonstrates the number of higher education students enrolled in state-funded programs.

**Figure 2.** Dynamics of changes in the number of higher education students enrolled in a state-funded program in public HEIs of the first wave of relocation

a lack of information on part-time employees at HEIs. This analysis can be supplemented with an example of Luhansk Taras Shevchenko National University.

In 2014, the Luhansk Taras Shevchenko National University was compelled to relocate to the city of Starobilsk utilizing the facilities of its own Separate Subdivision, “Starobilsk Faculty of Luhansk Taras Shevchenko National University.” At that time, it was one of the largest and most prestigious HEIs in the eastern region of Ukraine, with nearly 30,000 students enrolled (Kurylo & Savchenko, 2019). In 2024, the university has 6,000 students, which is five times fewer than before 2014; 562 research and teaching staff members work there, 457 of whom are full-time employees.

### 3.2. Displacement of universities after the beginning of a full-scale war (2022–present)

With the full-scale invasion of the Russian Federation into Ukraine on February 24, 2022, the second wave of university relocations occurred. According to Vox Ukraine (2022), during the second wave, HEIs could not avoid temporary relocation, as they were centrally blocked from accessing treasury services and the USEDE until the moment of relocation.

According to the MESU, 31 HEIs were temporarily relocated from the temporarily occupied and especially dangerous territories (Ministry of Education and Science of Ukraine, 2022). Nine universities have been doubly relocated. In most cases, the relocated universities are not located on the territories of their own separate subdivisions, as was the case during the first wave of relocation. Instead, they are situated on the campuses of industry-related HEIs or other education institutions. This situation has further complicated adaptation to new conditions and increased competition between the universities.

As of July 2022, over 54,000 students were studying in the displaced HEIs, and almost 7,000 teachers were employed (Vox Ukraine, 2022). The second displacement wave is more widespread and characterized by similar losses to the first but on a larger scale. After relocating from occupied territories, higher education institutions have lost almost all of their materials and technical bases, as well as part of the information and human resources. However, higher education institutions are still in danger, even in the new locations. Regular shelling across Ukraine poses a serious threat to the safety of employees and students. The example of Bohdan Khmelnytsky Melitopol State Pedagogical University, which was compelled to relocate to the free territory in Zaporizhzhia, is typical for many



displaced HEIs. The university lost its buildings and other material resources, approximately 25% of its students, 25% of its faculty, and 25% of its funding (Falko & Zhukov, 2023). The experience of Berdyansk State Pedagogical University during the war is also telling: after 53 days of functioning under occupation by Russian troops, the university's faculty was reduced by 13%, 43% remained in the occupied zone, 57% of employees moved to the territories controlled by Ukraine, and 14% later left the country (Peregudova, 2023).

The destruction of premises is occurring throughout Ukraine. Psychological exhaustion, threats to life, and the unstable economic situation are forcing researchers and students to leave the country. In 2021, there were 60,000 scientists and 35,000 support staff; within two weeks of the war, approximately 4,000 to 6,000 scientists had already fled the country (Maryl et al., 2022). One-tenth of all researchers in Ukraine have gone abroad (Irwin, 2023).

In order to continue their educational activities under these challenging conditions, universities are implementing anti-crisis management measures, relying on digital services, and making tremendous efforts to establish their operations and return students and faculty. However, all these efforts have inevitably affected the loss of leadership positions. The risk zone is undoubtedly occupied by displaced universities that have found themselves in other regions of the country, where they need to establish new connections with communities, seek new stakeholders and sources of additional funding, create new material and technical bases, form a contingent of applicants, and even compete with the universities that have provided them with shelter in their premises.

### 3.3. Analysis of leadership positions of temporarily displaced universities based on the “Top-200 Ukraine” university rankings

Some of the relocated universities were the leaders of the Eastern region of Ukraine, which at that time were among the top 200 universities according to the ranking of universities of

Ukraine 2012–2013, namely 12 universities. The fate of these institutions has varied. Some have experienced a loss in their positions, while others have been reorganized by merging or joining other HEIs (Euro Osvita, n.d.).

According to the “Top 200 Ukraine 2024” (Euro Osvita, n.d.), the ranking of the 200 best Ukrainian higher education institutions includes only eight temporarily displaced universities from Luhansk and Donetsk regions, which were present in the ranking before the displacement, and one more displaced institution, Donetsk State University of Internal Affairs, was incorporated in 2018. The dynamics of changes in the positions of these universities in the Top 200 Ukraine ranking from 2013 to 2024 are illustrated in Figure A1 (Appendix A).

As evident from Figure A1, the highly ranked universities have been more successful in maintaining their leading positions over these challenging nine years. However, even the top five leaders in these regions have experienced a gradual decline in the rankings. For instance, Vasyl' Stus Donetsk National University, ranked 17th in 2013, dropped to 32nd place in 2016, recovered to 21st place in 2022, and dropped to 31st place in 2024. Another influential university in Donetsk region, Donetsk National Technical University, also lost 33 positions during this period (from 18th place in 2013 to 51st place in 2024).

All universities have been gradually losing their positions in the rankings between 2015 and 2018. Only Luhansk State Medical University experienced a significant drop in the ranking in 2016, falling 78 positions in that year before stabilizing its position. Such dynamics are not unexpected; having relocated from Luhansk to Rubizhne, the institution lost almost all of its material base, similar to other displaced HEIs. During these difficult years, the Luhansk Taras Shevchenko National University moved from 21st place in 2013 to 86th place in 2024, losing 65 positions. There was a sharp drop in the university's ranking in 2019 to 111th place, and it increased to 52nd place in 2020. The university is actively striving to maintain its leadership position, albeit encountering a challenging path.

Another powerful institution in the Luhansk region, Volodymyr Dahl East Ukrainian National University, has dropped from 30th to 50th place over this period, losing 20 positions. It should be noted that since the maximum gradual decline in the ranking of the university to 69th place in 2020, the institution has demonstrated an increase in its position in subsequent years. This may be due to the merger of two other universities in 2018–2021, as mentioned above.

In 2019, almost all the universities showed a sharp fall in their rankings. Finding out the factors of this situation requires additional research and is not within the scope of this study. If the restrictions imposed by COVID-19 were becoming a serious challenge for the higher education system in 2019, then for displaced universities, these challenges were compounded by changes in operating conditions, loss of premises, deterioration of the material and technical base, loss of contingent staff, etc.

Most of the temporarily displaced universities have decreased their positions in the ranking over the entire research period. The drop in rankings is observed in HEIs after the crisis years (2014, 2022). However, one temporarily displaced university showed an increase in the ranking. Since 2018, Donetsk State University of Internal Affairs (185th place) has joined the top 200 HEIs. Until this year, the institution was not included in the rankings. In five years, the institution has climbed to 175th place. This improvement may be due to the accession of the displaced Luhansk State University of Internal Affairs named after E.O. Didorenko.

Generalized information on the ranking positions in 2013–2024 according to the university ranking “Top 200 Ukraine” of temporarily displaced HEIs in the second wave of displacement from Luhansk, Donetsk, Kherson, and Zaporizhzhia regions, which were among the top 200 HEIs in 2024, is presented in Figure A1 (Appendix A).

Interestingly, even with the addition of the universities of the second wave of displacement and those from occupied Crimea, the overall dynamics of the rankings have not changed significantly. Since 2014, there has been a decline in the rankings of HEIs, with the lowest rating in 2019. This

year, most of the ranking positions of research universities form a peak in the graph, which demonstrates the overall deterioration of the ranking positions of these universities. In 2020, the ranking is growing rapidly, with gradual stabilization in 2022 and deterioration in 2023 and 2024.

This dynamic in the ranking may be attributed to the impact of the COVID-19 pandemic, which compelled all HEIs to swiftly adapt to an online learning environment. Interestingly, the universities that relocated after 2014 had already been forced to adopt similar practices much earlier.

The obtained data indicate that the ranking does not immediately respond to the state of functioning and ranking positions of the HEI. Some ranking indicators have a cumulative effect, such as the recognition of the achievements of the HEI in the world and the citation and indexing of articles in scientometric databases. Accordingly, the active work of a higher education institution can lead to an increase in the rating, not in the current year but in the next year or even later. Conversely, a decrease in activity may be most evident in a few years. According to the data, the impact on rankings spans at least five years. This assumption is also confirmed by the fact that the 2014 and 2024 rankings do not reflect the crisis in which the HEIs in the conflict zone found themselves. As shown in Figure A1 (Appendix A), the majority (75%) of the temporarily displaced universities that were included in the ranking of the top 200 universities in Ukraine in 2013–2014 have even increased their ranking position or have not changed at all compared to 2013. And the other two universities (25%) showed a slight decrease in the ranking (by 3–4 steps). Thus, the positions in the ranking of HEIs in 2014 are stable, and only starting in 2015, they are gradually declining, progressing with each passing year. Similar dynamics are observed after 2022. In 2023–2024, the leading positions of universities declined. It should also be noted that the crisis in 2014 and 2022–2024 affected not only the activities of the HEIs displaced in the first wave but also those located close to the conflict zone. After a peak decline in the performance indicators of an HEI, there is a gradual stabilization of results, or the institution does not withstand the crisis and is reorganized by joining a more successful HEI.

### 3.4. The statistical analysis of the dynamics of changes in ratings of relocated higher education institutions

The non-parametric Wilcoxon test was used for the statistical analysis of the rating dynamics of changes in relocated HEIs. The results were obtained by comparing all 13 relocated HEIs in pairs by year from 2013 to 2020 (Tables A1 and A2). As previously noted, the comparison between 2013 and 2014 did not reveal significant differences. As evidenced by the results, it is possible to observe the deterioration of the ratings of relocated universities already in the comparison of the pairs of 2014–2015, 2015–2016, 2016–2017, and 2018–2019; such differences are significant at the 0.05 level (Table A2).

When comparing 2014 and 2020, the deterioration in rankings becomes even more pronounced: 10 out of 13 universities worsened their indicators, one remained unchanged, and only two showed improvement. The differences are significant ( $p < 0.001$ ) (Tables A3 and A4).

In order to cover a longer period, the indicators of universities for 2013–2024 were also compared. Data from nine HEIs were available for this period (Tables A5 and A6). There are significant differences in a sample of nine universities ( $p < 0.05$ ) when comparing 2015 with 2014, 2016 with 2015, and 2017 with 2016.

Additionally, 2014 and 2024 were compared for this group of institutions (Tables A7 and A8). As can be seen, the differences between 2014 and 2024 are significant at the 0.05 level (test statistic  $Z = -2.547$ ;  $p = 0.011$ ).

A comparison was made between 2022 and 2024, 2022 and 2019 for a group of 22 HEIs (Tables A9 and A10). In 2024, seven education institutions improved their rating, and 15 institutions worsened. In 2022, 16 education institutions improved their rating, and six worsened. The differences between 2022 and 2024 are significant at the 0.05 level (test statistic  $Z = -2.404$ ;  $p = 0.016$ ). In addition, significant differences were obtained between 2019 and 2022 at the 0.01 level (test statistic  $Z = -2.647$ ;

$p = 0.008$ ). Thus, statistical analysis confirmed the considerations (Figure A1) about the dynamics of changes in rankings in relocated HEIs related to COVID-19 and war.

Correlation analysis was performed using rank correlation coefficients in order to illustrate the invariance of the ratio of university ratings over the years. Spearman's and Kendall's rank correlation coefficients were significant at 0.001 for a pairwise comparison of all years for 13 universities (Table A11), indicating a consistent trend: universities with a comparatively better rating kept it over time. For a sample of nine twice-displaced universities, the same trend is maintained at 0.01 and 0.05 (Table A12).

Therefore, the statistical analysis confirmed substantive considerations regarding the dynamics of the decrease in the rating positions of relocated HEIs.

## 4. DISCUSSION

The results confirm the importance of preserving the network of HEIs for the restoration and reconstruction of Ukrainian territories (Agasisti et al., 2019; Agasisti & Bertolotti, 2022). This approach confirms the position of some Ukrainian scholars who concluded that an alternative to such associations in Ukraine could be the organizational consolidation of universities with systemic state support to transform them into powerful university centers (Lugovy et al., 2022).

It is necessary to take into account the conclusions of Agasisti and Bertolotti (2022), who note the positive impact of increasing the number of universities on the economic growth of regions. Moreover, Agasisti et al. (2019) stress the dependence of the successful development of not only universities but also regions on the competition between universities within these regions. Indeed, these studies were conducted in peacetime, and their results cannot be fully transferred to the realities of Ukraine, where a full-scale, exhausting war has been going on for more than two years, destroying the country's economy and human resources. Orzhel (2022) notes that "the current discourse of Ukrainian

higher education and universities should focus not on difficulties, lack of funding and the need to reduce the network of universities, but on rethinking Ukrainian universities and other universities, turning them into leading knowledge institutions capable of contributing to the restoration and revival of the country.”

What matters is the results of studies that emphasize the role of universities during military conflicts: fulfilling a social role in protecting human rights, establishing peace and implementing democratic values (Abanto et al., 2022), overcoming the consequences of inappropriate use of natural resources, landscape destruction and overcoming environmental problems (Fallanca, 2019). Studies show that after the Second World War, universities took on several new social functions, focusing on the training and renewal of professional staff, as well as on the reconstruction and development of industry. The urgent problems of the society in which the university operates become more relevant as the further development of the university depends on it (Tuunainen & Knuutila, 2008).

Petrushenko et al. (2023) note that Ukrainian universities play roles that are not typical for them in peacetime – serving society and responding to its urgent needs. These opinions emphasize that in times of war, HEIs transform their activities, direct them to solving their own and social concerns, and gain complex experiences of survival and overcoming the crisis, which can be valuable for other HEIs.

Kozhyna et al. (2022), and Kurapov et al. (2023) note that human resources have a significant impact on the economic development and competitiveness of the state. Suchikova et al. (2023) concluded that scientists who have moved abroad demonstrated the greatest decrease in the activity and efficiency of the scientific process. The need to rebuild Ukraine’s destroyed research infrastructure and the importance of international support for Ukrainian scientists have been widely discussed (Maryl et al., 2022; Irwin, 2023; Nature, 2023). Undoubtedly, support from international organizations, the government, local governments, and communities is very valuable for the survival of displaced universities.

During severe economic downturns and significant changes in the higher education sector, the interaction between universities, businesses, and their communities is of great significance and enhances the positive impact of universities (Chipperfield, 2014). Thus, displaced Ukrainian HEIs must cooperate with their regions’ authorities and establish interaction with state and local governments, businesses, and communities in their new locations. In order to restore and revive the country, displaced universities should review their missions, paying particular attention to the third mission, and set priorities based on how they can contribute to the post-war revival of their regions.

Petrushenko et al. (2023) identify the following areas of implementation of the third role of universities in the context of war and post-war reconstruction: lifelong learning, the social role of HEIs, the entrepreneurial role of the university, the innovative role of the university, and the political role of the university. These scholars note that a new (fourth) mission of universities will be formed based on the fulfillment of the postwar reconstruction function by universities. Poplavskyi (2022) posits that a university’s position in rankings indicates its strong academic reputation. However, this assessment may not always be entirely objective. A promising direction for the development of Ukraine’s higher education system lies in the implementation of an evaluation system that considers the societal impact of universities. Frondizi et al. (2019) and Poplavskyi (2022) emphasize the limitations of international rankings and projects in assessing and comparing the activities of universities in fulfilling the third mission. However, even if an institution is not among the best universities in the country or the world according to a particular ranking, it may be a leader in its field in a particular region.

The economic development of criteria for assessing the implementation of the social mission by Ukrainian universities is a promising avenue for further research. Development and implementation of such criteria at the state level would provide essential vectors for restoring and developing displaced universities as key institutions of their regions.

## CONCLUSION

The purpose of this study was to assess the impact of forced, urgent, and unplanned relocation of universities (due to the alleged or actual occupation of certain territories of the country by enemy forces) on the efficiency of their operations. This study was conducted on the example of Ukraine.

It was established that staff turnover, a decrease in the number of employees and students, reduced funding, and loss of material and technical facilities are characteristic of all displaced higher education institutions. Nearly all displaced higher education institutions have experienced numerous diverse challenges across all types and areas of activity. Universities that have merged with other higher education institutions after reorganization and highly rated institutions demonstrate greater success in restoring their rankings. The statistical analysis confirmed considerations regarding the dynamics of the decrease in the rating positions of relocated HEIs. The observed trend of decreasing ranking positions among temporarily displaced higher education institutions suggests a loss of scientific and educational potential, potentially leading to the dissolution of these institutions.

The research results substantiate the need to support displaced universities that are losing their leading positions under the influence of military events for the successful socio-economic recovery of the de-occupied territories.

Considering the significance of the third role of temporarily displaced higher education institutions in the context of war and post-war reconstruction of de-occupied territories, these institutions require increased support from the government, international organizations, and local authorities to ensure their preservation. This support may manifest as additional funding for state orders, allocation of resources to restore the material base, and psychological, legal, and economic assistance for faculty and students.

In light of the aforementioned data and discussion, it is expedient to strengthen the capacity of displaced universities. However, this should not be achieved through reorganization and merging of displaced universities, as such actions could result in the gradual disappearance of the majority of these institutions. Preservation of these institutions may be facilitated by uniting universities into associations based on their regions of location. Such university associations should focus on addressing the challenges of revival and socio-economic development in de-occupied regions.

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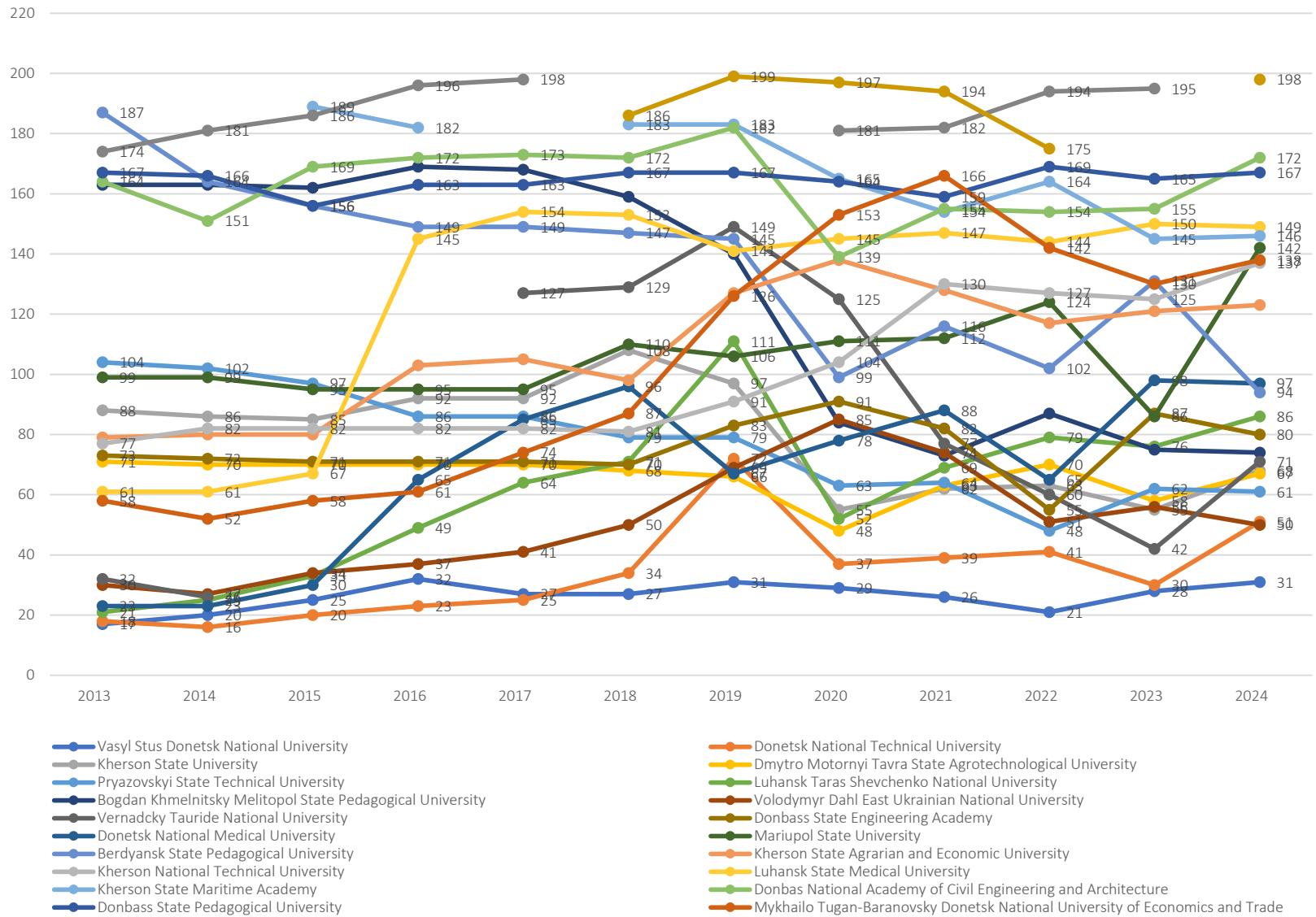
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Note: The Y-axis shows the position of temporarily displaced HEIs in the ranking. The X-axis shows the years.  
**Figure A1.** Dynamics of changes in the ranking positions of temporarily displaced higher education institutions in 2022 from Luhansk, Donetsk, Kherson and Zaporizhzhia regions for 2013–2024 according to the analysis of the university ranking “Top 200 Ukraine”

**Table A1.** Pairwise comparison by year of change in rating positions of 13 relocated higher education institutions according to the Wilcoxon criterion (2013–2020): Ranks

Pairwise comparison		N	Mean Rank	Sum of Ranks
y2014 – y2013	Negative Ranks	6 <sup>a</sup>	4.58	27.50
	Positive Ranks	3 <sup>b</sup>	5.83	17.50
	Ties	4 <sup>c</sup>		
	Total	13		
y2015 – y2014	Negative Ranks	0 <sup>d</sup>	.00	.00
	Positive Ranks	11 <sup>e</sup>	6.00	66.00
	Ties	2 <sup>f</sup>		
	Total	13		
y2016 – y2015	Negative Ranks	0 <sup>g</sup>	.00	.00
	Positive Ranks	11 <sup>h</sup>	6.00	66.00
	Ties	2 <sup>i</sup>		
	Total	13		
y2017 – y2016	Negative Ranks	1 <sup>j</sup>	4.00	4.00
	Positive Ranks	10 <sup>k</sup>	6.20	62.00
	Ties	2 <sup>l</sup>		
	Total	13		
y2018 – y2017	Negative Ranks	3 <sup>m</sup>	4.33	13.00
	Positive Ranks	7 <sup>n</sup>	6.00	42.00
	Ties	3 <sup>o</sup>		
	Total	13		
y2019 – y2018	Negative Ranks	2 <sup>p</sup>	5.00	10.00
	Positive Ranks	10 <sup>q</sup>	6.80	68.00
	Ties	1 <sup>r</sup>		
	Total	13		
y2020 – y2019	Negative Ranks	6 <sup>s</sup>	6.83	41.00
	Positive Ranks	5 <sup>t</sup>	5.00	25.00
	Ties	2 <sup>u</sup>		
	Total	13		

Note: a. y2014 < y2013, b. y2014 > y2013, c. y2014 = y2013, d. y2015 < y2014, e. y2015 > y2014, f. y2015 = y2014, g. y2016 < y2015, h. y2016 > y2015, i. y2016 = y2015, j. y2017 < y2016, k. y2017 > y2016, l. y2017 = y2016, m. y2018 < y2017, n. y2018 > y2017, o. y2018 = y2017, p. y2019 < y2018, q. y2019 > y2018, r. y2019 = y2018, s. y2020 < y2019, t. y2020 > y2019, u. y2020 = y2019.

**Table A2.** Statistics of the Wilcoxon test for comparing the ratings of 13 relocated higher education institutions (2013–2020)

	Test Statistics <sup>a</sup>						
	y2014 – y2013	y2015 – y2014	y2016 – y2015	y2017 – y2016	y2018 – y2017	y2019 – y2018	y2020 – y2019
Z	-.593 <sup>b</sup>	-2.940 <sup>c</sup>	-2.949 <sup>c</sup>	-2.584 <sup>c</sup>	-1.481 <sup>c</sup>	-2.275 <sup>c</sup>	-.712 <sup>b</sup>
Asymp. Sig. (2-tailed)	.553	.003	.003	.010	.139	.023	.476
Differences are significant	No	Yes	Yes	Yes	No	Yes	No

Note: a. Wilcoxon Signed Ranks Test. b. Based on positive ranks. c. Based on negative ranks.

**Table A3.** Comparison of ratings of 13 relocated higher education institutions in 2014 and 2020 according to the Wilcoxon criterion: Ranks

Pairwise comparison		N	Mean Rank	Sum of Ranks
2020–2014	Negative Ranks	2 <sup>a</sup>	2.00	4.00
	Positive Ranks	10 <sup>b</sup>	7.40	74.00
	Ties	1 <sup>c</sup>		
	Total	13		

Note: a. y2020 < y2014, b. y2020 > y2014, c. y2020 = y2014.

**Table A4.** Test statistics for comparing the ratings of 13 relocated higher education institutions in 2014 and 2020 according to the Wilcoxon test

Test Statistics <sup>a</sup>	
	2020–2014
Z	-2.746 <sup>b</sup>
Asymp. Sig. (2-tailed)	.006
Differences are significant	Yes

Note: a. Wilcoxon Signed Ranks Test. b. Based on negative ranks.

**Table A5.** Comparison of ratings of nine relocated higher education institutions (2013–2024) according to the Wilcoxon test: Ranks

Pairwise comparison	N	Mean Rank	Sum of Ranks
y2013 – y2014	Negative Ranks	2 <sup>a</sup>	6.50
	Positive Ranks	4 <sup>b</sup>	14.50
	Ties	3 <sup>c</sup>	
	Total	9	
y2014 – y2015	Negative Ranks	8 <sup>d</sup>	36.00
	Positive Ranks	0 <sup>e</sup>	.00
	Ties	1 <sup>f</sup>	
	Total	9	
y2015 – y2016	Negative Ranks	8 <sup>g</sup>	36.00
	Positive Ranks	0 <sup>h</sup>	.00
	Ties	1 <sup>i</sup>	
	Total	9	
y2016 – y2017	Negative Ranks	7 <sup>j</sup>	32.00
	Positive Ranks	1 <sup>k</sup>	4.00
	Ties	1 <sup>l</sup>	
	Total	9	
y2017 – y2018	Negative Ranks	5 <sup>m</sup>	25.00
	Positive Ranks	3 <sup>n</sup>	11.00
	Ties	1 <sup>o</sup>	
	Total	9	
y2018 – y2019	Negative Ranks	7 <sup>p</sup>	36.00
	Positive Ranks	2 <sup>q</sup>	9.00
	Ties	0 <sup>r</sup>	
	Total	9	
y2019 – y2020	Negative Ranks	4 <sup>s</sup>	18.00
	Positive Ranks	5 <sup>t</sup>	27.00
	Ties	0 <sup>u</sup>	
	Total	9	
y2020 – y2021	Negative Ranks	6 <sup>v</sup>	32.00
	Positive Ranks	3 <sup>w</sup>	13.00
	Ties	0 <sup>x</sup>	
	Total	9	
y2021 – y2022	Negative Ranks	2 <sup>y</sup>	7.00
	Positive Ranks	7 <sup>z</sup>	38.00
	Ties	0 <sup>aa</sup>	
	Total	9	
y2022 – y2023	Negative Ranks	6 <sup>ab</sup>	30.00
	Positive Ranks	3 <sup>ac</sup>	15.00
	Ties	0 <sup>ad</sup>	
	Total	9	
y2023 – y2024	Negative Ranks	5 <sup>ae</sup>	33.00
	Positive Ranks	4 <sup>af</sup>	12.00
	Ties	0 <sup>ag</sup>	
	Total	9	

Note: a. y2013 < y2014, b. y2013 > y2014, c. y2013 = y2014, d. y2014 < y2015, e. y2014 > y2015, f. y2014 = y2015, g. y2015 < y2016, h. y2015 > y2016, i. y2015 = y2016, j. y2016 < y2017, k. y2016 > y2017, l. y2016 = y2017, m. y2017 < y2018, n. y2017 > y2018, o. y2017 = y2018, p. y2018 < y2019, q. y2018 > y2019, r. y2018 = y2019, s. y2019 < y2020, t. y2019 > y2020, u. y2019 = y2020, v. y2020 < y2021, w. y2020 > y2021, x. y2020 = y2021, y. y2021 < y2022, z. y2021 > y2022, aa. y2021 = y2022, ab. y2022 < y2023, ac. y2022 > y2023, ad. y2022 = y2023, ae. y2023 < y2024, af. y2023 > y2024, ag. y2023 = y2024.

**Table A6.** Comparison of ratings of nine relocated universities from 2013 to 2024 according to the Wilcoxon test: Test statistics

Pairwise comparison	Test statistics <sup>a</sup>	
	Z	Asymp. Sig. (2-tailed)
y2013 – y2014	–.841 <sup>b</sup>	.400
y2014 – y2015	–2.527 <sup>c</sup>	.012
y2015 – y2016	–2.552 <sup>c</sup>	.011
y2016 – y2017	–1.960 <sup>c</sup>	.050
y2017 – y2018	–.983 <sup>c</sup>	.326
y2018 – y2019	–1.599 <sup>c</sup>	.110
y2019 – y2020	–.534 <sup>b</sup>	.594
y2020 – y2021	–1.127 <sup>c</sup>	.260
y2021 – y2022	–1.838 <sup>b</sup>	.066
y2022 – y2023	–.889 <sup>c</sup>	.374
y2023 – y2024	–1.245 <sup>c</sup>	.213

Note: a. Wilcoxon Signed Ranks Test, b. Based on negative ranks, c. Based on positive ranks.

**Table A7.** Comparison of rankings of nine displaced universities in 2014 and 2024

Pairwise comparison	N	Mean Rank	Sum of Ranks
y2014 – y2024	Negative Ranks	8 <sup>a</sup>	5.50
	Positive Ranks	1 <sup>b</sup>	1.00
	Ties	0 <sup>c</sup>	
	Total	9	

Note: a. y2014 < y2024, b. y2014 > y2024, c. y2014 = y2024.

**Table A8.** Comparison of rankings of nine displaced universities in 2014 and 2024 using the Wilcoxon criterion

Pairwise comparison	Test Statistics <sup>a</sup>	
	Z	y2014 – y2024
		–2.547 <sup>b</sup>
Asymp. Sig. (2-tailed)		.011

Note: a. Wilcoxon Signed Ranks Test, b. Based on positive ranks.

**Table A9.** Comparison of rankings of 22 displaced universities using the Wilcoxon criterion: Ranks

Pairwise comparison	Ranks		
	N	Mean Rank	Sum of Ranks
y2022 – y2024	Negative Ranks	15 <sup>a</sup>	13.37
	Positive Ranks	7 <sup>b</sup>	7.50
	Ties	0 <sup>c</sup>	
	Total	22	
y2019 – y2022	Negative Ranks	6 <sup>d</sup>	7.50
	Positive Ranks	16 <sup>e</sup>	13.00
	Ties	0 <sup>f</sup>	
	Total	22	

Note: a. y2022 < y2024, b. y2022 > y2024, c. y2022 = y2024, d. y2019 < y2022, e. y2019 > y2022, f. y2019 = y2022.

**Table A10.** Comparison of the ratings of 22 relocated universities according to the Wilcoxon test: Test statistics

Pairwise comparison	Test Statistics <sup>a</sup>	
	y2022 – y2024	y2019 – y2022
Z	–2.404 <sup>b</sup>	–2.647 <sup>c</sup>
Asymp. Sig. (2-tailed)	.016	.008

Note: a. Wilcoxon Signed Ranks Test. b. Based on positive ranks. c. Based on negative ranks.

**Table A11.** Correlation of ranking indicators of relocated universities by year (2013–2020, 13 universities): Kendell and Spearman rank correlation coefficients

		Correlations									
		y2013	y2014	y2015	y2016	y2017	y2018	y2019	y2020		
Kendall's tau_b	y2013	Correlation Coefficient	1.000	.923**	.897**	.821**	.821**	.846**	.839**	.787**	
		Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000	
		N	13	13	13	13	13	13	13	13	
	y2014	Correlation Coefficient	.923**	1.000	.974**	.846**	.846**	.821**	.813**	.710**	
		Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.001	
		N	13	13	13	13	13	13	13	13	
	y2015	Correlation Coefficient	.897**	.974**	1.000	.872**	.872**	.846**	.787**	.735**	
		Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	
		N	13	13	13	13	13	13	13	13	
	y2016	Correlation Coefficient	.821**	.846**	.872**	1.000	1.000**	.974**	.710**	.658**	
		Sig. (2-tailed)	.000	.000	.000	.	.	.000	.001	.002	
		N	13	13	13	13	13	13	13	13	
	y2017	Correlation Coefficient	.821**	.846**	.872**	1.000**	1.000	.974**	.710**	.658**	
		Sig. (2-tailed)	.000	.000	.000	.	.	.000	.001	.002	
		N	13	13	13	13	13	13	13	13	
	y2018	Correlation Coefficient	.846**	.821**	.846**	.974**	.974**	1.000	.735**	.684**	
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.001	
		N	13	13	13	13	13	13	13	13	
	y2019	Correlation Coefficient	.839**	.813**	.787**	.710**	.710**	.735**	1.000	.740**	
		Sig. (2-tailed)	.000	.000	.000	.001	.001	.000	.	.000	
		N	13	13	13	13	13	13	13	13	
	y2020	Correlation Coefficient	.787**	.710**	.735**	.658**	.658**	.684**	.740**	1.000	
		Sig. (2-tailed)	.000	.001	.000	.002	.002	.001	.000	.	
		N	13	13	13	13	13	13	13	13	
	Spearman's rho	y2013	Correlation Coefficient	1.000	.984**	.978**	.940**	.940**	.945**	.933**	.894**
			Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000
			N	13	13	13	13	13	13	13	13
		y2014	Correlation Coefficient	.984**	1.000	.995**	.945**	.945**	.940**	.913**	.869**
			Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000
			N	13	13	13	13	13	13	13	13
y2015		Correlation Coefficient	.978**	.995**	1.000	.956**	.956**	.951**	.908**	.880**	
		Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	
		N	13	13	13	13	13	13	13	13	
y2016		Correlation Coefficient	.940**	.945**	.956**	1.000	1.000**	.995**	.845**	.817**	
		Sig. (2-tailed)	.000	.000	.000	.	.	.000	.000	.001	
		N	13	13	13	13	13	13	13	13	
y2017		Correlation Coefficient	.940**	.945**	.956**	1.000**	1.000	.995**	.845**	.817**	
		Sig. (2-tailed)	.000	.000	.000	.	.	.000	.000	.001	
		N	13	13	13	13	13	13	13	13	
y2018		Correlation Coefficient	.945**	.940**	.951**	.995**	.995**	1.000	.861**	.823**	
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.001	
		N	13	13	13	13	13	13	13	13	
y2019		Correlation Coefficient	.933**	.913**	.908**	.845**	.845**	.861**	1.000	.890**	
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000	
		N	13	13	13	13	13	13	13	13	
y2020		Correlation Coefficient	.894**	.869**	.880**	.817**	.817**	.823**	.890**	1.000	
		Sig. (2-tailed)	.000	.000	.000	.001	.001	.001	.000	.	
		N	13	13	13	13	13	13	13	13	

Note: \*\*. Correlation is significant at the 0.01 level (2-tailed). \*. Correlation is significant at the 0.05 level (2-tailed).



**Table A12 (cont.).** Correlation of ranking indicators of relocated universities by year (2013–2024, nine universities): Kendell and Spearman coefficients

			y2013	y2014	y2015	y2016	y2017	y2018	y2019	y2020	y2021	y2022	y2023	y2024	
Spearman's rho	y2013	Correlation Coefficient	1.000	.967**	.967**	.900**	.900**	.917**	.867**	.933**	.933**	.933**	.950**	.900**	
		Sig. (2-tailed)	.	.000	.000	.001	.001	.001	.002	.000	.000	.000	.000	.000	.001
		N	9	9	9	9	9	9	9	9	9	9	9	9	9
	y2014	Correlation Coefficient	.967**	1.000	1.000**	.883**	.883**	.867**	.867**	.900**	.883**	.933**	.917**	.850**	
		Sig. (2-tailed)	.000	.	.	.002	.002	.002	.002	.001	.002	.000	.001	.004	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2015	Correlation Coefficient	.967**	1.000**	1.000	.883**	.883**	.867**	.867**	.900**	.883**	.933**	.917**	.850**	
		Sig. (2-tailed)	.000	.	.	.002	.002	.002	.002	.001	.002	.000	.001	.004	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2016	Correlation Coefficient	.900**	.883**	.883**	1.000	1.000**	.983**	.767*	.800**	.867**	.933**	.967**	.933**	
		Sig. (2-tailed)	.001	.002	.002	.	.	.000	.016	.010	.002	.000	.000	.000	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2017	Correlation Coefficient	.900**	.883**	.883**	1.000**	1.000	.983**	.767*	.800**	.867**	.933**	.967**	.933**	
		Sig. (2-tailed)	.001	.002	.002	.	.	.000	.016	.010	.002	.000	.000	.000	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2018	Correlation Coefficient	.917**	.867**	.867**	.983**	.983**	1.000	.817**	.817**	.883**	.950**	.983**	.967**	
		Sig. (2-tailed)	.001	.002	.002	.000	.000	.	.007	.007	.002	.000	.000	.000	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2019	Correlation Coefficient	.867**	.867**	.867**	.767*	.767*	.817**	1.000	.800**	.800**	.933**	.883**	.900**	
		Sig. (2-tailed)	.002	.002	.002	.016	.016	.007	.	.010	.010	.000	.002	.001	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2020	Correlation Coefficient	.933**	.900**	.900**	.800**	.800**	.817**	.800**	1.000	.967**	.867**	.883**	.833**	
		Sig. (2-tailed)	.000	.001	.001	.010	.010	.007	.010	.	.000	.002	.002	.005	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2021	Correlation Coefficient	.933**	.883**	.883**	.867**	.867**	.883**	.800**	.967**	1.000	.900**	.933**	.900**	
		Sig. (2-tailed)	.000	.002	.002	.002	.002	.002	.010	.000	.	.001	.000	.001	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
	y2022	Correlation Coefficient	.933**	.933**	.933**	.933**	.933**	.950**	.933**	.867**	.900**	1.000	.983**	.967**	
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.002	.001	.	.000	.000	
		N	9	9	9	9	9	9	9	9	9	9	9	9	
y2023	Correlation Coefficient	.950**	.917**	.917**	.967**	.967**	.983**	.883**	.883**	.933**	.983**	1.000	.983**		
	Sig. (2-tailed)	.000	.001	.001	.000	.000	.000	.002	.002	.000	.000	.	.000		
	N	9	9	9	9	9	9	9	9	9	9	9	9		
y2024	Correlation Coefficient	.900**	.850**	.850**	.933**	.933**	.967**	.900**	.833**	.900**	.967**	.983**	1.000		
	Sig. (2-tailed)	.001	.004	.004	.000	.000	.000	.001	.005	.001	.000	.000	.		
	N	9	9	9	9	9	9	9	9	9	9	9	9		