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WARTIME BUSINESS RELOCATION INTENTIONS AND ADAPTIVE CAPACITY IN UKRAINE: EVIDENCE FROM MULTINOMIAL LOGIT AND LATENT CLASS ANALYSIS

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ABSTRACT. Russia's full-scale invasion has transformed the spatial, infrastructural and financial conditions of Ukrainian business activity, making wartime relocation and adaptive capacity critical issues for economic resilience. This study aims to examine how Ukrainian businesses respond to wartime disruption by identifying the determinants of domestic and international relocation intentions and the latent profiles of business vulnerability and adaptation. The empirical analysis is based on survey data from 606 Ukrainian business representatives. It applies multinomial logit modelling to a complete-case sample of 505 observations, together with latent class analysis using 22 binary indicators. The results show that relocation intentions are heterogeneous: 31.7% of respondents reported no relocation intention, 28.7% had not considered relocation, 21.6% considered relocation within Ukraine and 18.0% considered relocation abroad. Domestic relocation is associated with credit risk (RRR = 1.570), logistics disruption (RRR = 2.277), import decline (RRR = 3.498) and reliance on own funds (RRR = 2.101). Foreign relocation is associated with business severity (RRR = 1.599), import decline (RRR = 4.224) and foreign cooperation, as the absence of foreign cooperation reduces the likelihood of relocation abroad (RRR = 0.343). Latent class analysis identifies two profiles: constrained non-investing firms (39.4%) and active adaptive vulnerable firms (60.6%), which differ significantly in relocation attitudes, $\chi^2(3) = 12.83$, $p = 0.005$, Cramer's $V = 0.146$.

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Introduction

Russia's full-scale invasion has profoundly transformed the spatial, infrastructural and financial conditions under which Ukrainian businesses operate. The scale and multidimensional character of this disruption, therefore, determine the relevance of researching wartime business relocation intentions and adaptive capacity. According to the Fifth Rapid Damage and Needs Assessment, the war has generated extensive damage and recovery needs across the Ukrainian economy, with reconstruction and recovery needs estimated at hundreds of billions of US dollars over the coming decade (World Bank, 2026). These losses are not limited to physical destruction. They also concern the disruption of key economic systems, including energy, transport, commerce, industry, agriculture and other sectors that shape firms' ability to continue operations, preserve employment, maintain supply chains and access domestic and foreign markets. These findings are consistent with IMF assessments, which emphasise that Ukraine's economy remains resilient but continues to face severe constraints from labour-market strains, energy infrastructure damage and exceptionally high uncertainty (International Monetary Fund, 2025). In this context, business relocation cannot be understood only as a geographical decision. It represents a socio-economic response to destroyed infrastructure, disrupted logistics, damaged energy systems, market uncertainty and changing wartime security conditions.

The macroeconomic context further reinforces the importance of this topic. IMF assessments show that Ukraine has preserved overall macroeconomic and financial stability under extremely difficult wartime conditions. However, the economy continues to face severe constraints arising from labour-market strains, damage to energy infrastructure, supply shocks, large external financing needs, and exceptionally high uncertainty (International Monetary Fund, 2025, 2026). The OECD similarly emphasises that Ukraine's resilience has been supported by the adaptation of firms, workers and public institutions. At the same time, recovery remains constrained by regional heterogeneity, attacks on electricity infrastructure, relocation challenges and labour-market pressures (OECD, 2025). Firm-level evidence also shows that the war has affected businesses unevenly, increasing uncertainty about future sales, investment, hiring and operational continuity (Avdeenko et al., 2024). These conditions suggest that firms differ not only in the degree of wartime disruption they experience but also in their ability to transform disruption into adaptive strategies.

Business relocation under wartime conditions is therefore a differentiated behavioural and organisational response rather than a uniform reaction to crisis. Some firms may remain operational through local restructuring, internal relocation, digitalisation, new sales channels or reliance on their own funds. Others may consider relocation abroad when disruption becomes more severe and when foreign cooperation provides access to external markets, partners, institutions or operational networks. This distinction is important because domestic and international relocation may be driven by different forms of pressure and different types of adaptive capacity. Domestic relocation may be associated with logistics disruptions, credit pressure, import declines, and the availability of internal financial resources, while relocation abroad may be more closely associated with severe business damage, disrupted international supply channels, and existing cross-border linkages.

The policy relevance of this issue is also substantial. Ukraine's reconstruction strategy increasingly depends on mobilising private investment and strengthening the resilience of

businesses of different sizes. The European Commission's Ukraine Facility provides a strategic framework for recovery, reconstruction and modernisation during 2024–2027, while the Ukraine Investment Framework aims to mobilise public and private investment for Ukraine's recovery and reconstruction (European Commission, 2026a, 2026b). This priority is consistent with the World Bank's RDNA5 assessment, which emphasises the potential contribution of private-sector participation to Ukraine's recovery if appropriate reforms, risk-sharing mechanisms and investment conditions are put in place (World Bank, 2026). The OECD (2025) also stresses that Ukraine's recovery requires stronger private investment, productivity growth, export development, and improved access to finance, particularly because the war has increased the private sector's financing needs. Effective recovery policy, therefore, requires a clearer understanding of which firms are constrained, which firms are actively adapting and which forms of disruption are associated with domestic or international relocation intentions.

1. Literature review

The scientific landscape on wartime business relocation and adaptive capacity begins with the broader understanding of war as a systemic socio-economic shock that reshapes markets, institutions, communities and individual decision-making. The Russian–Ukrainian war is increasingly conceptualised not only as a military conflict but also as a complex social situation that transforms economic expectations, institutional trust, migration behaviour and the functioning of local communities (Slyusarevskyy & Chunikhina, 2025; Zozulinskyy, 2024). The macroeconomic consequences of the war have been reflected in disrupted growth trajectories, weakened market predictability and increased pressure on business planning, investment and employment decisions (Dobrovolska et al., 2024; Tsymbal & Demediuk, 2025). War-related shocks also spread through sectoral linkages, including energy, agriculture, financial markets, real estate, transport and technology-intensive industries, which confirms that firm-level adaptation is embedded in a broader system of market volatility and infrastructural vulnerability (Dobrovolska & Fenenko, 2024; Jareño et al., 2025; Panazan & Gheorghe, 2026). This literature indicates that business relocation intentions should be analysed as part of a wider wartime reorganisation of economic space, rather than as an isolated managerial decision.

A second research stream concerns migration, displacement and relocation as socio-economic responses to insecurity and institutional disruption. International labour migration and refugee flows affect both sending and receiving economies by changing labour supply, entrepreneurial activity, social integration and product-market conditions (Junejo et al., 2024; Kuzior et al., 2020; Chugaievskaya et al., 2026). Ukrainian migration has also generated specific forms of cross-border economic adaptation, including refugee entrepreneurship, migrant business integration and the mobilisation of transnational networks (Andrejuk, 2019; De Coninck, 2022; Gawel et al., 2026). More recent evidence shows that forced displacement creates not only vulnerability but also new forms of entrepreneurial intention, social participation and business ecosystem integration, especially when migrants possess social capital, host-country knowledge or supportive networks (Elo et al., 2025; Zgura et al., 2025). For Ukraine, integrating internally displaced persons, ex-combatants, and host communities has become a major policy challenge, requiring social protection, conflict management, and targeted financing mechanisms (Mishchuk et al., 2024; Bilan et al., 2025; Yurchyk et al., 2025). Social tensions between internally displaced persons and host communities also require targeted policy attention (Oliinyk et al., 2025). These studies are important for the present research because business relocation intentions may reflect both organisational adaptation and the wider social logic of displacement, mobility and reintegration.

The entrepreneurship literature provides another foundation for analysing why some firms remain passive under crisis while others develop adaptive strategies. Wartime and extreme conditions may stimulate entrepreneurial behaviour when uncertainty is combined with perceived necessity, opportunity recognition, resilience, patriotism or social responsibility (Rugina & Klyver, 2025; Elo et al., 2025). Entrepreneurial success under instability depends not only on individual motivation but also on social capital, psychological capital, managerial capability and access to supportive ecosystems (Bayoumy et al., 2025; Elshaer et al., 2024; Iwara, 2025). Social entrepreneurship and solidarity-economy approaches are especially relevant in wartime contexts because firms may combine economic survival with social support, community resilience and security-oriented functions (Kuzior et al., 2023; Hossen et al., 2026; Verkhovod et al., 2025). Business-model competitiveness is also increasingly interpreted through social components, stakeholder relationships and adaptive management rather than through financial indicators alone (Iershova et al., 2025). This stream suggests that adaptive capacity is multidimensional: it includes not only financial resources but also networks, leadership, social embeddedness and the ability to reconfigure business activity under uncertainty.

A more directly related group of studies examines Ukrainian business adaptation, relocation practices and operational shocks during the war. Evidence on displaced Ukrainian businesses shows that firms face heterogeneous barriers, including the loss of assets, market disruption, staff displacement, logistical problems, financing shortages, and uncertainty about future demand (Polishchuk et al., 2024). Risk profiling and adaptive relocation practices further indicate that relocation is not a homogeneous response; firms differ in the degree to which they perceive relocation as a survival strategy, a growth opportunity or an unavoidable consequence of operational disruption (Polishchuk et al., 2025a). The analysis of business shocks under extreme conditions confirms that adaptation depends on the interaction between external disruption and internal capacity, including financial reserves, managerial flexibility, operational restructuring and digital tools (Sitnicka & Serhiienko, 2025). Studies of financial recovery, budgetary support and sector-specific performance show that wartime resilience also depends on access to financing instruments, sectoral stability and state or donor support programmes (Sarbasova et al., 2025; Zajac et al., 2025). This literature supports the assumption that domestic and international relocation should not be treated as a single category, because different forms of disruption may yield distinct relocation-related intentions.

Digitalisation, institutional quality and governance form an additional layer of adaptive capacity. Digital transformation, Industry 4.0, and human resource management are increasingly recognised as mechanisms that help organisations respond to uncertainty through flexible work practices, digital communication, process redesign, and technological upgrading (Eger & Žižka, 2024; Martinez et al., 2025). In Ukraine's wartime context, e-government, GovTech, and digital government development are linked to institutional resilience, business transaction costs, public revenue capacity, human well-being, and post-war recovery (Kuzior et al., 2026; Lyeonov et al., 2026a; Lyeonov et al., 2026b). Human-centred mechanisms of digital government are also relevant for quality of life and recovery capacity (Vasylieva et al., 2026). Digital maturity and institutional trust may also mediate the transformation of technological capacity into post-war infrastructure recovery, while digital remittances and cyber-risk management reveal both the opportunities and vulnerabilities of digital adaptation during crisis (Topazly et al., 2026; Polishchuk et al., 2025b; Yarovenko et al., 2024). Human capital, retraining, and lifelong learning are equally important because labour shortages, skills mismatches, and demographic shifts influence whether firms can maintain operations, relocate, digitalise, or redesign business models (Nexhipi et al., 2025; Yeremenko, 2026; Petrenko et al.,

2026). This evidence indicates that adaptive capacity should be conceptualised not only as financial readiness but also as technological, institutional, and human resource readiness.

The socio-economic resilience literature also emphasises the role of public administration, social protection, community stress and demographic change in shaping the environment in which firms operate. Wartime governance requires motivated public servants, effective support systems and institutional capacity to manage uncertainty, displacement and recovery processes (Podolchak et al., 2025; Roshchyk et al., 2025). Urban resilience, humanitarian crisis management, and local social-stress modelling show that relocation decisions are influenced by the resilience of places, infrastructure, and communities, rather than by the characteristics of individual firms (Badea et al., 2025; Saadi et al., 2023; Stadniichuk, 2025). Demographic transformation, migration, shifts in public health and well-being, and changes in labour availability, consumer demand, and regional recovery potential affect business continuity and relocation decisions (Ginevičius et al., 2025; Martyniuk et al., 2025; Zahorodnia et al., 2026). Social capital and e-commerce development further show that firms embedded in stronger networks and digital market channels may be better positioned to adapt to crisis-related spatial and market disruptions (Roszko-Wójtowicz et al., 2025). These studies broaden the analytical frame by showing that firm relocation and adaptation are shaped by the interaction between business-level resources and the resilience of the surrounding institutional, demographic and community environment.

Previous research has made important contributions to understanding war-related migration, entrepreneurship, business resilience, digital adaptation, social protection and institutional recovery. However, the existing literature still provides limited evidence on how different types of wartime disruption are associated with distinct relocation intentions and how firms can be grouped into latent profiles of vulnerability and adaptation. This creates a methodological and substantive gap: relocation is often discussed as part of displacement, business survival or crisis management, but it is less often modelled as a differentiated choice between non-relocation, indecision, domestic relocation and relocation abroad. The present study addresses this gap by combining multinomial logit modelling with latent class analysis to examine both the determinants of relocation intentions and the hidden profiles of Ukrainian businesses under wartime conditions. Such an approach allows wartime business relocation to be understood as a socio-economic adaptation process shaped by disruption type, resource availability, external linkages and broader adaptive capacity.

This study aims to investigate the socio-economic mechanisms through which Ukrainian businesses respond to wartime disruption, with particular attention to the determinants of domestic and international relocation intentions and the formation of latent profiles of business vulnerability and adaptive capacity.

2. Methodological approach

This study examines how Ukrainian businesses respond to wartime disruption through relocation intentions and adaptive strategies. The empirical design is based on a cross-sectional survey of business representatives. The survey captured information on wartime risks, infrastructure constraints, investment intentions, financing sources, future recovery strategies, firm characteristics and relocation-related attitudes. The analytical framework was structured around two hypotheses. The first hypothesis assumes that business relocation intentions during wartime differ according to the type of disruption: domestic relocation is mainly associated with credit pressure, logistics disruption, import decline and own funds, whereas foreign relocation is mainly associated with business severity, import decline and international cooperation. The second hypothesis assumes that Ukrainian businesses under wartime

conditions form distinct latent profiles of vulnerability and adaptation, and that these profiles differ in their relocation-related attitudes, especially in the balance between indecision and domestic relocation.

2.1. Data collection and questionnaire development

The survey instrument was developed to assess the challenges, adaptation strategies, investment intentions, international cooperation and relocation-related attitudes of Ukrainian businesses operating under wartime conditions. The survey was designed and administered within the framework of the research project Displaced Business in the Revitalisation of Regional Ecosystems (state registration number 0123U100357), conducted by a research team from Kyiv National Economic University named after Vadym Hetman (KNEU). The questionnaire was developed by the project researchers and underwent expert review by the KNEU Commission of Ethics. The Commission evaluated the relevance of the research design, the appropriateness of the survey instrument and its compliance with academic and ethical standards before the launch of data collection.

The questionnaire design was informed by the literature on business resilience, enterprise relocation, crisis management and post-war economic recovery, while also considering the specific realities faced by Ukrainian enterprises during the ongoing war. The survey questionnaire is available in Zenodo as a supporting research instrument (Polishchuk, 2026).

The questionnaire consisted of 25 questions grouped into six thematic dimensions. The first block examined the current state of business activity, including losses and operational disruptions. The second block focused on risk assessment and business resilience, covering financial, operational, security, personnel, legal and cybersecurity risks, as well as preparedness for potential crisis scenarios. The third block explored infrastructure needs, investment priorities and sources of financing for business development. The fourth block investigated international cooperation, including changes in export and import activities, the role of Ukrainians abroad in facilitating international business relations, and perceived opportunities and barriers to cooperation with European Union partners. A separate section was devoted to business relocation intentions, motivations, barriers and destination preferences. The final block examined attitudes towards relocated enterprises, their impact on local markets, collaboration practices and policy support mechanisms, while the closing questions collected information about enterprise size and sector.

Most questions used closed-ended response categories, while several open-ended questions were included to capture respondents' views on international cooperation and policy recommendations. The questionnaire combined single-choice and multiple-choice items, allowing respondents to provide a more comprehensive assessment of the challenges and opportunities facing their businesses.

Data collection was conducted between January and February 2025 using the SunFlowerSociology digital survey platform. The platform enabled rapid deployment of the questionnaire and facilitated the recruitment of respondents who met the study criteria. Invitations were distributed directly through popular messaging applications, including WhatsApp and Telegram, allowing participants to complete the survey at a convenient time during the fieldwork period.

Before the main survey, a pilot study was conducted with 15 Ukrainian enterprises representing different sectors of the economy. The purpose of the pilot phase was to evaluate the clarity, relevance and completeness of the questionnaire. Participants generally confirmed that the survey adequately reflected the key challenges faced by businesses under wartime

conditions, including security risks, operational disruptions, investment constraints, international cooperation and business relocation decisions. The feedback received mainly concerned minor wording adjustments, clarification of several response options and improvements to the logical sequence of questions. Based on these recommendations, several refinements were introduced before the full-scale survey was launched. The pilot study supported the content validity and practical applicability of the questionnaire.

To ensure data quality, completed questionnaires underwent consistency and logical coherence checks before inclusion in the final dataset. This procedure helped identify incomplete or contradictory responses and enhanced the reliability of the collected information.

The survey covered all regions of Ukraine except the temporarily occupied territories. A total of 606 business representatives participated in the study. Given the large population of registered business entities in Ukraine at the time of the survey, the achieved sample size provides a sufficient empirical basis for identifying major patterns, challenges, and opportunities within the Ukrainian business environment. At the same time, the sample is not intended to provide precise population estimates. Rather, it supports meaningful analysis of business adaptation patterns and relocation-related decision-making under wartime conditions.

2.2. Dataset and variables

The original dataset contained 606 observations. For the multinomial logit model, a complete-case sample of 505 observations was used because the model included a broader set of explanatory and control variables. For the latent class analysis, all 606 observations were retained because the 22 selected manifest indicators were fully binary-coded. The reference categories were frontline-region firms, micro firms with 0–9 employees, respondents aged 35–55 years, female respondents, and firms operating in trade, including wholesale and retail trade. The difference in sample size between the two empirical blocks is therefore due to differences in the models' variable requirements rather than to a change in the population of interest.

The dependent variable in the first empirical block was business relocation intention. It was operationalised as a categorical variable with four outcomes: no relocation intention, relocation not yet considered, relocation within Ukraine, and relocation abroad. The category “no relocation intention” was used as the reference outcome. This specification enables comparison of three alternative relocation-related positions against the baseline of non-relocation. The use of a multinomial rather than a binary model is justified because domestic and foreign relocation represent different strategic responses to wartime uncertainty and should not be collapsed into a single relocation category.

The main explanatory variables for the relocation model were selected to capture different types of wartime disruption and adaptive capacity. Business severity was included as an ordinal indicator of the extent of wartime business deterioration. Credit risk was included as an indicator of debt and repayment pressure. Several binary risk variables captured whether respondents reported financial, operational, security, staff-related, electricity-related, logistics-related or demand-related risks. International exposure was reflected in indicators of foreign cooperation, export growth, and import decline. The use of own funds, grants and bank credit represented financing capacity. The model also controlled for region, firm size, industry, age group and gender.

2.3. Empirical strategy and software

The first hypothesis was tested using a multinomial logit model estimated by maximum likelihood. The model estimates the relative log-odds of belonging to each relocation-related

category compared with the reference category of no relocation intention. The general form of the model can be expressed as:

$$\ln(P(Y_i = j)/P(Y_i = 0)) = \alpha_j + \beta_j X_i + \gamma_j Z_i + \varepsilon_{ij}$$

where Y_i denotes the relocation outcome for business i , and j denotes one of the non-reference categories, $Y_i = 0$ denotes no relocation intention, X_i is the vector of wartime disruption and financing variables, and Z_i is the vector of control variables. The estimated coefficients were transformed into relative risk ratios using $RRR = \exp(\beta)$. Relative risk ratios above 1 indicate an increase in the relative likelihood of a given relocation outcome compared with no relocation intention, while values below 1 indicate a decrease.

Before estimating the final multinomial logit model, categorical variables were checked for unused factor levels and sparse categories. One unused sectoral level was detected in the preliminary model, producing a non-computable standard error. To correct this, unused factor levels were removed from the complete-case estimation sample before the final model was re-estimated. The final specification converged successfully and did not contain non-finite, missing or zero standard errors. Sectoral variables were retained as controls, but sectoral coefficients were interpreted cautiously because several industry categories showed signs of sparse-cell estimation and quasi-complete separation.

The second empirical block used latent class analysis to identify unobserved profiles of wartime business vulnerability and adaptation. LCA was selected because the survey included multiple binary indicators of risks, infrastructure needs, investments, financing sources, and future strategies. Unlike standard clustering, LCA is a model-based classification method that estimates the probability of belonging to unobserved groups based on patterns in categorical manifest variables. This approach is appropriate when the objective is to identify hidden profiles that cannot be directly observed from a single survey question.

The LCA model used 22 binary manifest indicators. These covered seven groups of business characteristics: wartime risks, infrastructure needs, investment intentions, absence of investment plans, financing sources, recovery strategies and future relocation-related actions. Each indicator was coded as a two-level factor, with value 1 indicating the absence of the characteristic and value 2 indicating its presence. The model, therefore, estimated the conditional probability that businesses in each latent class reported each characteristic.

Latent class models with two to six classes were estimated. Each model was estimated using multiple random starts to reduce the risk of convergence to a local maximum. The optimal number of classes was selected using model fit indices, primarily the Bayesian Information Criterion, supported by the Akaike Information Criterion and substantive interpretability. Although AIC favoured the six-class solution, BIC favoured the two-class solution. Since BIC applies a stronger penalty for model complexity and the research aim was to identify robust and interpretable profiles, the two-class solution was selected as the preferred baseline model.

The general LCA model can be expressed as:

$$P(Y_i = y_i) = \sum_{c=1}^C \pi_c \prod_{m=1}^M P(Y_{im} = y_{im} | C_i = c)$$

where C is the number of latent classes, π_c is the probability of membership in class c , M is the number of manifest indicators, and $P(Y_{im} = y_{im} | C_i = c)$ is the conditional item-response probability for indicator m in class c . The interpretation of the classes was based on the estimated conditional probabilities of indicator presence.

After estimating the two-class model, each respondent was assigned to the latent class with the highest posterior probability. These predicted class memberships were used to compare relocation intentions across the two latent profiles. The association between latent class membership and relocation intention was assessed using a cross-tabulation and Pearson's chi-

square test. Cramer's V was used as an effect-size measure. This post-classification analysis allowed the study to determine whether the identified profiles differed not only in risk and adaptation patterns but also in relocation-related attitudes.

All calculations were conducted in RStudio using R version 4.4.0 (2024-04-24 ucrt), "Puppy Cup". The multinomial logit model was estimated using the `multinom()` function from the `nnet` package, while latent class analysis was performed using the `poLCA` package. Data preparation, recoding and tabulation were carried out using functions from the `dplyr` and related tidyverse packages. The results were reported as relative risk ratios for the multinomial logit model and as conditional item-response probabilities for the latent class model. Because the study is based on cross-sectional survey data, the results are interpreted as statistical associations rather than causal effects.

3. Conducting research and results

3.1. Multinomial logit results for business relocation intentions

The first empirical block tests H1 by examining whether different wartime constraints are associated with different types of relocation intention.

A multinomial logit model was estimated to identify factors associated with business relocation intentions during wartime. The dependent variable distinguishes between four relocation categories: no relocation intention, relocation not yet considered, relocation within Ukraine, and relocation abroad. The category "no relocation intention" was used as the reference outcome. Therefore, the coefficients and relative risk ratios reported in the tables show how each explanatory variable changes the relative likelihood of belonging to one of the three alternative categories compared with the non-relocation category.

The final model was estimated on a complete-case sample of 505 observations. The model converged successfully, with a residual deviance of 1125.727 and an AIC of 1353.727. Before the final estimation, unused factor levels were removed from the estimation sample, which eliminated the non-computable standard error observed in the preliminary specification. The final model, therefore, did not contain non-finite, missing or zero standard errors. The main model characteristics are presented in *Table A1, Appendix A*.

The distribution of the dependent variable demonstrates that relocation intentions are heterogeneous rather than concentrated in a single dominant category. In the estimation sample, 31.7% of respondents reported no relocation intention, 28.7% had not considered relocation, 21.6% considered relocation within Ukraine, and 18.0% considered relocation abroad. This structure justifies using a multinomial model rather than a binary specification, as domestic and foreign relocation represent distinct strategic responses to wartime uncertainty (*Table 1*).

Table 1. Distribution of relocation intentions in the estimation sample

Relocation category	Number of observations	Share of sample, %
No relocation intention	160	31.7
Relocation not considered	145	28.7
Domestic relocation	109	21.6
Relocation abroad	91	18.0
Total	505	100.0

Notes: *The table reports relative risk ratios, calculated as $\exp(\beta)$. The reference outcome is "no relocation intention". *** $p < .01$; ** $p < .05$; * $p < .10$.*

The results show that business severity is relevant mainly for foreign relocation. A one-unit increase in business severity increases the relative risk of considering relocation abroad by approximately 59.9% compared with reporting no relocation intention. This effect is statistically significant at the 1% level. However, business severity is not significantly associated with domestic relocation or with the “not considered” category. This suggests that more severe wartime business damage does not automatically increase all types of relocation intention; rather, it is specifically associated with the more radical option of moving abroad (*Table 2*).

Credit risk has a different pattern. It is positively and significantly associated with domestic relocation, increasing the relative likelihood of considering relocation within Ukraine by approximately 57.0%. However, credit risk is not significant for foreign relocation. This indicates that debt pressure and repayment difficulties may push businesses towards internal spatial adjustment, while not necessarily creating sufficient capacity or strategic orientation for cross-border relocation. In other words, domestic relocation appears to be a more feasible adaptation response for firms facing financial pressure. In contrast, international relocation is more strongly connected with business damage and external linkages (*Table 2*).

Among operational risks, logistics disruptions are the strongest predictors of domestic relocation. Businesses reporting logistics-related risks are approximately 2.28 times more likely to consider relocation within Ukraine than to report no relocation intention. This result is statistically significant at the 5% level. The finding suggests that domestic relocation may serve as a practical response to disrupted supply chains, transport instability, limited market access, or infrastructure bottlenecks. By contrast, logistics risk is not statistically significant for foreign relocation, which indicates that international relocation is not simply an extension of domestic logistics adaptation but a distinct strategic decision (*Table 2*).

Electricity-related risk shows a negative, statistically significant association with the “not considered” and “relocation abroad” outcomes. Firms reporting electricity-related disruption are approximately 48.1% less likely to be in the “not considered” category and approximately 54.5% less likely to consider relocation abroad than to report no relocation intention. This should not be interpreted as evidence that electricity problems protect firms from relocation. A more cautious interpretation is that electricity disruption represents a widespread operational constraint that may be addressed through local adaptation, backup power solutions or temporary operational restructuring rather than through foreign relocation. The negative association with the “not considered” category also suggests that energy disruption may force firms to adopt a more definite position, either towards adaptation or towards rejection of relocation (*Table 2*).

Demand decline is negatively associated with the “not considered” outcome and marginally negatively associated with domestic relocation. Firms reporting a fall in demand are less likely to remain undecided and, at the 10% significance level, are also less likely to consider relocation within Ukraine. This may indicate that demand reduction constrains the resources required for relocation, especially domestic relocation, which often depends on immediate financial and organisational capacity. Unlike import disruption, a demand decline does not appear to generate a clear relocation impulse; rather, it may reduce the firm’s ability to implement spatial adjustment (*Table 2*).

International exposure is one of the most important dimensions that differentiates domestic and foreign relocations. Firms without foreign cooperation are significantly more likely to remain in the “not considered” category and marginally more likely to consider domestic relocation. However, the absence of foreign cooperation significantly reduces the likelihood of considering relocation abroad. The relative risk ratio for foreign relocation is 0.343, meaning that firms without foreign cooperation are approximately 65.7% less likely to

consider relocation abroad than firms with some form of foreign cooperation. This finding indicates that international cooperation may act as an enabling condition for cross-border relocation by providing contacts, market access, operational knowledge or institutional familiarity (*Table 2*).

Import decline is the strongest positive predictor of relocation intentions among the core explanatory variables. Businesses reporting a decrease in imports are approximately 3.50 times more likely to consider domestic relocation and approximately 4.22 times more likely to consider relocation abroad than to reject relocation. This result is statistically significant in both cases. The finding suggests that disrupted import channels may create strong pressure for spatial restructuring, either within Ukraine or abroad. Compared with general financial or operational risk indicators, import decline appears to capture a more concrete disruption of business continuity and supply-chain functioning (*Table 2*).

Own funds are positively associated only with domestic relocation. Firms relying on their own funds are approximately 2.10 times more likely to consider relocation within Ukraine than to report no relocation intention. This indicates that domestic relocation is partly resource-dependent and may require immediately available internal financing. Grants and bank credit are not statistically significant predictors of relocation intentions in the final model. This may suggest that external financial instruments are either not sufficiently accessible, not directly connected with relocation planning, or not yet perceived by firms as a realistic basis for relocation decisions (*Table 2*).

Table 2. Core predictors of relocation intentions: relative risk ratios and significance

Predictor	Not considered vs no relocation	Domestic relocation vs no relocation	Relocation abroad vs no relocation
Business severity	1.050	1.014	1.599***
Credit risk	1.084	1.570***	1.068
Financial risk	1.370	1.784	1.192
Operational risk	1.371	1.295	1.131
Security risk	1.292	1.588	1.079
Staff risk	1.068	1.049	1.450
Electricity risk	0.519**	0.763	0.455**
Logistics risk	1.594	2.277**	1.427
Demand drop	0.413**	0.400*	0.956
No foreign cooperation	2.065**	1.832*	0.343***
Export growth	0.390	2.211	0.854
Import decline	1.552	3.498***	4.224***
Own funds	0.661	2.101**	0.936
Grants	0.903	1.646	1.071
Bank credit	0.655	0.944	0.879

Notes: The table reports relative risk ratios. Sectoral effects are interpreted relative to firms operating in trade, including wholesale and retail trade. Sectoral results should be interpreted cautiously, as several categories exhibit signs of sparse-cell estimation and quasi-complete separation. In future robustness checks, detailed industry categories may be replaced with broader sectoral groups. *** $p < .01$; ** $p < .05$; * $p < .10$.

The control variables provide additional insight into the heterogeneity of relocation intentions. Rear-region firms are marginally less likely to consider domestic relocation than firms in the omitted regional category. In contrast, the regional effect is not significant for the “not considered” or foreign relocation outcomes. This suggests that regional location matters

primarily for domestic relocation, though the result should be interpreted in light of the omitted regional category used in the factor coding (Table 3).

Firm size effects are mostly statistically insignificant. Small and large firms do not differ significantly from the omitted firm-size category in their relocation intentions. Medium-sized firms are marginally more likely to consider relocation abroad, with a relative risk ratio of 2.897, but this effect is significant only at the 10% level. Therefore, firm size does not appear to be a central explanatory dimension once wartime risks, financial pressure, international exposure and sectoral controls are included (Table 3).

Age is more important than firm size. Respondents under 35 are significantly more likely to consider both domestic and foreign relocation than the reference age group. The relative risk ratio is 2.959 for domestic relocation and 3.359 for relocation abroad. This suggests that younger business representatives may be more mobile, more adaptive, more willing to restructure operations, or more open to relocation as a strategic option. By contrast, respondents over 55 are marginally less likely to consider domestic relocation. Gender is not statistically significant across the three outcome categories, indicating that male and female respondents do not differ systematically in relocation intentions after controlling for other factors (Table 3).

Table 3. Regional, firm-size and demographic controls

Predictor	Not considered vs no relocation	Domestic relocation vs no relocation	Relocation abroad vs no relocation
Rear region	1.072	0.562*	1.361
Small firm	1.118	1.608	1.098
Medium-sized firm	1.775	0.986	2.897*
Large firm	1.556	1.555	2.585
Age under 35 years	1.620	2.959***	3.359***
Age over 55 years	1.453	0.307*	0.650
Male respondent	0.996	0.746	1.684

Notes: The table reports relative risk ratios, calculated as $\exp(\beta)$. Effects are interpreted relative to the following reference categories: frontline-region firms, micro firms with 0–9 employees, respondents aged 35–55 years, female respondents, and firms operating in trade, including wholesale and retail trade. *** $p < .01$; ** $p < .05$; * $p < .10$.

Sectoral controls were included in the model to account for differences in industry conditions. However, several industry coefficients show extremely large positive or negative estimates combined with very small standard errors. This pattern is typical of sparse cells or quasi-complete separation in categorical models. For this reason, sectoral estimates should be treated as controls rather than central substantive findings. The only sectoral result that can be interpreted with relatively greater caution is the positive association between logistics and transport and the “not considered” category. Firms in logistics and transport are approximately 3.54 times more likely to be in the “not considered” category than to report no relocation intention. However, the broader sectoral pattern should not be overinterpreted without collapsing industries into larger groups and re-estimating the model (Table A2, Appendix A).

The results provide evidence that relocation intentions among Ukrainian businesses are shaped by specific wartime constraints rather than by general risk perceptions alone. Broad indicators such as financial, operational, security and staff-related risks are not statistically significant after controlling for other variables. In contrast, more concrete disruption channels, including credit pressure, logistics risk, import decline, electricity disruption, and the presence or absence of foreign cooperation, show clearer associations with relocation outcomes. This

suggests that relocation intentions are formed through practical constraints affecting business continuity, supply chains, infrastructure access and external embeddedness.

The model also confirms that domestic and foreign relocation should not be treated as a single type of behaviour. Domestic relocation is primarily associated with credit risk, logistics disruption, import decline, and reliance on own funds. This profile suggests a pragmatic adaptation strategy in which firms seek to preserve operations within Ukraine by moving closer to resources, infrastructure, markets or safer operating conditions. Foreign relocation, by contrast, is associated with greater business severity, import decline and the presence of foreign cooperation. This profile suggests that international relocation is more likely when firms experience more serious damage and possess cross-border linkages that make relocation abroad feasible.

The findings, therefore, support the argument that wartime relocation is a differentiated strategic response. Internal relocation appears to reflect operational and resource-based adaptation, whereas foreign relocation reflects a combination of severe business disruption and international embeddedness. The results also show that younger respondents are more open to both domestic and international relocation, which may reflect greater mobility, lower attachment to existing operating locations, or a stronger orientation towards flexible business models. However, the cross-sectional survey design does not allow causal conclusions. The findings should therefore be interpreted as associations between firm characteristics, wartime constraints and relocation intentions.

3.2. Latent class analysis of wartime business vulnerability and adaptive strategies

The second empirical block tests H2 by identifying latent profiles of wartime business vulnerability and adaptation, and then comparing these profiles based on relocation intention.

Latent class analysis was applied to identify unobserved profiles of businesses based on wartime risks, infrastructure constraints, investment intentions, sources of financing and future recovery strategies. The analytical dataset contained 606 observations and 22 binary manifest indicators. Each variable was coded as a two-level factor, with value 1 indicating the absence of the characteristic and value 2 indicating its presence. The structure of the dataset confirms that all selected indicators were suitable for latent class modelling, as they were categorical and consistently coded across the full sample. No observations were lost at this stage, as the frequency distribution for each manifest indicator sums to 606 cases. The general structure of the LCA dataset is presented in *Table B1, Appendix B*.

The descriptive distribution of the manifest indicators shows that the surveyed businesses experienced a highly uneven combination of risks and adaptation strategies. Financial risk was the most frequently reported general risk, affecting 75.9% of respondents, while electricity-related risk was also highly prevalent, affecting 63.9% of respondents. Security and staff-related risks were observed in approximately 46% of cases each. By contrast, logistics risk and demand decline were less frequent, reported by 21.8% and 10.9% of businesses, respectively. This indicates that the wartime business environment in the sample is dominated by financial and energy-related pressures rather than by demand contraction alone, as shown in *Table B2, Appendix B*.

Infrastructure-related needs also show a clear hierarchy. Energy infrastructure was the most frequently identified need, reported by 64.9% of respondents. This confirms the centrality of energy stability for business continuity under wartime conditions. Communication infrastructure was selected by 34.5% of respondents, while logistics infrastructure was selected by 27.9%. These results suggest that infrastructural vulnerability is not homogeneous: energy constraints form the dominant infrastructural problem, whereas transport and logistics

infrastructure concerns are more concentrated in a smaller group of firms (*Table B2, Appendix B*).

Investment and financing patterns reveal a more constrained adaptive capacity. Only 18.3% of businesses reported planned digitalisation investments, 13.9% planned energy-saving investments, 24.3% planned investment in new products, and 27.1% planned expansion into new markets. At the same time, 26.6% of respondents reported no investment plans. Financing is strongly concentrated on internal resources: 51.0% of businesses reported using their own funds, compared with 29.0% relying on grants and 25.7% on bank credit. This suggests that wartime adaptation is primarily internally financed, while external financial channels remain secondary (*Table B2, Appendix B*).

Future-oriented strategies show that 33.7% of respondents planned to develop new sales channels, 25.9% expected recovery-oriented actions, 21.1% referred to future grants or investors, and only 12.2% indicated future relocation. This confirms that relocation is not the dominant forward-looking strategy in the LCA dataset. Instead, businesses more often focus on restoring operations, diversifying sales channels, and seeking financial support. The descriptive structure, therefore, suggests that the latent classes are likely to differentiate businesses not only by the intensity of risk exposure but also by the type of adaptive response they pursue (*Table B2, Appendix B*).

To determine the optimal number of latent classes, models with two to six classes were estimated. As expected, the log-likelihood improved monotonically as the number of classes increased, from -7244.756 in the two-class model to -7034.373 in the six-class model. This improvement indicates that additional classes capture more heterogeneity in the observed response patterns. However, the log-likelihood alone cannot be used for model selection, because it always tends to improve as model complexity increases. Therefore, AIC and BIC were used to compare competing specifications (*Table 4*).

The AIC favours the six-class model, as it reaches the lowest value of 14342.75. This indicates that, from the perspective of in-sample fit, the most complex tested solution provides the best in-sample fit among the tested specifications. However, the BIC produces a different conclusion. The lowest BIC is observed for the two-class model, with a value of 14777.82. Since BIC imposes a stronger penalty for model complexity, this result indicates that the two-class solution offers the best balance between explanatory fit and parsimony. The three-class solution has the second-lowest BIC, but it is 12.30 points higher than that of the two-class model, providing meaningful evidence against choosing the more complex solution solely on statistical grounds (*Table 4*).

Table 4. Fit indices for latent class models

Number of classes	Estimated parameters	Log-likelihood	AIC	Δ AIC	BIC	Δ BIC
2	45	-7244.756	14579.51	236.76	14777.82	0.00
3	68	-7177.226	14490.45	147.70	14790.12	12.30
4	91	-7118.712	14419.42	76.67	14820.45	42.63
5	114	-7079.012	14386.02	43.27	14888.41	110.59
6	137	-7034.373	14342.75	0.00	14946.49	168.67

Notes: Δ AIC is calculated relative to the model with the lowest AIC. Δ BIC is calculated relative to the model with the lowest BIC. The number of estimated parameters is derived from the binary-indicator LCA structure: $k \times 22$ item-response probabilities plus $k - 1$ class-membership probabilities.

The divergence between AIC and BIC is substantively important. AIC suggests that the data contain complex heterogeneity that a larger number of classes can represent. BIC, however, indicates that this additional complexity may not be justified once the number of parameters is penalised more strictly. In an applied survey context with 22 binary indicators and 606 observations, the BIC-supported two-class solution should be treated as the preferred statistical baseline. The six-class model may capture more detailed empirical differences, but it also carries a higher risk of overfitting and may produce small or unstable classes.

The results, therefore, support a parsimonious interpretation of the latent structure. At this stage, the evidence indicates that the sample can be most robustly divided into two broad unobserved groups. Substantively, these groups are likely to reflect a contrast between businesses with stronger wartime vulnerability and adaptation needs and businesses with lower or more selective vulnerability. However, the precise naming of the classes should not be finalised solely on the basis of fit indices. The final interpretation of class labels requires the conditional item-response probabilities from the selected model, as these probabilities indicate which risks, infrastructure needs, investments, and future strategies are most characteristic of each latent class.

The LCA results indicate that the surveyed businesses do not form a homogeneous group. Their responses combine different patterns of financial pressure, energy vulnerability, infrastructure needs, investment intentions, financing constraints and future adaptation strategies. The descriptive results show that financial and electricity-related risks are the most widespread, while relocation and energy-saving investments are relatively less frequent. The model-selection results show that a two-class solution is the most defensible baseline according to BIC, although AIC indicates that more complex class structures may capture additional heterogeneity. Therefore, the two-class model is reported as the preferred parsimonious solution, while more complex class structures may be considered in future robustness checks.

The two-class latent-class model identifies two qualitatively distinct business profiles under wartime conditions. The estimated class proportions show that Class 1 accounts for 39.5% of the sample, while Class 2 accounts for 60.5%. Thus, the dominant latent group is Class 2, which includes approximately three-fifths of the surveyed businesses. Since the manifest indicators were coded as binary variables, where level 1 denotes absence and level 2 denotes presence of a given characteristic, the interpretation of the classes is based on the conditional probabilities of level 2. These probabilities indicate how likely businesses assigned to each latent class are to report a specific risk, infrastructure need, investment intention, financing source or future strategy. The estimated class proportions are presented in *Table 5*.

Table 5. Estimated latent class proportions

Latent class	Estimated class proportion	Approximate share, %	Substantive interpretation
Class 1	0.395	39.5	Constrained non-investing firms
Class 2	0.605	60.5	Active adaptive vulnerable firms

Notes: *Class proportions are based on best_lca\$P. The substantive names are assigned according to the conditional item-response probabilities reported in Table 6.*

Class 1 may be interpreted as a group of constrained non-investing firms. These businesses report relatively high financial risk (conditional probability of 71.4%) and moderate electricity-related risk (50.1%). However, they show much weaker adaptive behaviour. The probability of digitalisation investment is virtually zero; the probability of energy-saving investment is only 0.6%; the probability of investment in new products is 2.6%; and the probability of entering new markets is 4.3%. At the same time, the probability of reporting no

investment plans is very high, at 63.3%. This means that Class 1 is not a low-risk group in the simple sense; rather, it represents firms that face important wartime constraints but have limited adaptive or investment capacity. This profile is shown in *Table 6*.

Class 2 may be interpreted as a group of active adaptive vulnerable firms. Compared with Class 1, these businesses have higher probabilities for almost all major risk and adaptation indicators. The probability of financial risk is 78.8%, electricity-related risk is 72.9%, staff-related risk is 52.9%, security risk is 51.1%, logistics risk is 28.3%, and operational risk is 29.8%. Class 2 also has a considerably higher probability of reporting infrastructure needs, especially energy infrastructure, at 73.2%. However, the most distinctive feature of this group is not only higher vulnerability but also stronger adaptive behaviour. Businesses in Class 2 are much more likely to plan digitalisation investments, new product investments, market expansion, and to use their own funds, grants, and bank credit, as well as to plan future recovery actions and the development of new sales channels (*Table 6*).

Table 6. Conditional probabilities of indicator presence by latent class

Indicator group	Manifest indicator	Class 1: constrained non- investing firms	Class 2: active adaptive vulnerable firms	Difference, Class 2 – Class 1
Wartime risks	Financial risk	0.714	0.788	0.074
Wartime risks	Operational risk	0.141	0.298	0.157
Wartime risks	Security risk	0.379	0.511	0.131
Wartime risks	Staff-related risk	0.355	0.529	0.175
Wartime risks	Electricity-related risk	0.501	0.729	0.227
Wartime risks	Logistics risk	0.118	0.283	0.165
Wartime risks	Demand decline	0.091	0.120	0.029
Infrastructure needs	Energy infrastructure	0.520	0.732	0.212
Infrastructure needs	Communication infrastructure	0.262	0.399	0.137
Infrastructure needs	Logistics infrastructure	0.173	0.348	0.175
Investment intentions	Digitalisation investment	0.000	0.303	0.303
Investment intentions	Energy-saving investment	0.006	0.226	0.220
Investment intentions	New product investment	0.026	0.384	0.358
Investment intentions	New market investment	0.043	0.419	0.376
Investment intentions	No investment plans	0.633	0.025	–0.608
Financing sources	Own funds	0.308	0.642	0.334
Financing sources	Grants	0.114	0.406	0.292
Financing sources	Bank credit	0.125	0.344	0.219
Future strategies	Recovery strategy	0.164	0.321	0.158
Future strategies	New sales channels	0.141	0.465	0.324
Future strategies	Future relocation	0.093	0.141	0.049
Future strategies	Future grants or investors	0.115	0.274	0.159

Notes: Values are conditional probabilities of response category 2, which denotes the presence of the corresponding characteristic. Values close to zero should be interpreted as very low probabilities rather than deterministic absence.

The clearest distinction between the two classes is observed in investment behaviour. Class 1 is characterised by an almost complete absence of planned digitalisation, energy-saving, new product and market-expansion investments. In contrast, Class 2 shows a much stronger orientation towards adaptive investment. The largest differences between the two classes are

observed for no investment plans, new market investment, new product investment, own funds, development of new sales channels and digitalisation investment. These results suggest that the latent structure is driven less by a simple high-risk versus low-risk divide and more by the contrast between constrained non-investment and active adaptation. The largest class differences are summarised in *Table B3, Appendix B*.

The results also indicate that both classes experience financial and energy-related vulnerability, but they respond to these pressures differently. Class 1 has a high probability of financial risk but low probabilities of investment, external financing and future strategic actions. This suggests a constrained profile in which firms face wartime pressure but have limited ability or willingness to invest in adaptation. Class 2, by contrast, combines higher risk exposure with higher probabilities of mobilising resources, investment, and strategic renewal. Therefore, vulnerability in Class 2 is not passive; it is accompanied by active attempts to maintain or transform business operations.

Future-oriented indicators reinforce this interpretation. Class 2 has a higher probability of planning new sales channels, recovery actions and future grants or investors. The probability of future relocation is also slightly higher in Class 2 than in Class 1, but the difference is relatively small compared with the differences in investment and financing indicators. This means that relocation is not the main feature distinguishing the two latent profiles. Instead, the central distinction lies in whether businesses respond to wartime constraints through investment, financing and market adaptation, or remain in a constrained non-investment position (*Table 6*).

After estimating the two-class model, respondents were assigned to the latent class with the highest posterior probability. This predicted class variable was then used to compare relocation intentions across the two latent profiles, as reported in *Table 7*.

The two-class LCA solution shows that Ukrainian businesses in the sample can be divided into two broad wartime profiles. The first profile consists of constrained, non-investing firms that face financial and energy-related pressures but report very low probabilities of adaptive investment and future development. The second profile consists of active adaptive vulnerable firms that face stronger multidimensional wartime risks but also show greater readiness to invest, mobilise financing, develop new sales channels, and seek recovery opportunities. This finding is important because it shows that wartime vulnerability does not necessarily lead to strategic paralysis. For a substantial share of firms, higher vulnerability is accompanied by stronger adaptive behaviour.

The cross-tabulation of latent class membership and relocation intentions shows that the two identified business profiles differ not only in their adaptive capacity but also in the structure of their relocation-related attitudes. As shown in *Table 7*, the group of constrained non-investing firms comprises 239 respondents (39.4% of the sample), while active, adaptive, and vulnerable firms comprise 367 respondents (60.6%). This confirms that the dominant latent profile comprises firms that are more vulnerable but also demonstrate stronger adaptive and investment-oriented behaviour.

Table 7. Relocation intentions by latent class membership

Latent class	No relocation	Relocation not considered	Domestic relocation	Relocation abroad	Total
Constrained non-investing firms	77 32.2%	86 36.0%	36 15.1%	40 16.7%	239 100.0%
Active adaptive vulnerable firms	115 31.3%	94 25.6%	94 25.6%	64 17.4%	367 100.0%
Total	192	180	130	104	606

Notes: Percentages are calculated within each latent class. Latent class membership is based on the most likely class assignment from the two-class LCA model. Pearson's chi-square test confirms a statistically significant association between latent class membership and relocation intention, $\chi^2(3) = 12.83$, $p = 0.005$, Cramer's $V = 0.146$.

The results in Table 7 indicate that constrained non-investing firms are more likely to remain undecided about relocation. In this group, 36.0% of respondents had not considered relocation, compared with 25.6% among active adaptive vulnerable firms. At the same time, constrained non-investing firms show the lowest share of domestic relocation intentions, at only 15.1%. This pattern is consistent with the interpretation of this class as a group with limited adaptive capacity. These firms face wartime constraints but are less likely to transform them into active spatial adjustment within Ukraine.

By contrast, active adaptive vulnerable firms are more strongly represented among businesses considering domestic relocation. In this class, 25.6% of respondents reported domestic relocation intentions, compared with 15.1% among constrained non-investing firms. The share of firms considering relocation abroad is relatively similar across the two classes, though slightly higher among active adaptive vulnerable firms: 17.4% compared with 16.7%. Therefore, the main difference between the two profiles concerns domestic rather than international relocation. This suggests that firms with stronger adaptive and investment behaviour are more likely to perceive relocation within Ukraine as a feasible strategic response. In contrast, foreign relocation appears to be driven by factors that are less directly dependent on the latent adaptation profile.

Table 7 shows that latent class membership provides additional explanatory insight into relocation behaviour. The difference between the two classes is not reflected in a simple opposition between relocation and non-relocation. Instead, it appears in the balance between indecision and domestic adaptation. Constrained non-investing firms are more likely to remain in a passive or undecided position. In contrast, active adaptive vulnerable firms are more likely to consider internal relocation as part of a broader adaptive strategy. This finding supports the argument that wartime business relocation should be analysed alongside firms' broader adaptive capacity, investment readiness, and recovery-oriented behaviour.

3.3. Summary of hypothesis testing

The empirical results provide support for both hypotheses formulated in the study. The multinomial logit model confirms that different wartime constraints shape domestic and foreign relocation intentions. At the same time, the latent class analysis shows that businesses form two distinct profiles of vulnerability and adaptation. The hypothesis-assessment summary is presented in Table 8.

Table 8. Summary of hypothesis testing

Hypothesis	Empirical method	Main finding	Status
H1	Multinomial logit	Domestic relocation is associated with credit risk, logistics risk, import decline and own funds; foreign relocation is associated with business severity, import decline and foreign cooperation.	Supported
H2	LCA + cross-tabulation	Two latent profiles are identified: constrained non-investing firms and active, adaptive, and vulnerable firms; these profiles differ significantly in relocation intentions.	Supported

The findings indicate that wartime business relocation should not be interpreted as a uniform response to crisis. Instead, relocation intentions depend on the type of disruption firms experience and their broader adaptive capacity.

3.4. Discussion

The results confirm that wartime business relocation in Ukraine should be interpreted as a differentiated socio-economic adaptation strategy rather than as a uniform response to crisis. The multinomial logit model shows that domestic and foreign relocation intentions are shaped by different types of disruption: domestic relocation is associated with credit risk, logistics disruption, import decline and reliance on own funds, whereas relocation abroad is mainly associated with business severity, import decline and foreign cooperation. This finding is consistent with the literature, which conceptualises the Russian–Ukrainian war as a systemic socio-economic shock affecting economic expectations, institutional stability, infrastructure, markets, and firm-level decision-making (Slyusarevskyy & Chunikhina, 2025; Zozulinskyy, 2024). It also supports earlier evidence that displaced Ukrainian businesses experience heterogeneous barriers related to logistics, finance, market disruption, staff displacement and uncertainty, meaning that relocation is not simply a spatial decision but a strategic response to concrete operational constraints (Polishchuk et al., 2024; Polishchuk et al., 2025a). The strong role of import decline in both domestic and foreign relocation intentions is particularly important because it shows that relocation is closely connected with supply-chain disruption and external market embeddedness, which corresponds to studies showing that war-related shocks spread through trade, transport, energy and sectoral linkages (Jareño et al., 2025; Tsymbal & Demediuk, 2025; Zając et al., 2025).

The results also refine the literature on migration, displacement and adaptive entrepreneurship by showing that business relocation intentions differ from individual migration or refugee mobility, even though they are embedded in the same wartime environment. Existing studies emphasise that migration and displacement reshape labour markets, entrepreneurial ecosystems, social integration and host-community relations (Kuzior et al., 2020; Chugaievska et al., 2026; Mishchuk et al., 2024). The present findings add that firms' relocation intentions depend not only on exposure to danger or uncertainty but also on their resource base and external linkages. The fact that the absence of foreign cooperation significantly reduces the likelihood of relocation abroad indicates that cross-border relocation requires enabling networks, institutional familiarity and access to external markets rather than merely a high level of wartime pressure. This is consistent with research showing that entrepreneurial activity under displacement and crisis is strongly shaped by social capital, host-country knowledge, business ecosystem integration and transnational networks (Andrejuk, 2019; Gawel et al., 2026; Elo et al., 2025). At the same time, the association between own funds

and domestic relocation suggests that internal relocation is more dependent on immediately available financial resources, which corresponds to studies emphasising that wartime adaptation is conditioned by financial reserves, access to support programmes and managerial flexibility (Sitnicka & Serhiienko, 2025; Sarbassova et al., 2025).

The latent class results deepen this interpretation by showing that Ukrainian businesses do not form a homogeneous group of wartime-affected firms. The two-class solution distinguishes between constrained non-investing firms (39.4% of the sample) and active, adaptive, vulnerable firms (60.6%). This finding is consistent with the entrepreneurship and resilience literature, which argues that crisis does not always produce passivity; under certain conditions, uncertainty may be accompanied by entrepreneurial action, adaptive investment, social responsibility and organisational renewal (Rugina & Klyver, 2025; Bayoumy et al., 2025; Iershova et al., 2025). The cross-tabulation further shows that the main difference between the two profiles is not foreign relocation but the balance between indecision and domestic relocation: constrained non-investing firms are more likely to remain undecided. In contrast, active adaptive vulnerable firms are more likely to consider relocation within Ukraine. This supports the view that adaptive capacity is multidimensional and includes financial readiness, investment orientation, digital and market adaptation, institutional embeddedness, and human resource capacity (Eger & Žižka, 2024; Lyeonov et al., 2026a; Yermenko, 2026). Therefore, the study contributes to the literature by showing that wartime relocation intentions should be analysed alongside firms' broader adaptive profiles: some firms experience vulnerability as strategic paralysis, while others combine vulnerability with investment, financing mobilisation, and market reconfiguration.

The study has several limitations that should guide future research. First, the analysis is based on cross-sectional survey data, so the results should be interpreted as statistical associations rather than causal effects. Second, relocation intention does not necessarily imply actual relocation behaviour; future studies should use longitudinal data to examine whether declared intentions are later translated into actual business relocation. Third, some sectoral controls showed signs of sparse-cell estimation and quasi-complete separation, so future research should consider broader industry groupings or larger sector-specific samples. Fourth, the latent class model identifies two broad profiles, but more detailed class structures could be explored in larger datasets or tested as robustness checks. Future research should also compare Ukrainian firms across regions, industries, and firm-size groups over time to determine how wartime adaptation strategies evolve across different stages of military, economic, and infrastructural disruption.

Conclusion

This study aimed to explain how Ukrainian businesses transform wartime disruption into relocation-related decisions and broader adaptive responses. In particular, it examined whether different types of disruption shape domestic and international relocation intentions, and whether businesses under wartime conditions form distinct profiles of vulnerability and adaptation.

The empirical analysis was based on survey data from 606 Ukrainian business representatives. Two complementary methods were applied. First, a multinomial logit model was estimated on a complete-case sample of 505 observations to identify factors associated with relocation intentions, distinguishing between no relocation intention, relocation not yet considered, relocation within Ukraine and relocation abroad. Second, latent class analysis was conducted on the full sample of 606 observations using 22 binary manifest indicators describing wartime risks, infrastructure needs, investment intentions, financing sources and future

strategies. The latent classes were then compared by relocation intention using cross-tabulation, Pearson's chi-square test and Cramer's V.

The results show, first, that relocation intentions were heterogeneous: in the multinomial logit sample, 31.7% of respondents reported no relocation intention, 28.7% had not considered relocation, 21.6% had considered relocation within Ukraine, and 18.0% had considered relocation abroad. Second, business severity was associated mainly with foreign relocation, increasing the relative risk of relocation abroad by 59.9% (RRR = 1.599, $p < .01$), whereas credit risk was associated only with domestic relocation (RRR = 1.570, $p < .01$). Third, domestic relocation was mainly associated with credit risk, logistics disruption (RRR = 2.277, $p < .05$), import decline (RRR = 3.498, $p < .01$) and reliance on own funds (RRR = 2.101, $p < .05$). Fourth, foreign relocation was associated with import decline (RRR = 4.224, $p < .01$) and international embeddedness, as the absence of foreign cooperation reduced the relative likelihood of relocation abroad (RRR = 0.343, $p < .01$). Fifth, latent class analysis identified two business profiles: constrained non-investing firms, comprising 239 respondents or 39.4% of the sample, and active adaptive vulnerable firms, comprising 367 respondents or 60.6%; these profiles differed significantly in relocation-related attitudes, $\chi^2(3) = 12.83$, $p = 0.005$, Cramer's V = 0.146.

The findings imply that wartime business-support policy should not treat all affected firms as a homogeneous group. Firms considering domestic relocation need practical support for internal spatial adjustment, including access to safer locations, logistics infrastructure, working capital, credit restructuring and support for restoring disrupted import channels. Firms considering relocation abroad require a different policy response, focused on maintaining international cooperation, ensuring continuity of export-import operations, providing legal and administrative assistance, and offering incentives to preserve economic links with Ukraine even when part of their activity moves across borders. The two latent profiles also suggest differentiated policy instruments: constrained non-investing firms need liquidity support, basic stabilisation measures, and incentives to restart investment, whereas active adaptive vulnerable firms require growth-oriented instruments, including grants, credit guarantees, digitalisation support, market-access programmes, and infrastructure-resilience measures. Such differentiation is essential because wartime vulnerability may lead either to strategic paralysis or to active adaptation, depending on firms' resources, financing capacity and external linkages.

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Appendix A. Multinomial logit results for business relocation intentions

Table A1. Model specification and fit statistics

Indicator	Value
Model type	Multinomial logit
Estimation method	Maximum likelihood
Dependent variable	Business relocation intention
Reference outcome	No relocation intention
Compared outcomes	Not considered; domestic relocation; relocation abroad
Complete-case sample	505 observations
Negative log-likelihood	562.864
Residual deviance	1125.727
AIC	1353.727
Model convergence	Yes
Problematic standard errors after correction	None
Main controls	Region, firm size, industry, age group, gender

Notes: The model was estimated after removing unused factor levels from the complete-case estimation sample. Coefficients are interpreted relative to the reference outcome, “no relocation intention”.

Table A2. Sectoral controls require cautious interpretation

Sectoral predictor	Not considered vs no relocation	Domestic relocation vs no relocation	Relocation abroad vs no relocation	Interpretation
Logistics and transport	3.542**	0.924	0.952	Relatively stable, significant effect for the “not considered” category
Energy and utilities	<0.001***	1.119	<0.001***	Likely affected by sparse cells or quasi-complete separation
Export-import activity	<0.001***	4.901	<0.001***	Likely affected by sparse cells or quasi-complete separation
Legal and administrative services	5.588	<0.001***	8.281	Likely affected by sparse cells or quasi-complete separation
Hotel and restaurant business	1.365	<0.001***	0.861	Likely affected by sparse cells or quasi-complete separation
Financial services	0.994	<0.001***	2.831	Likely affected by sparse cells or quasi-complete separation

Notes: The table reports relative risk ratios for sectoral controls. Sectoral effects are interpreted relative to firms operating in trade, including wholesale and retail trade. The results should be interpreted cautiously, as several sectoral categories exhibit signs of sparse-cell estimation and quasi-complete separation. *** $p < .01$; ** $p < .05$; * $p < .10$.

Appendix B. Latent class analysis of wartime business vulnerability and adaptive strategies

Table B1. Structure of the latent class analysis dataset

Component	Description
Number of observations	606
Number of manifest indicators	22
Type of indicators	Binary categorical variables
Coding of manifest indicators	1 = absence of characteristic; 2 = presence of characteristic
Method	Latent class analysis
Estimation package	poLCA
Number of tested class solutions	2–6 classes
Missing values in selected LCA indicators	None observed in the summary output.

Table B2. Descriptive distribution of manifest indicators used in LCA

Indicator group	Manifest indicator	Present, n	Present, %
Wartime risks	Financial risk	460	75.9
Wartime risks	Operational risk	143	23.6
Wartime risks	Security risk	278	45.9
Wartime risks	Staff-related risk	279	46.0
Wartime risks	Electricity-related risk	387	63.9
Wartime risks	Logistics risk	132	21.8
Wartime risks	Demand decline	66	10.9
Infrastructure needs	Energy infrastructure	393	64.9
Infrastructure needs	Communication infrastructure	209	34.5
Infrastructure needs	Logistics infrastructure	169	27.9
Investment intentions	Digitalisation investment	111	18.3
Investment intentions	Energy-saving investment	84	13.9
Investment intentions	New product investment	147	24.3
Investment intentions	New market investment	164	27.1
Investment intentions	No investment plans	161	26.6
Financing sources	Own funds	309	51.0
Financing sources	Grants	176	29.0
Financing sources	Bank credit	156	25.7
Future strategies	Recovery strategy	157	25.9
Future strategies	New sales channels	204	33.7
Future strategies	Future relocation	74	12.2
Future strategies	Future grants or investors	128	21.1

Notes: Percentages are calculated for the full LCA sample ($N = 606$). “Present” corresponds to factor level 2 in the R output.

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Table B3. Strongest discriminating indicators between the two latent classes

Indicator	Class 1 probability	Class 2 probability	Absolute difference	Interpretation
No investment plans	0.633	0.025	0.608	Strongly characteristic of Class 1
New market investment	0.043	0.419	0.376	Strongly characteristic of Class 2
New product investment	0.026	0.384	0.358	Strongly characteristic of Class 2
Own funds	0.308	0.642	0.334	Strongly characteristic of Class 2
New sales channels	0.141	0.465	0.324	Strongly characteristic of Class 2
Digitalisation investment	0.000	0.303	0.303	Strongly characteristic of Class 2
Grants	0.114	0.406	0.292	Strongly characteristic of Class 2
Electricity-related risk	0.501	0.729	0.227	More characteristic of Class 2
Energy-saving investment	0.006	0.226	0.220	More characteristic of Class 2
Bank credit	0.125	0.344	0.219	More characteristic of Class 2
Energy infrastructure needs	0.520	0.732	0.212	More characteristic of Class 2

Notes: The table reports indicators with the largest absolute differences in conditional probabilities between the two classes.