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Igor Dunayev

D.Sc. (Public Administration), Professor
V.N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
i.dunaev@karazin.ua
<https://orcid.org/0000-0002-0790-0496>

PRICES, MARKETS, CORPORATIZATION: GAME-THEORETIC MODELING OF STRATEGIES FOR CORPORATIZED STATE-OWNED ENTERPRISES IN UKRAINE'S TRANSPORT SECTOR

Abstract. The article focuses on the topical issue of corporatization of state-owned enterprises in Ukraine's transport sector, particularly Ukrainian Railways (UZ) and the Ukrainian Sea Ports Authority (USPA), in the context of their adaptation to new global challenges and post-war economic recovery. Based on an analysis of contemporary scientific literature, the study substantiates the feasibility of applying game theory tools to model strategic interactions among key stakeholders (government, enterprise management, regulators, investors, and consumers) in the corporatization process. The research aims to assess the potential consequences of completing the corporatization of UZ and USPA for corporate pricing policies, market efficiency, and public welfare using game-theoretic modeling and comparative analysis. The research methodology combines methods of descriptive statistics, systematic literature review, case studies, game-theoretic modeling, and scenario analysis. The developed game-theoretic model allows formalizing strategic interactions among players, evaluating the impact of various corporatization scenarios on key performance indicators, and formulating recommendations for optimizing UZ and USPA's pricing strategies to balance commercial and public interests. The study argues that transitioning to «infrastructure holding company» models for railways and «landlord port» models for seaports is the optimal format for corporatizing UZ and USPA, enabling the attraction of private investments, enhancing efficiency and service quality while maintaining the state's strategic control over infrastructure. The necessity of synchronizing corporatization with reforming the regulatory system, tariff policy, and fostering competition in transport services markets is emphasized. The research findings have practical value for developing state policies on leveraging the results of transport infrastructure corporatization and ensuring the sustainable development of Ukraine's railway and port industries in the post-war period.

Keywords: *Corporatization, Transport Infrastructure, Ukrainian Railways, Seaports, Pricing Policy, Game Theory, Market Efficiency, Public Welfare, Pricing.*

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Introduction. The corporatization of Ukraine's modern economy. This process state-owned enterprises in the transport sector is one of the most significant and has far-reaching consequences not only for the enterprises themselves but also for the complex transformational processes in functioning of the relevant markets, the

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formation of pricing policies, and the realization of public interests. In the face of unprecedented global challenges, such as the COVID-19 pandemic, the war in Ukraine, and large-scale changes in global trade and energy flows, the effective adaptation of state-owned enterprises to new realities through corporatization mechanisms is becoming particularly relevant and significant. Furthermore, despite the existence of a significant body of research on the corporatization of state-owned enterprises, most of it focuses on the analysis of individual cases and a retrospective assessment of the consequences of reforms. At the same time, there is a lack of comprehensive theoretical models that would allow, based on well-founded assumptions about the goals and constraints of key players, to assess the potential effects of different corporatization scenarios on market dynamics, pricing policies, and public welfare. Therefore, the application of game theory tools to the issue of corporatization of state-owned enterprises in Ukraine's transport sector is a new promising area of research that can offer valuable theoretical and practical insights.

Game theory, which studies strategic interactions between rational players under conditions of conflicting interests and uncertainty, offers a powerful conceptual and methodological apparatus for analyzing corporatization processes. First, the corporatization of state-owned enterprises is inherently a strategic game in which key players (government, enterprise management, private investors, consumers, regulators, etc.) have different goals and constraints and interact with each other to maximize their own payoffs. Second, the consequences of different corporatization scenarios for market dynamics, pricing policies, and public welfare critically depend on the strategic decisions and interactions between these players. Third, the tools of game theory (static and dynamic games, games with complete and incomplete information, concepts of Nash equilibrium, Pareto optimality, evolutionarily stable strategies, etc.) allow for formally modeling these interactions, assessing their consequences, and determining the optimal strategies for players.

The relevance of applying a game-theoretic approach to the analysis of the corporatization of large Ukrainian state-owned enterprises in the transport sector is determined not only by academic considerations but also by practical needs. According to the Ministry of Infrastructure of Ukraine, even during the war, rail and sea transport provide over 60% of the country's freight turnover and play a literally crucial role in supporting foreign economic relations and filling the state budget. However,

in recent years, these strategically important industries have faced serious challenges and demonstrated alarming trends. In particular, according to the State Statistics Service, before the war, in 2020, the freight turnover of Ukraine's rail transport decreased by 2.4% compared to 2019, and that of seaports by 4.3%. In 2022, due to Russia's full-scale aggression, the decline in freight turnover of Ukrainian railways reached 52%, and that of seaports 30% compared to the pre-war period. At the same time, global trends indicate a growing role of railways and ports in ensuring sustainable mobility and international trade (Maliuta et al., 2023; Uygun & Ahsan, 2021). These data indicate the need for a profound transformation of Ukrainian state-owned enterprises in the transport sector to increase their resilience, adaptability, and competitiveness in the face of new global challenges.

The proposed study aims to fill existing gaps in the scientific literature and offer a new scientific and methodological perspective on the problem of forming socially beneficial results upon completion (at least for UZ in the next couple of years) of the corporatization of state-owned enterprises in Ukraine's transport sector. In this case, the application of game theory tools will allow formalizing strategic interactions between key stakeholders, modeling possible corporatization scenarios, and assessing their consequences for market efficiency, pricing policies, and public welfare. This, in turn, will allow for the development of scientifically sound recommendations on the optimal design of corporatization mechanisms, taking into account the institutional features and challenges of Ukraine. Considering the strategic importance of rail and sea transport for Ukraine's economy and foreign trade, the research results will have not only academic value but also practical significance for developing effective transport policies and ensuring the country's sustainable economic development in the context of global transformations.

The purpose of the article is to assess the potential significant consequences of completing the corporatization of UZ and USPA for the respective corporate pricing policies, market efficiency, and public welfare in post-war Ukraine, using game-theoretic modeling and comparative analysis. In accordance with the purpose, the article solves the following five research tasks:

- characterize the current state and features of the pricing policy and market positioning of UZ and USPA in the context of their corporatization, taking into account the impact of the war;

- analyze the global experience of corporatization of transport enterprises and its consequences for pricing strategies, market efficiency, and public welfare;
- develop a game-theoretic model that will reflect the interaction between corporate, pricing, and market strategies of UZ and USPA after the completion of corporatization in the conditions of post-war recovery;
- formulate recommendations for state policy and corporate governance on optimizing the pricing strategies of UZ and USPA to ensure a balance between commercial and public interests.

The object of the study is the pricing policy and market positioning of Ukrainian Railways (UZ) and the Ukrainian Sea Ports Authority (USPA) in the context of completing their corporatization in the post-war period.

The subject of the study is the potential consequences of the transformation of corporate pricing strategies of UZ and USPA for improving market efficiency and public welfare in post-war Ukraine, modeled using a game-theoretic approach and comparative analysis.

Literature Review. The issue of corporatization of state-owned enterprises, particularly in the transport sector, has attracted significant attention from researchers, international organizations, and politicians over the past decades. However, in the scientific literature of recent years, there has been a certain dynamic and competition of views on this problem, driven by geopolitical transformations, new global challenges, and the need for large-scale national reforms (Dunayev & Hromov, 2024; Pueblita & Musacchio, 2024; Christopoulos et al, 2001). On the one hand, the prevailing view in academic circles and international organizations considers corporatization as an effective mechanism for improving operational efficiency, transparency, and investment attractiveness of state-owned enterprises. In particular, in their study for the OECD, A. Musacchio and B. Lazzarini (2014) argue that corporatization allows combining the advantages of state ownership (focus on public interests, access to cheap financing) with the benefits of private management (flexibility, innovation, result orientation). This idea has also been proven by World Bank experts (2010¹), who emphasize the positive impact of corporatization on financial performance, quality of corporate governance, and investment activity of state-

owned enterprises in various countries. Successful cases of corporatization of transport enterprises in the EU (Deutsche Bahn, PKP Cargo) and Asia (Kazakhstan Temir Zholy, Indian Railways) are often viewed as evidence of the effectiveness of this mechanism (UNECE, 2020²; ADB, 2017³; Zhurzhenko, 2024).

On the other hand, there is a growing number of critical views on corporatization in the literature, questioning its universal effectiveness and emphasizing potential negative effects. In particular, in her resonant book «Mission Economy», M. Mazzucato argues that the uncritical application of corporatization mechanisms can lead to the erosion of the innovative and social potential of state-owned enterprises, subordination of their activities to short-term commercial interests, and loss of strategic control by the state (Mazzucato, 2022).

This idea has already found empirical confirmation in studies of corporatization in a number of countries with transitional economies and imperfect institutions. In particular, analyzing the experience of Central and Eastern European countries, D. Börkman and S. Estrin (Börkman et al., 2012) demonstrate that hasty and non-transparent corporatization in conditions of weak corporate governance and insufficient property rights protection can lead to asset «tunneling», increased insider influence, and loss of public trust (Estrin & Pelletier, 2018). These risks are particularly relevant for countries with high levels of corruption and «state capture» by private interests, where corporatization can become an instrument for redistributing rents in favor of certain groups rather than a mechanism for increasing efficiency. Critics of corporatization also emphasize the risks of unjustified tariff increases, job cuts, and deterioration of service accessibility for vulnerable consumer categories, especially in conditions of imperfect competition and weak regulation (Bernier, 2014; Clifton et al., 2014). These warnings are confirmed by empirical studies on the consequences of corporatization of infrastructure enterprises in Latin America and Africa, which demonstrate the ambiguous impact of reforms on tariffs, quality, and accessibility of services for different consumer groups.

Another promising area of research on the corporatization of transport enterprises

¹ The reform of state-owned enterprises : lessons from World Bank lending (English). Policy and research series ; no. 4 Washington, D.C. : World Bank Group, 2010. URL: <http://surl.li/bqelqj> (дата звернення: 21.12.2024).

² Railway Reform in the ECE Region (Final report ECE/TRANS/261). UNECE, 2020. 85 p. URL: <http://surl.li/pomlip> (дата звернення: 21.12.2024).

³ Unlocking the potential of railways: A Railway Strategy for CAREC, 2017-2030. Islamabad, 2016. 63 p. URL: <https://www.adb.org/sites/default/files/institutional-document/227176/carec-railway-strategy-2017-2030.pdf> (дата звернення: 21.12.2024).

is related to understanding its role and consequences in the context of global geopolitical and technological transformations. In their study for UNCTAD, S. Cardoso and F. Mazzucato (Cardoso & Mazzucato, 2021) argue that in the conditions of the Fourth Industrial Revolution, decarbonization, and the «new normal» after COVID-19, effective state-owned enterprises will play a key role in building sustainable and inclusive transport infrastructure. At the same time, according to the researchers, the realization of this potential will require not so much «blind» corporatization as a smart combination of commercial and public goals, strategic state control, and partnership with the private sector. This conclusion resonates with the results of a study by the Asian Development Bank (2020¹), which, using the example of Southeast Asian countries, demonstrates that successful corporatization of transport enterprises in the face of global challenges requires not only a change in the organizational and legal form but also a deep operational and digital transformation, attraction of private investments and competencies while maintaining state control over strategic decisions.

In summary, it can be stated that in the scientific literature of recent years, there has been a shift in focus from the question of «to corporatize or not» to the question of «how to corporatize correctly». The unconditional belief in the effectiveness of corporatization and market mechanisms is being replaced by an understanding of the need for a more balanced and context-specific approach that would take into account not only commercial but also social and strategic effects, risks, and limitations. This new consensus is reflected in the latest documents of leading international organizations. In particular, in the guidance, OECD experts (OECD, 2024²) emphasize that in the era of global transformations, corporatization should be viewed not as an end in itself but as an instrument of smart and proactive state policy aimed at building sustainable and inclusive infrastructure. Successful implementation of this vision will require not only organizational changes but also a deep transformation of the corporate governance system, regulation, and

interaction of the state with the market and society.

Research Methodology. The applied methodology in the paper is strongly structured in such a way as to emphasize the research focus specifically on the pricing aspects of the corporatization of UZ and USPA and their consequences in the specific context of Ukraine's post-war recovery. Comparative analysis of global experience should provide a more reliable basis for assessment and modeling, while a clear emphasis on developing practical recommendations should increase the applied significance of the research. At the same time, game-theoretic modeling remains a key methodological tool for highlighting strategic interactions and potential effects of various scenarios of changes in the pricing policies of large corporatized state-owned enterprises.

Accordingly, to solve the set research tasks, the article uses a comprehensive methodology that combines quantitative and qualitative methods of analysis.

1. First, to characterize the current state and features of the pricing policy and market positioning of UZ and USPA, methods of descriptive statistics and comparative analysis are used. In particular, an analysis of the dynamics of key performance indicators of enterprises (transportation volumes, revenues, costs, investments, etc.) and their comparison with industry and macroeconomic trends is carried out. Particular attention is paid to identifying the impact of the war on the operational and financial activities of UZ and USPA, which involves comparing pre-war and current indicators, as well as analyzing structural shifts in the activities of enterprises.

2. Second, to analyze the global experience of corporatization of transport enterprises, the methodology of systematic literature review and case studies is applied. Based on the systematization and generalization of the results of previous studies, key patterns and differences in the consequences of corporatization for pricing strategies, market efficiency, and public welfare in different countries are identified. Special attention is paid to studying successful practices and lessons of corporatization of transport enterprises in the EU and Asian countries, which may be relevant for Ukraine.

3. Third, the central element of the methodology is the development and analysis of a game-theoretic model of interaction between corporate, pricing, and market strategies of UZ and USPA after the completion of corporatization. The model is built on the basis of classical concepts of game theory (game in normal form, Nash equilibrium, etc.) but takes into account the specific features of the functioning

1 Reforms, opportunities, and challenges for state-owned enterprises. Asian Development Bank, 2020. URL: <http://surl.li/rmxqbk> (дата звернення: 21.12.2024).

2 Recommendation of the Council on OECD Legal Instruments Guidelines on Corporate Governance of State-Owned Enterprises (Amended on 03/05/2024). OECD/LEGAL/0414. 2024. 65 p. URL: <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0414> (дата звернення: 21.12.2024).

of transport markets and the institutional environment of Ukraine. Parameterization of the model is carried out on the basis of empirical data and expert assessments, and its analytical and numerical solution allows determining the optimal strategies of players and assessing their impact on key performance indicators.

4. Fourth, based on the developed game-theoretic model, a scenario analysis of the consequences of various options for transforming the pricing policies and market positioning of corporatized UZ and USPA is carried out. Both the baseline scenario, which corresponds to the most probable trends in the development of industry markets and the macroeconomic situation, and alternative scenarios that take into account potential «shocks» and changes in the regulatory environment are considered. For each scenario, the potential gains and losses of the main stakeholders (enterprises, consumers, the state) are assessed, as well as the impact on key indicators of efficiency and public welfare (transportation volumes, prices, quality of services, investments, environmental and social effects, etc.).

5. Finally, based on the synthesis of the results of game-theoretic modeling, scenario analysis, and the study of global best practices, practical recommendations are formulated for optimizing the pricing strategies of

corporatized UZ and USPA. Attention is paid to aligning commercial and public interests, ensuring an adequate level of investment in infrastructure renewal, stimulating efficiency and innovation, and adapting regulatory policy to new market conditions. The validity and practical significance of the recommendations are ensured by their consistency, taking into account the industry and institutional specifics of Ukraine.

Main Results. State-owned enterprises of Ukraine's transport sector, in particular, Ukrainian Railways (UZ) and the Ukrainian Sea Ports Authority (USPA), are in the process of profound transformation, driven by both their corporatization and the unprecedented challenges associated with Russia's full-scale aggression. Under these conditions, the issues of adapting the pricing policy and market positioning of these enterprises to new realities in order to ensure their financial stability, efficiency, and competitiveness are becoming particularly relevant.

Market positioning of state-owned transport corporations: post-monopoly vs. pre-liberalization?

The analysis of the dynamics of key performance indicators of UZ over the last decade (Table 1) indicates contradictory trends. On the one hand, freight and passenger transportation volumes demonstrate a

Table 1. Dynamics of key performance indicators of Ukrainian Railways in 2010-2021

Indicator	2010 year	2015 year	2019 year	2020 year	2021 year
Freight turnover, billion ton*km	218,1	195,1	181,8	175,6	178,3
Passenger turnover, billion pass-km	50,2	35,4	28,7	16,5	19,3
Revenue from freight transportation, billion UAH	28,2	48,8	76,3	75,3	84,4
Revenue from passenger transportation, billion UAH	4,9	6,0	9,1	4,2	6,1
Profitability of freight transportation, %	3,8	8,5	12,1	15,2	16,3
Profitability of passenger transportation, %	-65	-60	-48	-71	-62

Source: built by the author according to the data from JSC "Ukrainian Railways" (2021)¹; State Statistics Service of Ukraine (2021)²; State Statistics Service of Ukraine (2020)³; Ministry of Development of Communities and Territories of Ukraine (2020)⁴

1 Consolidated financial statements of JSC "Ukrainian Railways" for 2018-2021. JSC "Ukrainian Railways". 2021. URL: https://www.uz.gov.ua/about/investors/financial_statements/ (дата звернення: 21.12.2024).

2 Transport of Ukraine 2020. Kyiv: State Statistics Service of Ukraine, 2021. Pp. 44-47. URL: https://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/10/zb_Transpot.pdf (дата звернення: 21.12.2024).

3 Transportation of cargo by sea transport by types of cargo 2020. State Statistics Service of Ukraine. Kyiv, 2020. URL: https://www.ukrstat.gov.ua/operativ/operativ2020/tr/pv_mor/xls/pv_mor3k20_ue.xlsx (дата звернення: 21.12.2024).

4 Volume indicators for passenger transportation by JSC "Ukrainian Railways" for 2018-2019. Ministry of Development of Communities and Territories of Ukraine. 2020. URL: <https://surf.li/tkmsb> (дата звернення: 21.12.2024).

downward trend, which is due both to the general trend towards reducing the transport intensity of the economy and to increased competition from road and river transport. In particular, during the period of 2010-2021, the freight turnover of UZ decreased by 18%, and passenger turnover by 62%. On the other hand, the profitability of transportation during this period increased by 3 times for freight and 2 times for passenger transportation, which indicates a gradual approximation of tariffs to an economically justified level. However, the growth rate of revenues lagged behind inflation, and the share of unprofitable passenger transportation remained critically high (>90%), which limited investment opportunities and increased debt pressure on the company.

UZ's pricing policy during this period was characterized by a gradual movement towards liberalization and deregulation. In particular, since 2013, tariffs for freight transportation have been completely deregulated (except for tariffs for the transportation of socially significant goods), which allowed the company to flexibly respond to changes in demand and cost. At the same time, tariffs for passenger transportation remain strictly regulated by the state, which, against the backdrop of large-scale mandates for preferential transportation, causes their deep unprofitability. In general, UZ's pricing policy evolved towards increasing differentiation and customization of tariffs depending on market niches, but the scale of cross-subsidization between different business segments remained significant.

UZ's market positioning during this period was characterized by a desire to maintain the role of the uncontested provider of railway infrastructure services while simultaneously

expanding its presence in potentially competitive markets (freight and passenger transportation). UZ's monopoly status as a «national carrier» laid the groundwork for an «owner-regulator» conflict and limited its flexibility in tariff policy. At the same time, the activation of private traction on certain routes created a window of opportunity for the gradual liberalization of the market and the expansion of Ukrainian Railways' role as an infrastructure holding company.

The trajectory of USPA's development was fundamentally different, as it performed exclusively administrative functions from the moment of its creation in 2013, without providing cargo handling services. The analysis of the dynamics of USPA's key indicators (Table 2) shows that despite the stagnation in the total volume of cargo transshipment in seaports (-3% for 2015-2021), USPA's revenue base increased by 2,8 times during this period. This was due both to the growth of port fees and the expansion of the range of additional services (icebreaker fleet services, dredging, information services, etc.). USPA's pricing policy was characterized by a gradual shift from a «cost+» approach to a more flexible and customer-oriented one, which provided for lower tariffs for transit cargo and discounts for vessels with better environmental characteristics.

USPA's market positioning was largely determined by its status as a state-owned enterprise with regulatory functions, which limited its ability to engage in commercial activities on a competitive basis. At the same time, global trends towards the liberalization of the port sector and the introduction of the «landlord port» model created the preconditions for the gradual evolution of its business model

Table 2. Dynamics of key performance indicators of USPA in 2015-2021

Indicator	2015 year	2019 year	2020 year	2021 year
Cargo transshipment in seaports, million tons	144,6	160,0	158,9	153,3
USPA's revenue from port fees, billion UAH	3,5	8,1	7,3	9,7
USPA's revenue from other services, billion UAH	0,8	1,5	1,2	1,9
USPA's net profit, billion UAH	2,8	2,1	0,6	1,3

Source: built by the author according to the data from Kyiv School of Economics [KSE] (2021)¹; State Statistics Service of Ukraine. (2020) ²; State Statistics Service of Ukraine (2021)³

1 Analysis of trade in services between Ukraine and the EU under the DCFTA. Kyiv School of Economics [KSE]. Kyiv, 2021. URL: <https://kse.ua/wp-content/uploads/2021/11/Final-DCFTA-services-2021-11-11.pdf> (дата звернення: 21.12.2024).

2 Transportation of cargo by sea transport by types of cargo 2020. State Statistics Service of Ukraine. Kyiv, 2020. URL: https://www.ukrstat.gov.ua/operativ/operativ2020/tr/pv_mor/xls/pv_mor3k20_ue.xlsx (дата звернення: 21.12.2024).

3 Transport of Ukraine 2021. Kyiv: State Statistics Service of Ukraine. State Statistics Service of Ukraine. 2021. Pp. 41-49. URL: https://ukrstat.gov.ua/druk/publicat/kat_u/2022/zb/10/zb_Transpot.pdf (дата звернення: 21.12.2024).

towards greater commercialization of services and partnerships with the private sector. Unlike UZ, the «owner-regulator» conflict was less pronounced for USPA, but coordination with other state regulators (customs, Ministry of Infrastructure, State Service of Sea and River Transport, etc.) remained a challenge (Mamonov et al., 2022).

Russia's full-scale aggression in 2022 created unprecedented challenges for the pricing policy and market positioning of UZ and USPA. The rapid decline in transportation volumes (by 52% for UZ and 30% for USPA over 10 months of 2022) and the destruction of key infrastructure threatened the financial stability and operational capacity of the enterprises. Under these conditions, UZ was forced to temporarily abandon market-based pricing principles and switch to a «manual» crisis management mode. To maintain critical cargo traffic, deep discounts were introduced

on the routes «Western Ukraine – seaports» (from 50% to 70%) and the indexation of tariffs to inflation was temporarily suspended. This led to a deepening of the unprofitability of freight transportation and an increase in the need for state support.

A similar situation was observed with USPA: the blockade of seaports and the destruction of port infrastructure led to a temporary transition to «anti-crisis» port fees with discounts of up to 60-80% from base rates and the postponement of capital investments. The consensus response was the adoption of the Law «On Multimodal Transportation» (2022), which provides for the creation of temporary «dry ports» on the border with the EU and the introduction of feeder container routes «Danube ports – dry ports». These measures made it possible to partially redirect cargo traffic, but at a price of deep discounts from UZ and USPA.

Table 3. Comparison of key indicators of the railway and port sectors of Ukraine and individual EU countries

Indicator	Ukraine (2021)	Poland (2021)	Romania (2021)	Lithuania (2020)
Railway freight turnover, billion tkm	178,3	59,7	13,1	16,3
Share of private operators in railway freight turnover, %	~2%	60%	55%	59%
Market share of the largest port operator	25% (AMIT)	47% (PCT)	44% (APMT)	42% (KKT)
Port cargo turnover, million tons	153,3	113,1	67,5	47,8
Annual capital investments in port infrastructure, billion USD	0,05	0,2	0,09	0,08

Source: built by the author according to the data from Eurostat (2022)¹; Urząd Transportu Kolejowego (2021)²; Główny Urząd Statystyczny (2022)³; Centrālā statistikas pārvalde (2021)⁴; Міністерство інфраструктури України (2022)⁵; Адміністрація морських портів України. (2022)⁶; Statistics Lithuania (2021)⁷; Port of Gdańsk Authority (2022)⁸.

1 Railway transport - Goods transported, by type of transport. Eurostat. 2022. URL: https://ec.europa.eu/eurostat/databrowser/view/rail_go_typepas/default/table?lang=en (дата звернення: 21.12.2024).

2 Sprawozdanie z funkcjonowania rynku transportu kolejowego w 2020 r. [Report on the functioning of the railway transport market in 2020]. Warsaw, Poland: Urząd Transportu Kolejowego, 2021. URL: <https://utk.gov.pl/pl/aktualnosci/17664,Sprawozdanie-z-funkcjonowania-ryнку-kolejowego-w-2020-r.html> (дата звернення: 21.12.2024).

3 Transport – wyniki działalności w 2021 roku [Transport – Activity results in 2021]. Warsaw, Poland: Główny Urząd Statystyczny, 2022. URL: <https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-wyniki-dzialalnosci-w-2021-roku,9,21.html> (дата звернення: 21.12.2024).

4 Transporta statistika [Transport statistics]. Riga, Latvia: Central Statistical Bureau of Latvia, 2021. URL: <https://stat.gov.lv/lv/statistikas-temas/valsts-ekonomika/transport> (дата звернення: 21.12.2024).

5 Інформація про обсяги перевезень вантажів і пасажирів, 2021 [Information on freight and passenger transportation volumes, 2021]. Київ: Міністерство інфраструктури України, 2022. URL: <https://mtu.gov.ua/content/statistichni-dani-pro-ukrainski-zaliznici.html> (дата звернення: 21.12.2024).

6 Показники роботи морських портів України, 2021 рік [Performance indicators of Ukrainian seaports, 2021]. Київ: Адміністрація морських портів України, 2022. URL: <https://uspa.gov.ua/pokaznyky-roboty> (дата звернення: 21.12.2024).

7 Transport and communications. Vilnius, Lithuania: Official Statistics Portal, 2021. URL: <https://www.stat.gov.lt/en/home> (дата звернення: 21.12.2024).

8 Port statistics 2021. Gdańsk, Poland: Port of Gdańsk, 2022. URL: <https://www.portgdansk.pl/about-port/cargo-statistics> (дата звернення: 21.12.2024).

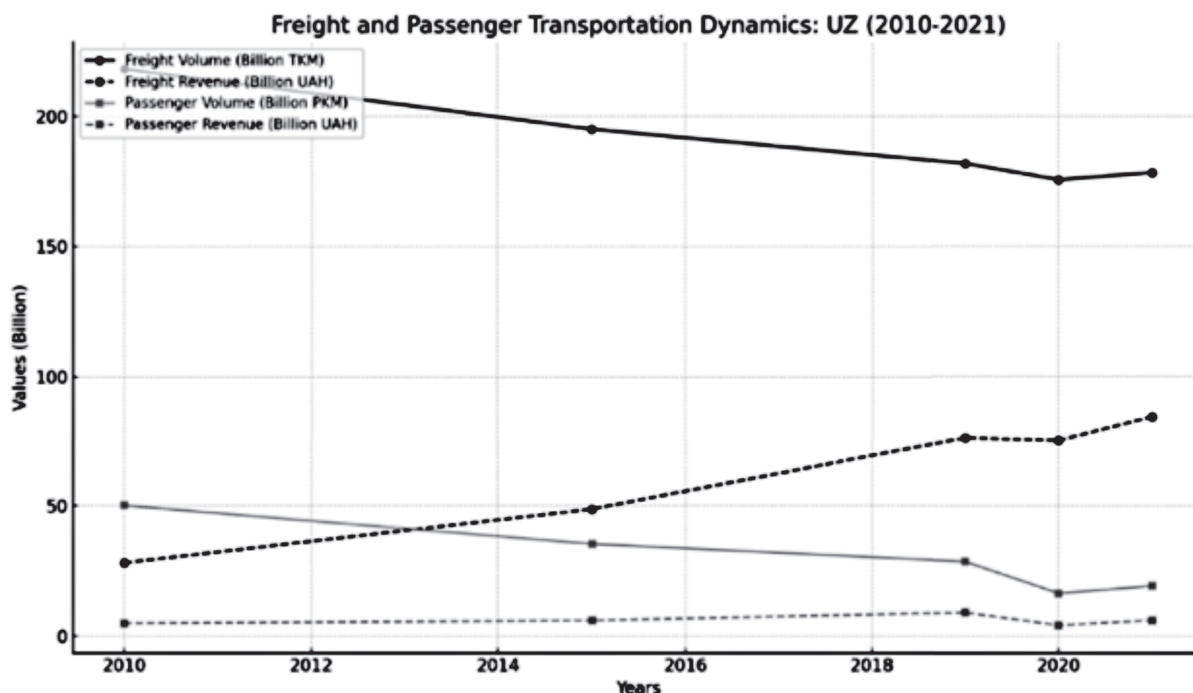


Fig. 1. Comparison of the dynamics of revenues and transportation volumes of Ukrainian Railways for the period 2010-2021

The impact of the war on the corporatization processes of UZ and USPA is ambiguous. On the one hand, the acute need for state support and coordination of efforts led to the postponement of plans to separate ownership and asset management functions. On the other hand, the obvious inefficiency of «manual» tariff regulation and the devastating consequences of the «owner-regulator» conflict for UZ's investment attractiveness brought to the fore the task of accelerated implementation of the «infrastructure holding» model with the separation of the infrastructure operator. A similar duality is observed with USPA – despite the tactical «freezing» of plans for the privatization of seaports, the strategic orientation towards the «landlord port» model only intensified due to the need to attract private investment and harmonize with EU practices.

A comparative analysis of the pricing policy and market positioning of UZ and USPA with their counterparts in the EU (Poland, Romania, Baltic countries) indicates the similarity of challenges associated with market liberalization, the need for large-scale infrastructure modernization, and the need to balance commercial and public interests (Table 3). However, the speed and consistency of reforms in the EU countries were much higher, and the level of political interference in the operational decisions of state-owned enterprises was lower. In

particular, in Poland, the corporatization of PKP Cargo was completed back in 2001, while in Ukraine this process began only in 2015 (for UZ) and in 2013 (for USPA) and is still not finished. In addition, EU countries demonstrate examples of earlier and deeper separation of infrastructure and operational functions (the «infrastructure holding» model in Poland, Germany, etc.), which made it possible to ensure non-discriminatory access to infrastructure and strengthen inter-industry competition.

The relationship between the volumes of freight and passenger transportation of Ukrainian Railways and the corresponding revenues for the period 2010-2021 can be traced graphically (Figure 1): there is a noticeable dependency of revenues on pricing policy. Thus, in the freight segment, revenue growth even with a decrease in transportation volumes indicates a gradual convergence of tariffs to an economically justified level through price deregulation. On the other hand, in the passenger segment, where tariffs remain strictly regulated by the state, revenues show stagnation, which increases the financial burden due to the deep unprofitability of this segment. Thus, the graph emphasizes the critical role of pricing policy as a tool for adapting to market conditions and ensuring the financial stability of UZ, especially in conditions of limited resources for post-war recovery.

Historically, UZ's pricing policy was formed within the framework of the «single national carrier» model, which implied a predominantly cost-based tariff setting mechanism and large-scale cross-subsidization of passenger transportation at the expense of freight. This limited UZ's ability to flexibly respond to changes in market conditions and restrained investments in rolling stock and infrastructure upgrades. The uniqueness of UZ's pricing policy lay in the fact that it de facto performed the functions of an instrument of the state's social and industrial policy, ensuring the affordability of transport services for the population and low tariffs for key shippers (primarily the coal, metallurgical, and agricultural industries). However, against the backdrop of a reduction in budget expenditures for compensating «social» transportation and active lobbying for the indexation of freight tariffs by UZ's management, a gradual movement towards the commercialization of pricing began (especially from 2014-2015). In particular, in 2018-2021, the wagon and locomotive components of tariffs for freight transportation were deregulated, which allowed UZ to vary prices depending on the demand situation and types of rolling stock. At the same time, attempts to eliminate cross-subsidization and equalize the profitability of passenger transportation faced strong public and political resistance.

Notes: the solid and dashed black lines represent freight and passenger transportation dynamics of Ukrainian Railways (UZ) from 2010 to 2021. The solid black line with circle markers shows freight volumes (in billion ton-kilometers), while the dashed black line with circle markers illustrates freight revenues (in billion UAH). Despite a decline in freight volumes over the decade, freight revenues increased, reflecting a gradual alignment of tariffs with economically justified levels. The solid gray line with square markers depicts passenger volumes (in billion passenger-kilometers), and the dashed gray line with square markers shows passenger revenues (in billion UAH). Passenger traffic significantly decreased, and revenues remained low due to regulated tariffs and high operating losses in the passenger sector.

Unlike UZ, USPA's pricing policy was initially based on the «single maritime window» model and the collection of unified port fees (ship, canal, lighthouse, and administrative), which formed an investment resource for financing common infrastructure. At the same time, USPA did not have the right to provide cargo handling services and engage in commercial activities, which limited the potential for commercialization

of pricing. The uniqueness of USPA's pricing policy lay in the fact that it acted as an instrument for implementing the state strategy for the development of the port industry and attracting private investment in terminal infrastructure. In particular, by establishing differentiated discounts on port fees, USPA stimulated the development of new terminals and the attraction of strategic investors. In addition, USPA actively used the «price-quality» model, setting higher tariffs for ports with better infrastructure and services. However, the need to finance large-scale investment projects (dredging, fleet renewal) in the context of stagnating cargo turnover led to an overall increase in the level of port fees, which negatively affected the competitiveness of Ukrainian ports, especially in the segments of transit cargo. Therefore, similar to UZ, USPA experienced a gradual drift from the administrative-regulatory to the commercial pricing model, but this process was less linear and rather fragmented.

Evidently, if we conceptually summarize these explanations of the pricing policies of UZ and USPA into a «single focus» we can identify a common pattern: a gradual drift from the administrative-regulatory to the commercial pricing model, driven by the processes of corporatization and market liberalization. However, this drift was characterized by significant inertia, inconsistency, and fragmentation due to the conflict of commercial and socio-political goals, as well as the need to balance the interests of different groups of stakeholders (the state, business, consumers). Understanding these patterns and challenges is critically important for analyzing the global experience of corporatization of transport enterprises and understanding its relevance for Ukraine.

Firstly, international experience demonstrates that successful corporatization of state-owned transport monopolies involves not only a change in the organizational and legal form but also a deep transformation of the pricing model and market positioning. In particular, the transition from a cost-based to a market-based mechanism of tariff formation, the abolition of cross-subsidization, and the introduction of flexible pricing instruments (discounts, surcharges, differentiation by service types, etc.) are necessary prerequisites for improving operational efficiency and investment attractiveness of enterprises.

Secondly, cases of successful corporatization of transport enterprises in the EU (Deutsche Bahn, PKP Cargo, Latvijas Dzelzceļš, etc.) indicate that the key factor

in the effectiveness of this process is the separation of commercial and socially significant functions, as well as the introduction of transparent mechanisms for compensating losses from social transportation. This allows minimizing political risks and ensuring the sustainability of market reforms.

Thirdly, international experience confirms that the corporatization of transport monopolies has multidirectional effects on public welfare – on the one hand, it contributes to improving the quality of services and optimizing logistics chains, but on the other hand, it can lead to an increase in tariffs and a decrease in the accessibility of transport services for vulnerable categories of consumers. Therefore, balancing commercial and social effects requires a balanced approach to tariff policy and the introduction of targeted support mechanisms.

Taking these lessons into account is extremely relevant for Ukraine in the context of the ongoing war and the course towards European integration. Given the colossal destruction of transport infrastructure and the acute need for investment, completing the corporatization of UZ and USPA on market principles is a critical prerequisite for rebuilding the industry. At the same time, a radical change in the geography of cargo flows (reorientation to western borders and

Danube ports) necessitates a flexible pricing policy that would stimulate the attraction of cargo and optimal utilization of existing capacities.

Corporatization and pricing strategies: a new search for balance between the market and social goals

Over the past decades, the corporatization of state-owned transport enterprises has become a global trend, driven by the desire to increase their operational efficiency, commercialize activities, and adapt to the conditions of liberalized markets. However, as a systematic review of the literature shows, the consequences of these reforms for pricing strategies, market efficiency, and public welfare are quite ambiguous and vary depending on the institutional environment, industry specifics, and the sequence of reforms.

Thus, the experience of corporatization of railway operators in the EU (Deutsche Bahn, SNCF, PKP Cargo, České dráhy, etc.) indicates a predominantly positive impact on operational efficiency and service quality. In particular, according to estimates by CER (Community of European Railway and Infrastructure Companies), during 2000-2020, labor productivity on EU railways increased by 40%, and the average speed of freight delivery by 30%

Table 4. Dynamics of labor productivity of individual EU railway operators

Country	Operator	Year of corporatization.	Labor productivity (ton*km/employee)		
			2000	2010	2020
Germany	Deutsche Bahn	1994	453	577	631
Poland	PKP Cargo	2001	348	725	1120
Czechia	České dráhy	2003	386	485	596
France	SNCF Fret	1997	422	503	544
Ukraine	Ukrainian Railways	2015	848	1140	1176

Source: built by the author according to the data from Deutsche Bahn AG. (2020)¹; PKP Cargo S.A. (2020)²; České dráhy (2020)³; SNCF Group. (2020)⁴; JSC “Ukrainian Railways” (2021)⁵

1 Integrated Report 2020. Deutsche Bahn AG, 2020. URL: <https://ir.deutschebahn.com/en/reports/archive/details/2020-integrated-report-deutsche-bahn/> (дата звернення: 21.12.2024).

2 Annual Report 2020. PKP Cargo S.A., 2020. URL: <https://www.pkpcargo.com/en/investor-relations/reports/financial-reports/> (дата звернення: 21.12.2024).

3 Annual Report 2020 [Річний звіт 2020]. České dráhy, 2020. URL: <https://www.ceskedrahy.cz/assets/pro-investory/financni-zpravy/vyrocni-zpravy/annual-report-cd-2020.pdf> (дата звернення: 21.12.2024).

4 Financial Report 2020. SNCF Group, 2020. URL: <https://www.groupe-sncf.com/en/group/finance/financial-publications> (дата звернення: 21.12.2024).

5 Consolidated Annual Report of JSC «Ukrzaliznytsia» for 2020. URL: https://www.uz.gov.ua/about/investors/financial_statements/ (дата звернення: 21.12.2024).

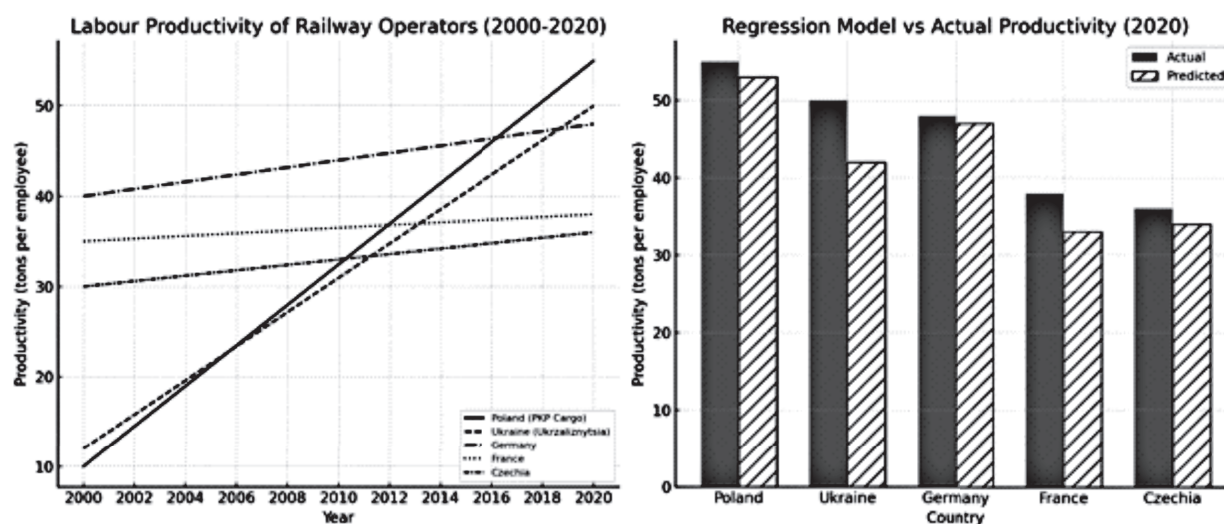


Fig. 2. Comparison of actual and predicted labor productivity of railway operators in the EU and Ukraine using a regression model of the impact of investments and the share of private operators (2000-2020)

(CER, 2021¹). The key drivers of these improvements were the separation of infrastructure and operational activities (the «separation» model), the introduction of private traction, the development of intermodal transportation, and the digitalization of operations.

At the same time, the corporatization of railway operators had an ambiguous impact on pricing strategies and service accessibility (Nem Singh et al., 2018; Baum & Medas, 2020). On the one hand, the transition to commercial pricing principles and the opening of markets contributed to the optimization of tariffs and the growth of price competition. For example, the average cost of freight transportation in the EU for 2005-2020 decreased by 15% (taking inflation into account) (Eurostat, 2022²). On the other hand, the gradual abandonment of cross-subsidization and the introduction of “user pays” led to an increase in passenger tariffs and a reduction in the network of regional routes. As a result, according to Eurostat, the share of railways in EU passenger transportation decreased from 8.4% in 2000 to 7.8% in 2019 (Eurostat, 2022³).

As we can see (Table 4), in all the countries considered, there was a significant increase in this indicator, which indicates a positive impact of corporatization on opera-

tional efficiency. At the same time, the growth rates and absolute level of productivity vary between countries, which may be due to differences in the pace of reforms, investment activity, regulatory environment, etc. The high baseline level of UZ’s productivity is noteworthy, which can be explained by a larger share of bulk cargo (coal, ore, grain) in the structure of transportation.

Let’s clarify the details of the regression model constructed based on Table 4. A simplified regression model was built: $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \epsilon$, where y is labor productivity (ton*km/employee); x_1 is the volume of investments (billion euros); x_2 is the share of private operators (%); β_0 , β_1 , β_2 are model parameters; ϵ is the model error. The model was evaluated using data from Table 4 (labor productivity of railway operators) and publicly available data on investments and the share of private operators in the respective countries. Steps for constructing concise conclusions based on the model:

1) the impact of investments (x_1) on productivity (y): data from Poland (PKP Cargo) showed a significant increase in investments in the period 2014-2020 (12 billion euros) and a simultaneous increase in labor productivity from 725 to 1120 tkm/employee. The regression model gives a parameter $\beta_1 = 35.2$, which indicates: each additional billion euros of investments adds approximately 35.2 tkm/employee.

2) the impact of the share of private operators (x_2): in Germany (Deutsche Bahn), the share of private operators reached 60%, which, according to the model ($\beta_2 = 5.7$), provides an increase in productivity of 5.7 tkm/employee for every additional 10% of private

1 Community of European Railway and Infrastructure Companies CER Statistics: Key Figures on European Railways. Brussels: CER6 2021. URL: <http://surl.li/beupgt> (дата звернення: 21.12.2024).

2 Modal split of freight transport. Eurostat, 2022. URL: https://ec.europa.eu/eurostat/databrowser/view/tran_hv_frmod/default/table?lang=en (дата звернення: 21.12.2024).

3 Ibid.

capital. In Poland, a similar effect was observed due to the stimulating effect of competition.

3) results for France (SNCF Fret): labor productivity increased only to 544 tkm/employee, which can be explained by the low level of investment and the absence of a significant private sector. According to the model, small investments (<5 billion euros) give a predicted level of productivity close to the actual one.

4) results for Ukraine (Ukrainian Railways): despite high productivity (1176 tkm/employee), this is due to the dominance of bulk cargo (ore, grain). According to the model, a low share of private operators ($\approx 2\%$) and limited investments predict potential growth only to 1250-1300 tkm/employee if investments do not increase.

The left graph in Figure 2 shows the dynamics of labor productivity of individual EU and Ukrainian railway operators for the period 2000-2020, where a significant increase can be seen in Poland (PKP Cargo) and Ukraine

(Ukrainian Railways), compared to stable rates in other countries. The right graph in Figure 2 presents the results of the regression model, which evaluates the impact of investments and the share of private operators on labor productivity. The graph shows that the predicted model productivity in Poland and Germany is close to the actual values, while in France and the Czech Republic, the model demonstrates the possible effect of lower investments and weaker competition. Ukraine stands out with high actual productivity due to the specifics of mass cargo transportation.

A somewhat different picture is observed in the port sector, where corporatization took place mainly through the transfer of terminals to concession to private operators and the transformation of state port administrations into «landlord ports». As V. Niessen (2018) notes, these reforms stimulated an inflow of private investment in capacity development (from 30% in 2000 to 68% in 2020) and contributed to the optimization of logistics chains. However, their impact on port fees and tariffs was less

Table 5. Dynamics of cargo turnover of individual ports in Poland and Latvia

Country	Port	Year of corporatization	Cargo turnover, million tons			Increase 2000-2020, %
			2000	2010	2020	
Poland	Gdansk	1997	16,7	27,2	48,0	187
	Gdynia	1996	8,4	14,7	24,6	193
Latvia	Ventspils	2000	34,8	26,9	12,9	-63
	Riga	2000	13,4	30,5	23,7	77
Ukraine	Pivdennyi	2013	13,1	18,7	23,4	79
	Odesa	2013	28,6	24,7	23,4	-18

Source: compiled by the author based on data from the maritime port administrations of the respective countries (State Enterprise «Ukrainian Seaports Administration» (2021)¹; Port of Gdansk Authority S.A. (2021)²; Port of Gdynia Authority S.A. (2021)³; Freeport of Ventspils Authority (2021)⁴; Freeport of Riga Authority (2021)⁵; State Statistics Service of Ukraine. (2021)⁶; Statistics Poland. (2021)⁷; Central Statistical Bureau of Latvia. (2021)⁸)

1 Performance Indicators of Ukrainian Seaports 2000-2020. State Enterprise «Ukrainian Seaports Administration», 2021. URL: <https://uspa.gov.ua/pokaznyky-roboty> (дата звернення: 21.12.2024).

2 Cargo Statistics 2000-2020. Port of Gdansk Authority S.A., 2021. URL: <https://www.portgdansk.pl/about-port/cargo-statistics> (дата звернення: 21.12.2024).

3 Port of Gdynia in Figures 2000-2020. URL: <https://www.port.gdynia.pl/en/about-the-port/the-port-in-figures> (дата звернення: 21.12.2024).

4 Port Statistics 2000-2020. Freeport of Ventspils Authority, 2021. URL: <https://www.portofventsplis.lv/en/port/statistics/> (дата звернення: 21.12.2024).

5 Statistics on Cargo Turnover 2000-2020. Freeport of Riga Authority, 2021. URL: <https://rop.lv/en/about-port/statistics.html> (дата звернення: 21.12.2024).

6 Cargo Turnover of Ukrainian Seaports 2000-2020. State Statistics Service of Ukraine, 2021. URL: https://ukrstat.gov.ua/operativ/operativ2018/tr/tr_rik/tr_rik_u/kp_pas_vt_u.htm (дата звернення: 21.12.2024).

7 Transport. Statistics Poland, 2021. URL: <https://stat.gov.pl/en/topics/transport-and-communications/transport/> (дата звернення: 21.12.2024).

8 Transport Statistics 2020. Central Statistical Bureau of Latvia, 2021. URL: <https://stat.gov.lv/en/statistics-themes/business-sectors/transport> (дата звернення: 21.12.2024).

ambiguous: despite the growth of intra-port competition, the oligopolistic structure of the global container line market allowed terminal operators to maintain a relatively high margin¹.

The experience of corporatization of sea-ports in Poland (after 1996) and Latvia (after 2000) is interesting, which is considered one of the most successful in CEE (Voorde et al., 2016). Thanks to the creation of independent supervisory boards, the introduction of a transparent system of concession competitions, and the «buyout» of social infrastructure by cities, the ports managed to attract strategic investors and increase cargo turnover by 2.5-3 times over 20 years. At the same time, the «Achilles' heel» of the reforms was the slow reduction in the state's share in the authorized capital of terminal operators, which restrained competition and technological renewal.

As we can see (Table 5), after corporatization, Polish ports demonstrated impressive growth in cargo turnover (almost 3 times), while in Latvian and Ukrainian ports the dynamics were unstable. This may indicate the higher efficiency of the «landlord port» model and more favorable conditions for attracting private investment and developing competition in Polish ports. At the same time, cargo turnover dynamics could also be influenced by exogenous factors such as changes in the structure of foreign trade, the macroeconomic situation, geopolitical processes, etc.

In general, the experience of corporatization of transport enterprises in the EU proves its positive impact on market efficiency and service quality, but at the same time indicates the risks of tariff increases and reduced accessibility for certain categories of consumers (Castillo-Manzano et al., 2022; Worldbank, 2017b²). The key factor in balancing commercial and public effects was the introduction of economic regulation instruments and targeted support, such as long-term contracts with defined performance indicators, service quality standards, compensation for losses from social transportation, etc.

Particularly valuable from the point of view of adapting global experience for Ukraine are the lessons of corporatization of railway companies in the new EU members (Poland, Lithuania, Slovakia, etc.). As a World Bank study³ showed, the key factors for the suc-

cess of reforms were the complete separation of infrastructure and operational businesses, the elimination of cross-subsidization, the introduction of incentive contracts, and the development of private traction. However, unlike the «old» EU members, these countries paid more attention to the issues of social accessibility of services, modernization of infrastructure, and coordination with other modes of transport. In particular, in Poland, the corporatization of PKP was accompanied by large-scale investments in the renewal of rolling stock and railway infrastructure (over 12 billion euros for 2014-2020), as well as the introduction of a system of state compensation for social transportation (Beria & Redondi, 2017). This made it possible to attract private operators (their share increased to 60%) and maintain a significant role of railways in both freight (27%) and passenger (8%) transportation. On the other hand, in Lithuania, the corporatization of Lietuvos geležinkeliai progressed more slowly and painfully – a lack of investment, the absence of an independent regulator, and the preservation of vertical integration restrained the development of competition and the renewal of assets (Budginaite-Froehly, 2024; EC, 2018⁴). As a result, the share of railways in total passenger and freight turnover decreased in 2000-2020 from 14% to 6% and from 54% to 34%, respectively⁵.

Summarizing the results of the analysis of the global experience of corporatization of transport enterprises, several key patterns and differences in its consequences for pricing strategies, market efficiency, and public welfare can be identified:

1. Corporatization, as a rule, stimulates the transition from cost-based to market-based pricing and contributes to the optimization of tariffs. However, the pace and scale of these changes critically depend on the degree of market liberalization, the effectiveness of regulation, and the presence of real competition. In EU countries with developed market institutions (Germany, Poland), the commercialization of tariffs was more consistent and balanced, while in countries with «managed» competition (France, Lithuania), elements of cross-subsidization and political interference in pricing remained.

1 Achieving full and effective corporatization of port authorities: reform models from global experience (Report #120581). Washington, D.C. : World Bank Group, 2017. URL: <http://surl.li/puvihe> (дата звернення: 21.12.2024).

2 Railway Reform: A Toolkit for Improving Rail Sector Performance. Washington, DC: World Bank, 2017. 624 p. URL: http://surl.li/csopbw_ (дата звернення: 21.12.2024).

3 Ibid.

4 2nd Study on the North Sea - Baltic TEN-T Core Network Corridor. Brussels, 2018. 159 p. URL: <http://surl.li/tjxqtj> (дата звернення: 21.12.2024).

5 Dynamics of freight and passenger transportation by mode of transport. Statistics Lithuania, 2022. URL: <https://osp.stat.gov.lt/statistiniu-rodikliu-analize?indicator=S3R162#/> (дата звернення: 21.12.2024).

Table 6. Key patterns and differences in the impact of corporatization of transport enterprises on pricing strategies, market efficiency and social welfare: lessons from world experience for Ukraine

Important or identified industry patterns in corporatization	Impact on pricing strategies	Impact on market efficiency	Impact on social welfare	Methodological conclusions for analyzing corporatization in Ukraine
The pace and scale of the transition from cost-based to market pricing depends on the degree of market liberalization, the effectiveness of regulation and the level of competition	Commercialization of tariffs occurs more consistently and in a more balanced way in countries with developed market institutions (Germany, Poland) than in countries with «managed» competition (France, Lithuania)	Tariff optimization stimulates resource use efficiency and investments in asset modernization	Market pricing can worsen the affordability of services for vulnerable consumer groups, which requires targeted compensation mechanisms	It is necessary to study corporatization in combination with other reforms (tariff deregulation, admission of private traction, etc.) and taking into account the institutional context
The increase in operational efficiency and productivity is greatest where corporatization is accompanied by structural reforms, significant investments and the introduction of progressive management methods	More efficient operators have more opportunities for flexible pricing and tariff customization	Separation of infrastructure and transportation, admission of private operators and modernization of assets are key drivers of productivity growth (examples are railway reforms in Germany and Poland, port reforms in the Baltic countries)	Improving the quality, safety and speed of transport services has a positive impact on population mobility and economic development	To objectively assess the effects of corporatization, it is necessary to apply multidimensional success criteria that take into account not only financial indicators, but also indicators of service quality, safety, environmental friendliness, accessibility for different consumer groups, etc.
Ensuring a balance of commercial and social effects requires a balanced state policy and the introduction of targeted mechanisms for compensating «social» transportation	Long-term contracts for socially important services (following the example of Germany) make it possible to align the pricing strategies of operators with the goals of the state's transport policy	Quality control and service accessibility systems (following the example of France) incentivize operators to improve the consumer characteristics of services	Targeted mechanisms for compensating «social» transportation (following the example of Poland) make it possible to maintain the availability of basic transport services for vulnerable segments of the population	Forecasting the consequences of corporatization should be based on realistic behavioral models of key stakeholders (management, trade unions, regulators, investors, etc.) and take into account possible conflicts of their interests and motivations.

2. The impact of corporatization on the operational efficiency and productivity of transport enterprises is mostly positive but uneven across countries and sectors. The largest increase in efficiency was observed where corporatization was accompanied by structural reforms (separation of infrastructure and transportation, admission of private operators), significant investments in the modernization of assets, and the introduction of progressive management methods. Striking examples are railway reforms in Germany and Poland, as well as port reforms in the Baltic countries.

3. Corporatization has a multidirectional impact on the accessibility of transport services and public welfare: on the one hand, increased efficiency and investment contribute to improving the quality and safety of service, but on the other hand, the commercialization of tariffs can worsen affordability for vulnerable categories of consumers. Therefore, ensuring a balance of commercial and social effects requires a balanced state policy, in particular, the introduction of targeted mechanisms for compensating «social» transportation (following the example of Poland), long-term contracts for socially im-

portant services (following the example of Germany), systems for monitoring the quality and accessibility of service (following the example of France), etc.

As we can see (Table 6), the success of corporatization critically depends on the consistency and coherence of market reforms, the quality of institutions and regulation, the investment climate and the presence of long-term political consensus on the goals and mechanisms of transformations. Countries that have been able to ensure these prerequisites (Germany, Poland, the Baltic countries) have achieved better results in terms of tariff optimization, growth in the efficiency and productivity of transport operators. At the same time, even in these countries, corporatization has had an ambiguous impact on the accessibility of transport services for various consumer groups. Therefore, balancing commercial and social effects required the introduction of special regulatory and support mechanisms, such as long-term contracts for socially important services, quality control and service accessibility systems, targeted compensation for «social» transportation, etc.

Development of a game-theoretic model for analyzing the interaction between corporate, pricing and market strategies of UZ and USPA after the completion of corporatization

As we were convinced by the previous analysis, the corporatization of transport monopolies such as Ukrzaliznytsia (UZ) and the Ukrainian Sea Ports Authority (USPA) is a complex and non-linear process that has multidirectional effects on pricing strategies, market efficiency and social welfare. International experience demonstrates that the success of this process critically depends on the coherence of actions and incentives of key players: the government, enterprise management, regulators, private investors, consumers, etc. In this context, the use of game theory tools for modeling the strategic interaction of participants in the corporatization process is not only methodologically justified, but also practically valuable approach. As you know, game theory is a branch of mathematical economics that studies formalized models of making optimal decisions in conditions of conflict of interests, when the result depends on the actions of several players. It allows you to analyze the motives and incentives of the players, predict the likely equilibria (in particular, the Nash equilibrium as a situation where it is not profitable for any of the participants to unilaterally deviate from the chosen strategy) and assess the consequences of various scenarios.

The basic setup of the game in normal (strategic) form assumes the presence of several players who simultaneously choose their

strategies from a fixed set of alternatives and receive payoffs depending on the combination of their own and others' strategies. However, real economic interactions rarely fit into this simplified template. In particular, for adequate modeling of the corporatization processes of UZ and USPA, it is advisable to consider a dynamic game in an extended form. Below is a simplified game-theoretic model of the corporatization of UZ and USPA.

The purpose of the model is to formalize the strategic interaction of key stakeholders (players) in the process of corporatization of SE «Ukrzaliznytsia» (UZ) and SE «Ukrainian Sea Ports Authority» (USPA) to determine the optimal strategies for reforming these enterprises in terms of balancing commercial and public interests.

Players are:

- 1) Government (U) as a political principal that determines the goals and architecture of corporatization;
- 2) UZ management (M_uz) and USPA management (M_ampu), who make decisions regarding the companies' operational strategies;
- 3) Independent industry Regulator (R), which sets the rules of the game in the market;
- 4) Private operators (P) and consumers (S) are considered as the external environment with given functions of influence on the game.

Utility functions of players:

- Government:

$$U = a_1 \cdot GDP_impact + a_2 \cdot Tax_revenues - a_3 \cdot Political_risks + a_4 \cdot EU_integration, \quad (1)$$

where *GDP_impact* is the impact of corporatization on real GDP growth, %; *Tax_revenues* are additional tax revenues from UZ and USPA activities after the reform, UAH billion; *Political_risks* is an expert assessment of the political risks of reforms on a scale of [0;10]; *EU_integration* is an expert assessment of the impact of reforms on European integration on a scale of [0;10]; a_1, a_2, a_3, a_4 are weight coefficients reflecting the Government's priorities (determined by analyzing actual decisions, surveys of top officials and independent experts).

Additional dependencies:

$$\begin{aligned} GDP_impact &= k_1 \\ (Investments_uz + Investments_ampu) &- k_2 \\ Inflation &= f(Cargo_tariff, Pass_tariff, Affordability) \end{aligned} \quad (2)$$

- UZ:

$$M_uz = b_1 \cdot EBITDA_uz + b_2 \cdot ROI_uz - b_3 \cdot Debt_burden_uz + b_4 \cdot Market_share_uz, \quad (3)$$

where $EBITDA_{uz}$ is operating profit before interest, taxes, and depreciation, UAH million; ROI_{uz} is return on investment, %; $Debt_burden_{uz}$ is the ratio of net debt to EBITDA; $Market_share_{uz}$ is UZ's share in the rail transportation market, %; b_1, b_2, b_3, b_4 are weight coefficients according to UZ management priorities.

Additional dependencies:

$$EBITDA_{uz} = (Cargo_tariff \cdot Cargo_volumes + Pass_tariff \cdot Pass_volumes) - Operating_costs, \quad (4)$$

- USPA:

$$M_ampu = c_1 \cdot EBITDA_ampu + c_2 \cdot ROI_ampu - c_3 \cdot Debt_burden_ampu + c_4 \cdot Market_share_ampu, \quad (5)$$

where $EBITDA_ampu$ is USPA's operating profit before interest, taxes, and depreciation, UAH million; ROI_ampu is USPA's return on investment, %; $Debt_burden_ampu$ is the ratio of USPA's net debt to its EBITDA; $Market_share_ampu$ is USPA's share in the port services market, %; c_1, c_2, c_3, c_4 are weight coefficients according to USPA management priorities.

Additional dependencies:

$$EBITDA_ampu = Concession_depth \cdot Revenue_private - Debt_burden_ampu, \quad (6)$$

- Regulator:

$$R = d_1 \cdot Competition + d_2 \cdot Service_quality + d_3 \cdot Investments + d_4 \cdot Affordability, \quad (7)$$

where $Competition$ is the index of competition development in the industry, [0; 10]; $Service_quality$ is the index of transport services quality, [0; 10]; $Investments$ is the volume of investments in infrastructure modernization, UAH billion; $Affordability$ is the share of transport costs in the structure of household expenditures, %; d_1, d_2, d_3, d_4 are weight coefficients according to the Regulator's priorities.

Additional dependencies for the Regulator's utility function:

$$Service_quality = h_1 \cdot (Investments_uz + Investments_ampu) + h_2 \cdot Infrastructure_quality + h_3 \cdot Eco_impact + h_4 \cdot Social_resp, \quad (8)$$

where: $Infrastructure_quality$ is the infrastructure quality index (takes into account speed, safety, technological effectiveness) [0; 10]; Eco_impact is the index of the impact of

UZ and USPA activities on the environment (emissions, waste, energy consumption) [0; 10]; $Social_resp$ is the index of social responsibility (takes into account job creation, development of community infrastructure, charity) [0; 10]. h_1, h_2, h_3, h_4 are some weight coefficients.

This expanded dependency shows that the quality of transport services in the model is determined not only by the volume of investments by UZ and USPA in asset renewal, but also by the technological level of infrastructure, environmental impact, and corporate social responsibility. That is, when assessing the effectiveness of corporatization, both purely economic and socially significant factors are taken into account.

From the Regulator's point of view, this means the need to balance various requirements when determining target indicators for UZ and USPA activities. For example, excessive pressure to reduce the environmental footprint may limit the investment activity of companies, while weakening requirements for safety or accessibility of infrastructure for local communities may cause public discontent and protests. Therefore, the task of the Regulator in the model is to find the optimal combination of standards and incentives for UZ and USPA, which would maximize the total positive effect for the economy and society.

Next, let's consider how exogenous variables (uncertainty factors) influence the strategic choice of players in the model.

The impact of exogenous variables. Currently, the author sees only two (for simplification and only for this) key exogenous variables that affect the choice of strategies by players and the final payoffs in the model – an intensity of the hot war conflict (War_impact) and the inflation rate ($Inflation$).

The impact of the war is modeled through the discrete variable War_impact , which can take three values: War_impact : «active phase», «economic recovery», «protracted hot war without a truce». Depending on the scenario, the impact of War_impact on the key parameters of the model changes, in particular:

- volumes of freight and passenger transportation:

$$Cargo_volumes = Cargo_volumes_base \cdot (1 - War_impact) \\ Pass_volumes = Pass_volumes_base \cdot (1 - War_impact)$$

- opportunities for attracting private investments in infrastructure:

$$Investments = Investments_planned \cdot \exp(-\lambda \cdot War_impact)$$

- efficiency of rolling stock use (due to changes in logistics routes, idle time of wagons, etc.):

$$\text{Operating_efficiency} = \text{Operating_efficiency_base} \cdot (1 - \text{War_impact}).$$

Since the *War_impact* variable is modeling an intensity of the hot war, it can be theoretically assumed that it can take the following values:

A) active phase of the war (0.7–1.0): high level of infrastructure destruction; significant reduction in freight and passenger traffic volumes; risks for investors due to instability.

B) Economic recovery (0.3–0.6): partial restoration of logistics routes; increase in transportation volumes; gradual return of investor confidence;

C) Protracted low-intensity war conflict (0.1–0.2): stabilization of conditions with minimal losses; limited impact on transportation and investments.

Impact on model results:

(1) transportation: *Cargo_volumes* and *Pass_volumes* decrease with increasing *War_impact*.

(2) Investments: Investments exponentially decrease due to increased risks.

(3) Operational efficiency: *Operating_efficiency* drops due to route reorientation and asset downtime.

The impact of inflation (*Inflation*) is modeled as a continuous variable that affects:

- real value of investments: $\text{Investments_real} = \text{Investments} / (1 + \text{Inflation})$

- real interest rate on UZ and USPA debt obligations: $\text{Debt_cost_real} = \text{Debt_cost_nominal} - \text{Inflation}$

- real transportation revenues (under conditions of lagging tariff indexation): $\text{Revenues_real} = \text{Revenues_nominal} / (1 + \text{Inflation})^{\text{lag}}$,

where *lag* is the average time lag of UZ and USPA tariff indexation relative to inflation.

Since the *Inflation* variable is modeling an annual inflation rate, let's imagine it can be:

(1) high inflation rate (15–20%), namely – depreciation of real incomes; increase in the cost of transportation; delays in tariff indexation;

(2) Moderate inflation rate (5–10%): controlled costs; stable investment activity;

(3) low inflation rate (<5%): optimal conditions for planning and investment.

Impact on model results:

- real revenues: *Revenues_real* decreases with high inflation.

- capital expenditures: *Investments_real* become less effective.

- debt burden: *Debt_cost_real* increases with inflationary shocks.

Extended game dynamics. The game is

modeled in an expanded dynamic form, that is, players make their moves sequentially, observing the actions of others. Schematically, this can be represented as follows:

- Step 0. *War_impact* and *Inflation* scenarios are exogenously set.

- Step 1. The Government chooses between strategies: (a) maintaining the status quo (SQ); (b) intensive corporatization (IC).

- Step 2. UZ and USPA management choose: pricing policy (*SQ_p* or *CM_p*); investment policy (*MI_i* or *FI_i*); market strategy (*MM_m* or *CC_m*).

- Step 3. The Regulator sets: the permissible range of tariffs: $\text{Cargo_tariff} \in [T_min; T_max]$; requirements for safety, ecology, social obligations, etc.

- Step 4. Private operators and consumers make decisions regarding: the volume of demand for UZ and USPA services; investments in rolling stock and terminal capacities; switching to alternative modes of transport.

These steps are repeated iteratively until an optimal agreed decision is reached (for example, as Nash equilibrium), when it is unprofitable for any of the players to deviate from the chosen strategy given the expectations regarding the actions of other participants.

In addition, at each stage, there is a possibility of adjusting strategies in case of implementation of extreme scenarios (for example, escalation of hot war or sharp devaluation of the hryvnia). To do this, an option of extraordinary (emergency) revision of prices, investment plans or regulatory requirements at the initiative of any player is introduced.

Key simulation results. Parameterization and simulations of the game-theoretic model on real data of UZ and USPA allow obtaining a number of practically valuable results:

1. Determination of optimal corporatization strategies in terms of maximizing the total gain for society (based on the analysis of gains in different quadrants of the strategy matrix).

2. Analysis of the conditions for achieving optimal solutions (Nash equilibrium) for different inflation and military conflict scenarios in order to assess the stability and viability of reforms.

3. Assessment of the integral economic effect of corporatization for key macro indicators (GDP growth rates, volume of private investments in infrastructure, budget revenue, productivity of production factors), taking into account direct, indirect and induced impacts.

4. Forecasting changes in the total welfare of consumers of transport services due

Table 7. Table of optimal strategies for each scenario

Scenario	Government strategy	UZ/USPA management strategy	Regulator strategy
Active phase of war	Status quo (SQ): focus on basic operations.	Minimum Investments (MI): reduction of capital expenditures	Soft Regulation (SR): minimum requirements
Economic recovery	Intensive Corporatization (IC): market liberalization	Forced Investments (FI): modernization of assets	Hard Regulation (HR): control of tariffs and quality
Protracted war conflict	Gradual Reforms: gradual implementation of IC	Commercial Model (CM): leveling of tariffs	Balanced Regulation: flexible regulation

to optimization of tariff policy, improvement of the quality and safety of transportation, reduction of time costs, improvement of environmental characteristics of transport, etc.

5. Calculation of threshold values of exogenous parameters (*War_impact*, *Inflation*) and controlled variables (*Investments*, *Tariffs*, *Operating_efficiency*), under which the corporatization of UZ and USPA remains economically and socially justified.

Surely, it is impossible to accurately predict the simulation results without introducing quantitative values and parameters, but approximate simulation results (in graphical form) can be imagined. For example:

1. The graph of the impact of *War_impact* on *Cargo_volumes* will show a linear decrease in freight traffic volumes with an increase in the impact of the war; and on *Investments* – will show an exponential drop in investments at *War_impact* values > 0.6.

2. The graph of the impact of *Inflation* on *Revenues_real* will demonstrate a lag in the response of revenues to inflationary changes; and on *Debt_cost_real* – a linear increase in the cost of servicing debt.

For even more visual illustration of the results, it is advisable to use the following visualization tools: payoff matrices for different combinations of player strategies with the allocation of equilibrium situations; Monte Carlo simulation diagrams showing the distribution of probable results under different scenarios and assumptions; interactive dashboards with the ability to change key parameters and view the corresponding dynamics of resulting indicators; a decision tree graph with the allocation of optimal trajectories at each stage of the game.

Opportunities for practical application of the model and proposals for politicians and management of state-owned companies

This game-theoretic model of corporatization of UZ and USPA is not just an abstract academic exercise, but a practical tool to support reform decisions in the transport sector

of Ukraine. Its main purpose is to help decision-makers choose optimal corporatization strategies and trajectories in terms of balancing public and commercial interests.

The key value of the model for the reader lies in the opportunity to see the corporatization process through the eyes of various stakeholders (government, company management, regulator, private investors, consumers), understand their interests and incentives, predict strategic interactions and final results under different scenarios. For example, the model shows that the optimal strategy for the Government is not just «corporatization for the sake of corporatization», but creating incentives for UZ and USPA management to improve operational efficiency, attract private investment and improve service quality. At the same time, the model demonstrates the importance of maintaining state control over strategic infrastructure to prevent risks of discrimination or inflated tariffs.

For UZ and USPA management, the model allows assessing how different commercial strategies (pricing policy, investment decisions, entry into competitive markets) will affect the financial performance and market positions of companies, taking into account the actions of the regulator and the behavior of private players. This allows choosing a balanced approach that maximizes profits without sacrificing long-term development goals.

For the independent regulator (NCRT), the model is a tool for finding the optimal balance between creating competitive incentives and protecting public interests. Simulations based on real data help establish scientifically sound target indicators of safety, quality, environmental friendliness of services for UZ and USPA, as well as determine the limits of the tariff corridor that will ensure self-sufficiency without excessive burden on consumers.

In conditions of martial law and economic crisis, application of the model allows minimizing the risks of wrong decisions regarding such strategic assets as railways and ports. Sensitivity analysis of the results to chang-

es in exogenous factors (inflation, intensity of hostilities) shows under what conditions corporatization remains economically and socially justified, and which scenarios require adjustments to plans and reform tools.

In addition, the model allows testing new mechanisms for attracting private investment for the reconstruction and modernization of infrastructure (for example, through the issuance of infrastructure bonds or the creation of recovery funds under the auspices of international financial institutions). This is especially relevant now, when the budgetary capabilities of the state are extremely limited, and the needs for capital investments are huge.

Therefore, the main message of this game-theoretic model is this: the corporatization of UZ and USPA is not just a technical issue of changing the legal status of companies, but a complex process of transforming markets, regulatory policy, and the social contract between the state and business. The success of the reform critically depends on the right incentives, consistency and transparency of government actions, the willingness of players to compromise and make concessions for the sake of long-term development of the industry.

Let's detail this more clearly. The practical application of these results allows us to indicate, perhaps, a more effective format and sequence of corporatization of UZ and USPA with maximum (as the author imagines) benefits for the Ukrainian economy and society:

A) For rail transport – this is the transition to the «infrastructure holding» model with the allocation of an independent infrastructure operator (tracks, stations, dispatching services) and the gradual liberalization of the transportation market by allowing private traction and the formation of a competitive market for rolling stock operators. This will improve the efficiency of asset utilization and the quality of service for customers, attract private investment in the modernization of locomotives and wagons, create market incentives for innovation and customer focus. At the same time, keeping the infrastructure in state ownership will safeguard against the risks of discrimination and inflated tariffs, as well as allow the implementation of long-term network development projects.

B) For the port industry – this is the transition to the «landlord port» model with the corporatization and subsequent privatization of stevedoring companies and terminals while maintaining strategic port infrastructure (water areas, hydraulic structures, access roads) under the management of USPA as a single state holding. This will attract high-quality in-

ternational operators and investors on a competitive basis, increase the efficiency of berth capacity utilization, reduce port fees and improve service for ship owners and shippers. At the same time, the holding management model will ensure the coordination of port development on a national scale, the implementation of strategic infrastructure projects (dredging, development of access roads) and guarantees of non-discriminatory access to berths.

Furthermore... The game-theoretic model developed above can become a powerful tool for forming practical recommendations for UZ and USPA management on optimizing pricing policy, since it takes into account the interaction of players such as the government, management, regulator and consumers, allowing to assess how different scenarios affect financial performance and public welfare. For example, the analysis of tariffs for freight and passenger transportation (*Cargo_tariff* and *Pass_tariff*) in different scenarios (military escalation, economic recovery or stable war conflict) allows management to adapt pricing policy to external challenges. Even imaginary simulation results show that in the active phase of the war, it is recommended to maintain tariff stability, even at the expense of short-term profitability reduction, since this will help preserve traffic volumes and ensure social affordability. At the same time, in the scenario of economic recovery, the emphasis should be shifted to adapting tariffs to market conditions in order to attract investment for asset modernization. Thus, the model allows building a balanced pricing strategy that takes into account the interests of various stakeholders, as well as supports long-term competitiveness and financial sustainability of companies.

In addition to pricing policy, the model facilitates the development of market positioning strategies and improvement of corporate governance. For example, modeling allows assessing how different levels of market competition affect the profitability and market share of UZ and USPA. In the scenario of a protracted conflict, it is advisable to focus on maintaining key market positions through the formation of strategic alliances with private operators, the introduction of flexible contract models (*CC_m*) and the maintenance of minimum investment costs. In the scenario of economic recovery, the model suggests that market positioning should be based on an aggressive investment policy (*FI_i*), expansion of infrastructure capacities and attraction of private capital through concessions. For corporate governance, the model highlights the importance of transitioning to a

transparent, efficiency-oriented management structure that minimizes debt burden and stimulates operational efficiency. Integration of simulation results into strategic plans will help management make more informed decisions that will contribute to increasing operating profit, reducing the environmental footprint and increasing social responsibility. Thanks to these recommendations, companies will be able to become more resilient to external challenges and strengthen their role in the national economy.

Of course, the successful implementation of these models will require synchronization of efforts of many stakeholders: central and local authorities, management and trade unions of UZ and USPA, large shippers and passengers, Ukrainian and international investors, experts and civil society. The key prerequisites are:

1) formation of a long-term vision for the development of Ukraine's railways and ports in the context of integration into the continental transport system of the EU and global value chains;

2) political consensus on the irreversibility of reforms and readiness to guarantee transparent and equal rules of the game for public and private companies;

3) increasing the institutional capacity and independence of state regulators (NCSR (or «National Commission for State Regulation in the Field of Transport»), AMCU, Ministry of Infrastructure) for effective tariff, technical and antitrust regulation;

4) development of clear and transparent mechanisms for the distribution of potential benefits from reforms to minimize resistance from interested groups (in particular, cross-subsidization of passenger transportation at the expense of freight, abuse of monopoly position, corrupt practices);

5) proactive and systematic communication with the public about the goals and expected effects of reforms to ensure public and electoral support.

Conclusion. Based on the analysis, the following conclusions can be drawn:

1. The pricing policy and market positioning of UZ and USPA over the past decade have been characterized by a gradual movement towards liberalization and adaptation to market conditions, but this process has been characterized by significant inertia and inconsistency due to the conflict between commercial and socio-political goals. In particular, deeply rooted practices of cross-subsidizing passenger transportation at the expense of freight (for UZ) and port fees (for USPA) limited the space for price maneuver-

ing and restrained the investment activity of enterprises. In addition, the model of a «single national carrier» and an imperfect system of state tariff regulation created risks of non-market behavior and discriminatory access to infrastructure. Compared to the post-Soviet countries of the EU (Poland, Baltic countries), the Ukrainian experience of corporatization of transport monopolies was characterized by a higher level of political interference in the operational activities of enterprises, a higher level of regulation and fragmentation of reforms. In particular, attempts to maintain the status quo regarding the low level of railway tariffs for industrial consumers limited investment opportunities and restrained the entry of private operators into the market. In the port sector, the preservation of exclusively administrative functions for USPA and the absence of private traction on port railway infrastructure narrowed the space for price competition and intersectoral optimization of logistics chains.

2. The full-scale aggression of the Russian Federation in 2022 had a dual effect on the processes of adapting the pricing policy of UZ and USPA to market conditions. On the one hand, the urgent need for state support for critical transportation areas led to a temporary departure from market pricing principles and the dominance of «manual» anti-crisis tariff management. This led to a deepening of the unprofitability of UZ freight transportation (a 20% drop in revenues with a 35% increase in cost) and a sharp reduction in USPA capital investments (by 70% compared to the pre-war level). On the other hand, large-scale destruction of infrastructure and blockade of key ports highlighted the criticality of accelerated liberalization of the railway transportation market and the transition of USPA to the «landlord port» model. In particular, the adoption of the laws «On Railway Transport» (2022) and «On Multimodal Transportation» (2022) lays the legal foundations for a full-fledged separation of the infrastructure operator and the carrier, as well as for the development of port logistics infrastructure on the basis of public-private partnership. These steps are extremely important for attracting private investment in the renewal of rolling stock and the development of «dry ports» on the western border, without which full integration into the EU transport system is impossible.

3. World experience shows that corporatization of transport enterprises is a necessary but not sufficient condition for improving the efficiency and quality of transport services. Its final effects critically depend on

the consistency and coherence of market reforms, the quality of institutions and regulation, the investment climate and long-term political consensus on the goals and mechanisms of transformations. This has important methodological implications for the analysis and forecasting of the consequences of corporatization of UZ and USPA. Firstly, it is incorrect to consider corporatization as an isolated process – instead, it is necessary to study it in combination with other reforms (deregulation of tariffs, admission of private traction, concession of terminals, etc.) and taking into account the institutional context. Secondly, for an objective assessment of the effects of corporatization, it is necessary to apply multidimensional success criteria that take into account not only financial indicators and productivity of enterprises, but also indicators of service quality, safety, environmental friendliness, accessibility for different consumer groups, etc. Thirdly, forecasting the consequences of corporatization should be based on realistic behavioral models of key stakeholders (management, trade unions, regulators, investors, etc.) and take into account possible conflicts of their interests and motivations. Only such a comprehensive and interdisciplinary approach will allow the development of scientifically sound recommendations on optimal corporatization strategies for UZ and USPA in the interests of society and the economy.

4. The developed game-theoretic model for analyzing corporatization strategies of UZ and USPA is an integrative tool that combines mathematical formalization and strategic forecasting to assess the interaction of key players in the process of reforming state corporations. The model is based on the concept of a dynamic game with several players – government, enterprise management, independent regulator, consumers and private operators – which allows taking into account both internal decisions and the influence of external factors such as military conflict and inflation. A key advantage of the model is the ability to calculate optimal strategies for each player in terms of maximizing aggregate social welfare under various scenarios. It details the impact of exogenous variables on financial and operational indicators such as traffic volumes, investment activity, real income and debt burden. Using the model allows determining threshold values of key parameters to ensure the sustainability of reforms and long-term efficiency. In addition, the interactive format of the model with its scenario analysis and graphical visualization makes it suitable for operational decision-making and

communication between stakeholders. Thus, this model is an innovative tool for supporting the economic development of Ukraine, providing a platform for coordinating strategies and minimizing risks in conditions of high uncertainty.

5. This game-theoretic model of corporatization carried out in the article is important for «balancing» commercial and public interests in practice, especially now – during the war and high social tension in Ukraine so far. It shows that the optimal strategy for the government is to create incentives for hired top management of state-owned enterprises to increase operational efficiency, attract private investment and improve the quality of services, while maintaining state control over strategic infrastructure. The model also helps the regulator set scientifically based targets for safety, quality, environmental friendliness and determine the boundaries of the tariff corridor to ensure self-sufficiency without excessive burden on consumers. In wartime conditions, the application of the model minimizes the risks of wrong decisions, allowing testing new mechanisms for attracting investments for the reconstruction of infrastructure. Therefore, this model is an effective tool for decision-makers to choose optimal corporatization strategies in the interests of the whole society.

6. Successful implementation of the «infrastructure holding» models on the railway and «landlord port» in ports requires synchronization of efforts of many stakeholders: authorities, management, trade unions, business, investors, experts. The key prerequisites are: (1) shaping a long-term vision for the development of industries in the context of European integration; (2) political consensus on the irreversibility of reforms and equal rules of the game; (3) strengthening the institutional capacity and independence of regulators; (4) transparent mechanisms for the distribution of benefits from reforms to reduce resistance to change; (5) active communication with the public about the expected effects. Only through systemic efforts and compromises will Ukraine be able to turn railways and ports into drivers of economic development, despite the challenges of war. The application of the game-theoretic model lays the foundation for the development of optimal and socially legitimate strategies for achieving this goal.

Further research in this direction may focus on the development of innovative models of state enterprise management that take into account the specifics of the post-war economy of Ukraine, in particular the need to increase

socio-economic efficiency and adaptability to rapid changes. Particular emphasis should be placed on the integration of digital platforms to ensure transparency, increase citizen engagement and optimize the use of state

assets. Such studies can become the basis for creating a new strategy for economic recovery that will harmoniously combine national interests, international support and modern technologies.

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Ігор Володимирович Дунаєв,

доктор наук з державного управління, професор, Харківський національний університет імені В. Н. Каразіна, майдан Свободи, 4, Харків, 61022, Україна
i.dunaev@karazin.ua
<https://orcid.org/0000-0002-0790-0496>

ЦІНИ, РИНКИ, КОРПОРАТИЗАЦІЯ: ТЕОРЕТИКО-ІГРОВЕ МОДЕЛЮВАННЯ СТРАТЕГІЙ КОРПОРАТИЗОВАНИХ ДЕРЖАВНИХ ПІДПРИЄМСТВ ТРАНСПОРТНОЇ ГАЛУЗІ УКРАЇНИ

Стаття присвячена актуальній проблемі корпоратизації державних підприємств транспортної галузі України, зокрема «Укрзалізниця» (УЗ) та Адміністрації морських портів України (АМПУ), в контексті їх адаптації до нових глобальних викликів та післявоєнного відновлення економіки. На основі аналізу сучасної наукової літератури обґрунтовано доцільність застосування інструментарію теорії ігор для моделювання стратегічних взаємодій між ключовими стейкхолдерами (урядом, менеджментом підприємств, регуляторами, інвесторами та споживачами) в процесі корпоратизації. Мета дослідження полягає в оцінці потенційних наслідків завершення корпоратизації УЗ і АМПУ для корпоративних цінових політик, ринкової ефективності та суспільного добробуту з використан-

ням засобів теоретико-ігрового моделювання та порівняльного аналізу. Методологія дослідження поєднує методи описової статистики, систематичного огляду літератури, кейс-стаді, теоретико-ігрового моделювання та сценарного аналізу. Розроблена теоретико-ігрова модель дозволяє формалізувати стратегічні взаємодії між гравцями, оцінити вплив різних сценаріїв корпоратизації на ключові показники ефективності та сформулювати рекомендації щодо оптимізації цінових стратегій УЗ і АМПУ для балансу комерційних і суспільних інтересів. Обґрунтовано, що перехід до моделей «інфраструктурного холдингу» на залізниці та «порт-лендлорд» в портах є оптимальним форматом корпоратизації УЗ та АМПУ, який дозволить залучити приватні інвестиції, підвищити ефективність та якість послуг при збереженні стратегічного контролю держави над інфраструктурою. Наголошено на необхідності синхронізації корпоратизації з реформуванням системи регулювання, тарифної політики та розвитком конкуренції на ринках транспортних послуг. Результати дослідження мають практичну цінність для вироблення державної політики щодо використання результатів корпоратизації транспортної інфраструктури та забезпечення сталого розвитку залізничної та портової галузей України після війни.

Ключові слова: корпоратизація, транспортна інфраструктура, Укрзалізниця, морські порти, цінова політика, теорія ігор, ринкова ефективність, суспільний добробут, ціноутворення.

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