

Labor Market Disruption and Reintegration Capacity in Ukraine after February 2022

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Abstract. *The Russian invasion of Ukraine in 2022 generated one of the largest displacement crises in Europe since the Second World War, causing significant demographic losses and severe disruptions in the labor market. Millions of Ukrainians were dislocated internally and externally, and the destruction of enterprises, mobilization, and emigration resulted in decreased labor force participation and labor capacity. This paper examines structural changes in Ukraine's labor market between January 2022 and December 2025, particularly in terms of unemployment, job vacancies, and labor market tightness as indicators of labor capacity. The monthly national level data was obtained from the Ukraine War Economy Tracker, published by the Center for Economic Strategy. The interrupted time series (ITS) model was used to determine the immediate impact of the invasion and subsequent long-term trend changes under wartime conditions. The Quandt-Andrews and Bai-Perron structural break tests were employed to determine the occurrence of any endogenous structural changes in the labor market. The results imply that the reintegration of refugees into Ukraine is not an absolute demographic factor but rather dependent upon the recovery of labor demand and Ukraine's capacity for labor absorption and job creation.*

Keywords: Wartime Labor Markets; Refugee Return Migration; Labor-Market Tightness; Structural Breaks; Ukraine War Economy.

Introduction

Russia's full-scale invasion in February 2022 triggered a significant forced displacement, leading to substantial demographic changes and labor market disruptions. Millions of Ukrainians, mostly working-age women and children, were forced to flee their homes and seek refuge abroad, while internal displacement and large-scale military mobilization further reduced the active labor force. These dynamics constrained recovery and limited the absorptive capacity available for eventual return.

The invasion disrupted Ukraine's labor market through physical capital destruction, human capital loss via emigration and mobilization, and sectoral mismatch between surviving demand and available supply (Cheromukhina, 2024; Turlo et al., 2025). Cheromukhina (2024) found supply-demand imbalance, hidden unemployment, wage stagnation, and rising competition for the remaining vacancies. Cheromukhina found that the number of job seekers per job vacancy rose markedly after February 2022 and peaked in mid-2022, indicating a marked contraction in labor absorption capacity (Cheromukhina, 2024). Horoshkova et al. (2024) highlighted marked differences in the impact of the war on Ukraine's labor market in different regions, including the destruction of job vacancies and unemployment pressures in frontline regions and labor-market pressures in the western regions driven by the inflow of internally displaced persons and relocated enterprises. A large share of Ukraine's working-age male population was conscripted or voluntarily entered frontline military service, further reducing domestic labor supply and altering the demographic composition of the workforce.

Return migration introduced an additional structural challenge. The International Organization for Migration (IOM) stated, “While a significant number of refugees expressed the intention to return, the stability of return remains uncertain due to low employment rates, insecurity, and the risk of repeat migration.” Returnees faced disadvantages in comparison to those who remained in host countries, which included increased labor market competition and skill mismatch, and limited access to stable livelihoods (IOM, 2025). Return was therefore an economic outcome conditional on labor demand and on the level of vulnerability returnees faced in Ukraine.

Forced displacement left persistent labor-market scarring on returnees in post-conflict settings (Kondylis, 2010; Fakihi & Ibrahim, 2016; Bahcekapili & Cetin, 2015). Evidence from post-conflict Bosnia and Herzegovina demonstrated that displaced individuals experienced poor labor market outcomes and long-lasting employment penalties (Kondylis, 2010). Similar findings were also reported in other refugee settings, including Syrian refugees in Jordan and Turkey (Fakihi & Ibrahim, 2016; Bahcekapili & Cetin, 2015). The scale of Ukrainian displacement tied long-run reconstruction directly to labor-market recovery and to the return process.

Existing research on Ukraine’s wartime labor market lacked quantitative evidence on the timing and persistence of structural breaks in absorption capacity. Cross-sectional regional comparisons (Horoshkova et al., 2024) and descriptive vacancy trends (Cheromukhina, 2024) dominated the literature, leaving the structural-break question open.

This paper applied an interrupted time series (ITS) design to monthly indicators from the Ukraine War Economy Tracker (Center for Economic Strategy). ITS was a standard quasi-experimental design for estimating the effects of population-level shocks when randomization was infeasible (Penfold & Zhang, 2013). In particular, the ITS approach was well suited to the Ukrainian war-time macroeconomic environment, which allowed for the estimation of level shifts and trend changes following an exogenous event.

The analysis addressed four questions. First, whether a statistically significant break occurred in unemployment and labor-market tightness following the February 2022 invasion. Second, whether absorption capacity, measured by vacancies and tightness, had continued to deteriorate. Third, whether the post-invasion trajectory implied structural disadvantages for returning migrants. Fourth, whether endogenous breaks beyond February 2022 indicated further regime shifts during 2023–2025.

Four hypotheses followed. Unemployment was expected to display an immediate upward level shift consistent with war-induced job destruction (Cheromukhina, 2024). Vacancies were expected to contract sharply after February 2022, reflecting depressed labor demand (Horoshkova et al., 2024). Tightness was expected to fall and remain low, raising entry costs for displaced and returning workers (IOM, 2025). Finally, additional endogenous breaks were expected within the wartime period, identified through the Quandt–Andrews and Bai–Perron tests.

Literature review

Armed conflicts cause forced migration and demographic change, and the February 2022 invasion of Ukraine triggered displacement on a scale that demanded labor-market analysis. The protracted nature of the conflict raised questions about return feasibility, the circumstances governing refugee return, and the sustainability of reintegration.

Research on post-conflict economies consistently noted that the return of refugees was neither rapid nor permanent. Returnees often experienced persistent unemployment and occupational downgrading, and a non-trivial share remained at risk of re-emigration (Kondylis, 2010). Kondylis (2010), in a study of post-war migration in Bosnia and Herzegovina, found that

even after the end of the armed conflict, individuals who experienced forced migration suffered from employment penalties. The return migration of refugees from Ukraine could be described as fragile and conditional. The International Organization for Migration (IOM) reported that limited job opportunities and economic insecurity were the principal constraints on sustained return. The IOM further noted that nearly a quarter of the returning refugees contemplated emigrating again from Ukraine (IOM, 2025). Return migration was therefore conditional on labor absorption capacity and on the economic vulnerability faced by returnees.

Earlier conflicts produced persistent labor-market shocks through firm exit, capital destruction, demographic loss, and institutional disruption (Kondylis, 2010, on Bosnia–Herzegovina; Fakihi & Ibrahim, 2016, on Syrian refugee inflows to Jordan). Across earlier conflicts, aggregate labor demand fell while specific sectors faced shortages, producing differentiated adjustment patterns. Comparative work on Ukraine and EU labor markets under wartime conditions has documented similar divergences (Shkolnyk & Dekhtiar, 2025).

Turlo et al. (2025) documented occupational restructuring, instability, and widening mismatch between Ukrainian labor demand and supply, with large-scale wartime emigration creating skill shortages in some sectors and surpluses in others. Bohdan and Kotenko (2025) reported similar sectoral distortions, with widening gaps between sectors gaining and losing labor under wartime conditions.

Cheromukhina (2024) documented a level shift in the applicant-to-vacancy ratio coinciding with February 2022, with no return to the pre-war range over the observation window. On online platforms, the applicant-to-vacancy ratio rose substantially over the same period (Cheromukhina, 2024). The wartime series did not exhibit mean reversion in tightness or vacancies, which was inconsistent with a market clearing toward a new equilibrium over the observation window.

Labor-market tightness, the ratio of vacancies to job seekers, measured labor-absorption capacity (Cheromukhina, 2024). In standard labor economics, tightness measured the balance of labor demand and supply; in post-conflict settings, it also indicated the absorptive capacity available to returnees.

Cheromukhina (2024) reported that wartime tightness fell to historically low levels under sustained applicant pressure. Displaced persons experienced challenges in reintegration due to low demand and high competition for a few job opportunities.

Regional labor markets in Ukraine differed considerably in performance, as emphasized by Horoshkova et al. (2024). The authors documented pronounced differences across frontline, western, and other regions of Ukraine. While frontline regions faced a decline in job vacancies and an increase in unemployment, the western regions faced a tight labor market due to the inflow of internally displaced persons.

Food-insecurity indicators captured an additional dimension of returnee vulnerability. The IOM report on return dynamics emphasized that returning individuals faced difficulties in achieving a stable livelihood and were forced to adopt coping strategies due to a lack of employment opportunities (IOM, 2025).

Reintegration depended on labor demand combined with welfare and food-security conditions; recovery in post-conflict economies was consistently constrained by weak labor demand for returnees (Kondylis, 2010; Fakihi & Ibrahim, 2016).

Return migration shaped post-war reconstruction in earlier conflicts as well (Kondylis, 2010; Fakihi & Ibrahim, 2016): returnees brought human capital, remittances, and population replenishment, but these effects depended on domestic labor demand.

Turlo et al. (2025) stressed that Ukraine's economic reconstruction required effective labor policies that included retraining schemes and incentives for skilled returnees. Lobetska and Korpan (2025) likewise framed labor migration as a structural factor shaping postwar economic transformation, with return flows contingent on domestic absorptive capacity. In the absence of these policies, return migration in Ukraine might result in increased labor rivalry instead of economic revitalization.

Where domestic absorption was weak, return was frequently followed by renewed emigration, a pattern documented in earlier post-conflict labor markets (Kondylis, 2010).

Methodology

The study employed national monthly labor market data collected through the Ukraine War Economy Tracker, compiled by the Center for Economic Strategy. The data set covered the period from January 2022 to December 2025 and provided consistent data on unemployment conditions, vacancy postings, and job seeker pressure for the wartime period.

Labor market tightness was measured as the ratio of posted vacancies to the number of job seekers, which captured the economy's capacity to absorb labor supply. Vacancy data were used as a proxy for labor demand, and unemployment data were used to measure displacement pressures and job destruction. Macroeconomic vulnerability indicators such as food insecurity captured reintegration challenges faced by potential returnees.

Following the online labor-market indicators in the Ukraine War Economy Tracker, two flow variables were constructed: V_t (monthly mean of new job openings, aggregated from weekly vacancy postings) and U_t (monthly mean of new CV submissions, aggregated from weekly applicant flows). $Vacancies_t Resumes_t$

Since the original series for these variables were based on a weekly frequency, they were converted to a monthly series by the application of monthly averages.

$$Vacancies_t = \frac{1}{W_t} \sum_{w=1}^{W_t} Vacancies_{s_w} \quad (1)$$

$$Resumes_t = \frac{1}{W_t} \sum_{w=1}^{W_t} Resumes_{s_w} \quad (2)$$

Where W_t denotes the number of weeks observed in month .

An important labor absorption capacity indicator was labor market tightness, defined as the ratio of monthly job openings to monthly job seeker activity:

$$Tightness_t = \frac{Vacancies_t}{Resumes_t} \quad (3)$$

Besides labor flow indicators, it also included monthly macroeconomic and vulnerability variables such as U_t (unemployment rate), FI_t (food insecurity rate), and CCI_t (consumer confidence index). These variables provided a comprehensive picture with respect to labor absorption and vulnerability over time.

Wartime labor markets were characterized by sudden regime changes due to displacements, destruction or relocation of firms, mobilizations, and changes in the composition of demand. These phenomena were identified in labor market research on Ukraine (Cheromukhina, 2024; Horoshkova et al., 2024; Turlo et al., 2025). These environments were often inconsistent with the underlying assumptions of the usual time series regression analysis carried out in levels, making it necessary to use approaches that allowed for regime changes and changes in trends.

Integration properties were checked using the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979, 1981).

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^p \delta_i \Delta y_{t-i} + \varepsilon_t \quad (4)$$

With the null hypothesis of $H_0: \gamma = 0$ (unit root) (Dickey & Fuller, 1979, 1981). If the series in levels were non-stationary, then first differences or log differences for strictly positive flow series resulted in stationary series.

$$\Delta y_t = y_t - y_{t-1} \Delta \ln x_t = \ln x_t - \ln x_{t-1} \quad (5)$$

These series were used as robustness checks but were less interpretable due to their focus on short-run volatility.

Wartime macroeconomic series exhibited discontinuities rather than gradual trends. Ukraine's labor market outcomes were affected by displacement, destruction and relocation of firms, military mobilization, and mass migration. Such effects were documented in recent studies on labor markets in Ukraine (Cheromukhina, 2024; Horoshkova et al., 2024; Turlo et al., 2025).

Levels regressions risked spurious inference under such conditions. The February 2022 invasion served as an exogenous shock to Ukraine's economy. With no counterfactual economy available for a randomized design, an interrupted time series analysis was used.

ITS did not require a control group, which was decisive in wartime macroeconomic settings where no counterfactual economy existed. ITS analysis relied on discontinuities in levels and changes in trends in the post-intervention period.

Formally, the segmented ITS specification estimated:

$$Y_t = \alpha + \beta_1 t + \beta_2 Post_t + \beta_3 TimeAfter_t + \varepsilon_t \quad (6)$$

In this specification, Y_t represented labor market outcomes such as unemployment, vacancies, or tightness. The invasion was represented by an intervention date (February 2022), which allowed the estimation of a level shift change (β_2), reflecting the impact of the sudden disruption of the war and a slope change (β_3), reflecting gradual adjustment or continued deterioration.

ITS was suited to the Ukrainian case because the relevant variation took the form of discrete breaks rather than equilibrium adjustment.

Monthly macro series typically exhibited autocorrelation and heteroskedasticity. The ITS regressions were therefore estimated by OLS with Newey–West (1987) HAC standard errors at one lag.

$$\widehat{Var}(\hat{\beta})_{HAC} \quad (7)$$

In this case, a lag of one month was adopted, which was a reasonable choice due to the sample size (48 observations).

Since the data set started from January 2022, there was only one month available before February 2022. This implied that a Chow test at the invasion breakpoint was not feasible. Identification of additional breaks therefore relied on the Quandt–Andrews unknown-breakpoint test and the Bai–Perron multiple-break procedure.

For conducting a test for structural change without specifying a breakpoint, the following Quandt–Andrews method was adopted. It calculated Chow tests over all potential breakpoints and selected the maximum of these tests (Quandt, 1960; Andrews, 1993):

$$supF = \max_{b \in B} F(b) \quad (8)$$

Bootstrap methods were used to compute p-values for the $F_{\max}$ statistic.

In order to identify whether multiple regimes existed during the war period, a multiple break methodology following the Bai–Perron approach was adopted (Bai & Perron, 1998, 2003):

$$Y_t = X_t' \beta_j + \varepsilon_t \text{ for } t = T_{j-1} + 1, \dots, T_j \quad (9)$$

where T_j are break dates and β_j represented coefficients for each regime. Due to the small sample size available on a monthly basis, the multi-break analysis was treated cautiously. The multi-break analysis was employed for exploratory purposes rather than focusing on coefficients.

All data cleaning, aggregation, estimation, and visualization steps were carried out using Python within a Google Colab environment. The libraries used were pandas and numpy for data management and transformations, statsmodels for ordinary least squares estimation, augmented Dickey-Fuller unit root tests, Newey-West inference, ruptures for exploratory segmentation with multiple changes, as performed by Bai-Perron-type change-point analysis and matplotlib for time series plotting.

Results and discussions

Ukraine's national unemployment rate rose sharply after February 2022 (Figure 1), consistent with the outbreak of full-scale invasion, and remained elevated through the observation window.

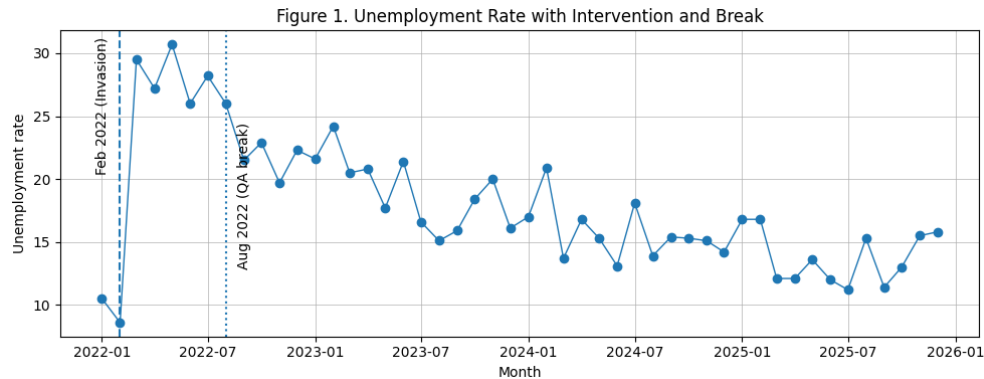


Figure 1. Unemployment rate (%) in Ukraine, January 2022–December 2025, with invasion intervention line

Source: Author's own result Data: Center for Economic Strategy (2026).

The trajectory matched the displacement-driven unemployment patterns reported by Cheromukhina (2024) and Turlo et al. (2025).

Labor-market tightness, the ratio of job vacancies to resumes, captured a complementary dimension of absorption capacity. Tightness fell sharply from February 2022 (Figure 2), reflecting a rapid decline in vacancies relative to job-seeker activity, and remained below the pre-invasion level over the observation window.

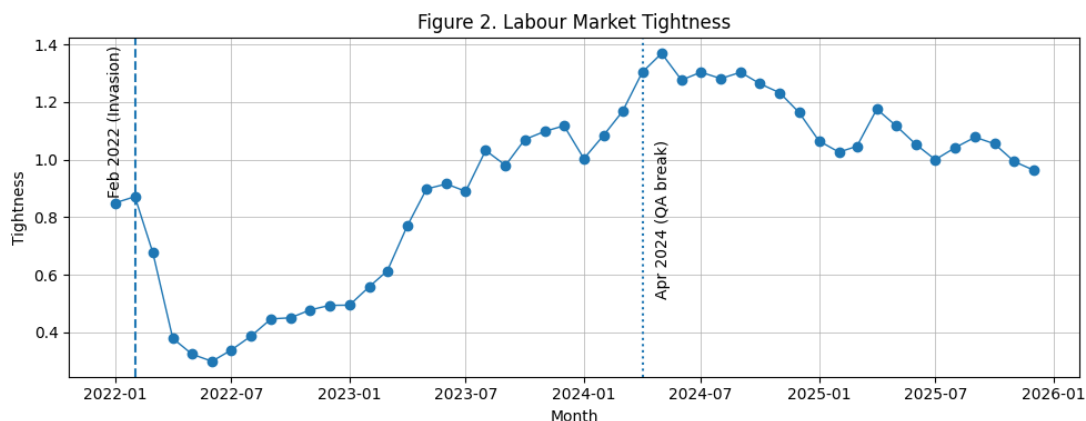


Figure 2. Labor market tightness (Vacancies/Resumes), January 2022–December 2025

Source: Author's own result Data: Center for Economic Strategy (2026).

Sustained low tightness raised the cost of reintegration for returnees, who entered a market with few vacancies per applicant.

Segmented ITS regressions tested the immediate change and post-invasion trend for unemployment, tightness, and vacancies; Table 1 reports the coefficients.

Table 1. Interrupted time series estimates for unemployment, tightness, and vacancies

	(1) Unemployment rate	(2) Tightness	(3) Vacancies
Constant	4.479***	0.715***	79.628***
	-0.389	-0.02	-1.423
Time trend (t)	6.021***	0.134***	12.122***
	-0.389	-0.02	-1.423
Post (Feb 2022+)	7.842***	-0.464***	-56.513***
	-1.219	-0.064	-4.457
TimeAfter	-6.299***	-0.117***	-10.992***
	-0.441	-0.023	-1.611
Observations	48	48	48
R²	0.56	0.554	0.618

Source: Author's own result Data: Center for Economic Strategy (2026).

From the regression equation for unemployment, there was evidence of a statistically significant level shift after February 2022. The post-invasion coefficient suggested an immediate rise in unemployment of around 7.8 percent.

The slope adjustment term also turned out to be statistically significant, suggesting that the unemployment trend continued upward beyond the initial level shift.

The tightness model showed a significant discontinuity at February 2022, with tightness falling as labor demand contracted relative to applicant inflows. Cheromukhina (2024) reported a comparable widening of the applicant-to-vacancy ratio after February 2022.

The vacancy decline exceeded the unemployment and tightness shifts in absolute magnitude, indicating that the contraction in absorption capacity came chiefly from depressed labor demand rather than expanded supply.

While February 2022 represented the natural intervention date, there remained the possibility that subsequent changes occurred within the Ukrainian wartime economy following the initial invasion. In order to test this, Quandt-Andrews unknown breakpoint tests were used, which rejected the stability of the parameter for unemployment and revealed an endogenous breakpoint in August 2022.

Table 2. Interrupted time series estimates for unemployment, tightness, and vacancies.

Series	supF statistic	Bootstrap p-value	Estimated break date
Unemployment rate	17.205	0.002	2022-08
Tightness	25.157	0.002	2024-04

Source: Author's own result Data: Center for Economic Strategy (2026).

Restructuring continued through the first year of the conflict beyond the initial invasion shock. For labor market tightness, a further regime shift occurred in April 2024, suggesting that there had been continued evolution of labor absorption conditions far beyond the initial period of the conflict. Exploratory multiple breakpoints also identified changes in the unemployment regime in 2023-2024, indicating that the wartime labor market did not converge to a stable equilibrium.

Turlo et al. (2025) reported a comparable rise in displacement-driven unemployment after the invasion. The estimated unemployment shift was of the order Kondylis (2010) reported for post-conflict labor scarring.

The tightness estimates indicated that the disruption operated chiefly through labor demand. The sharp decline in vacancies and the sustained weakening of labor-market tightness implied that labor demand contracted more severely than job-seeker activity. Cheromukhina (2024) reported the same pattern: a persistently elevated applicant-to-vacancy ratio and worse entry conditions for new participants after 2022.

These dynamics also shaped return-migration prospects: the IOM return dynamics report identified limited labor market opportunities as a major barrier to successful reintegration. Nearly a quarter of returnees were considering re-emigration (IOM, 2025). The results implied that return migrants had been attempting to re-integrate into a labor market that was experiencing structural weaknesses in job creation.

Ukraine's labor market did not absorb a single structural shock and recover; it passed through successive wartime regimes. The 2022 endogenous break indicated delayed adjustment, and the 2024 break in tightness indicated continued regime change. Return migration depended on domestic vacancy creation.

Conclusion

Structural change in Ukraine's wartime labor market shaped the feasibility of refugee return. Monthly indicators from the Ukraine War Economy Tracker (Center for Economic Strategy) covering January 2022 to December 2025 measured absorption capacity through unemployment, vacancy creation, and labor market tightness.

The estimates indicated disruption in Ukraine's labor markets following the February 2022 invasion. The interrupted time series analysis identified a significant immediate increase in unemployment alongside a sharp decline in labor demand. Vacancy creation contracted after the outbreak of war, and labor market tightness deteriorated, reflecting reduced job availability relative to applicant pressure. Ukraine's labor markets therefore experienced not only employment losses but a sustained decline in absorption capacity.

Quandt-Andrews unknown break tests further identified two endogenous regime shifts after the initial February 2022 break, in unemployment and in labor market tightness. Ukraine's labor markets had not converged to a stable wartime equilibrium.

A substantial number of Ukrainian refugees expressed a desire to return to Ukraine, but the sustainability of this return was heavily reliant on labor market conditions in Ukraine. The decline in labor market tightness documented in this research provided a micro foundation for survey observations that identified a lack of job prospects and economic insecurity as the principal impediments to repatriation (IOM, 2025).

Post-war reconstruction policy should be calibrated to labor-market recovery, not to the cessation of hostilities alone. Without sustained employment generation, the return of Ukrainian refugees would intensify labor-market competition rather than support recovery.

The analysis relied on aggregate national indicators and could not capture regional heterogeneity. The 48-month sample limited inference about long-run dynamics and reduced the precision of the multiple-breakpoint estimates. Future research would benefit from sub-national labor market data, returnee outcomes, and richer measures of labor demand by sector.

The decline in labor absorption documented here was the principal constraint on reintegration: the cessation of hostilities was a necessary but not sufficient condition. Economic

recovery and demographic return depended on Ukraine's capacity to generate employment in the post-war period.

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