Understanding the Impact and Aftermath of COVID-19 on Reshaping Migration Flows

Short Abstract

The COVID-19 pandemic caused extensive disruption to international migration, halting cross-border mobility and reshaping global migration flows. While the immediate contraction of flows in 2020-2021 is well documented, less is known about how and where migration recovered, and which structural factors shaped diverging recovery trajectories. The paper investigates the reconfiguration of international migration flows, during, and after the pandemic (January 2019 – December 2022) using Meta's *International Migration Flows dataset* – a large-scale digital trace source capturing monthly movements between 181 countries. We develop a Migration Recovery Index (MRI) that measures four dimensions of recovery after the pandemic-induced collapse: speed, duration, persistence, and volatility. Using a multilevel model with varying intercepts for origin and destination countries, we identify key drivers of recovery across migration corridors. Results show that migration recovery was highly uneven: corridors linking geographically proximate and institutionally connected countries (e.g. those with shared language or EU membership) exhibited faster and more stable recovery, while long-distance and more restrictive destinations lagged behind. Stronger governance in origin countries and larger destination populations was also associated with higher recovery scores. By integrating digital trace data, systems-based analysis, and resilience perspectives, this research provides new insights into how global mobility systems adapt crises. Ongoing work will extend the analysis through dynamic clustering of recovery trajectories, contributing to broader debates on migration resilience and adaptation under new global realities shaped by pandemics, conflicts, and inequality.

1. Introduction

The COVID-19 pandemic caused extensive disruption to the global mobility system. Border closures, travel bans, and rapidly changing public health measures halted migration flows worldwide (Benton et al., 2021). While early studies documented the immediate contraction of mobility during 2020–2021 (e.g. Rowe et al., 2022; González-Leonardo, 2025), systematic evidence on how migration systems recovered and restructured in the aftermath remains limited. Understanding recovery trajectories is essential for assessing the resilience of global migration systems and for informing adaptive migration governance in an era of compounding crises.

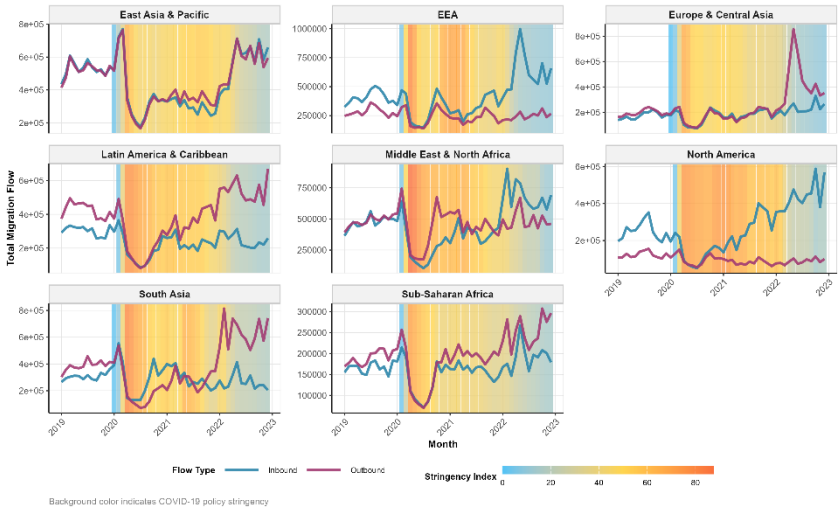

Figure 1. Inbound vs. Outbound Mobility by Region and Pandemic Stringency

This study investigates the global restructuring of international migration flows before, during, and after the COVID-19 pandemic (January 2019–December 2022). It draws on Facebook's *International Migration* Flows dataset, a large-scale, high-frequency digital trace source capturing monthly flows between more than 180

countries produced by Chi et al. (2025). Figure 1 demonstrates the changing in and outbound migration flows by region across the time of the data, demonstrating heterogeneity pre-pandemic, in the depth of pandemic disruption, and subsequent recovery trajectories.

Our contribution is twofold. First, we develop a novel Migration Recovery Index (MRI) that captures multiple temporal dimensions of recovery: speed, duration, persistence, and volatility, following the pandemic-induced collapse in migration. Second, we apply a multilevel modelling approach to identify structural, demography, and policy factors associated with differential recovery across origin-destinations (O-D). Building on this, we plan to extend the analysis using dynamic time warping and clustering methods to derive typologies recovery trajectories. Together, these analyses offer new, systematic evidence of how international migration systems adapted to the pandemic shock whilst also highlighting changes in the structural pathways within the global migration system.

2. Data

We utilise a novel data source *'International Migration Flows Data'* which is distributed by Meta Data for Good Humanitarian Data Exchanged and are produced by Chi et al. (2025). These data provide estimates for monthly country-to-country migration flows for 181 countries for over three billion Facebook users. Their temporal and spatial granularity provides a unique opportunity to study the onset and aftermath of the pandemic, spanning from January 2019 to December 2022.

The migration data are combined with a range of contextual covariates at origin and destination levels, including:

- COVID-19 stringency measures (monthly averages, from the Oxford COVID-19 Government Response Tracker) (Hale et al. 2021)
- Traditional gravity model variables (distance, trade intensity, colonial ties, shared language, EU membership, and social connectivity) (CEPII Gravity Database, 2024)
- Socioeconomic indicators (GDP per capita, population size) (World Bank, 2024)
- Institutional and governance measures (rule of law indices, diplomatic disagreement scores) (World Bank, 2024)

Corridors with fewer than 50 migrants were excluded. After filtering and cleaning, the final dataset includes over 2,000 bilateral corridors worldwide.

3. Methods

3.1. Constructing the Migration Recovery Index

To quantify post-pandemic recovery dynamics, we define a pre-pandemic baseline as the mean migration flow between January 2019 and February 2020. A recovery threshold was then set at $\pm 10\%$ of this baseline. From this, four components were derived for each corridor:

1. **Time to First Recovery** – the number of months it takes for migration between a corridor to return to the threshold after the pandemic dip
2. **Recovery Duration** – the number of consecutive months that migration remained about the recovery threshold after first recovery
3. **Recovery Persistence** – proportion of months post-recovery where flows remained recovered
4. **Recovery Volatility** – standard deviation of the monthly % change from baseline after recovery.

Each component was normalised on a 0-100 scale and weighted (20%, 30%, 35%, and 15% respectively) to form a composite recovery index (0 – 100) that balances speed, persistence, and stability of recovery.

3.2. Modelling Strategy

A multi-level model was run to understand the drivers of the recovery index, including a random intercept for the origin and the destination to observe unobserved corridor-level heterogeneity tied to the origin or destination.

$$MRI_{od} = \beta_0 + \beta X_{od} + u_o + v_d + \varepsilon_{od}$$

Where MRI_{od} is the migration recovery index for the origin-destination corridor o -> d. X_{od} is a vector of explanatory variables for each corridor (e.g. distance, GDP, shared language, policy stringency). u_o is the random intercept for the origin country, v_d is the random intercept for the destination country, and ε_{od} is the residual error term. This structure allows for corridor-specific effects to be separated from broader structural or institutional contexts, recognising that recovery dynamics are influenced both by features of individual corridors and by country-level characteristics.

4. Preliminary Findings and Descriptives

The total recovery index across migration corridors ranges from 4.19 to 54.9, with most corridors clustering in the mid-range (~40–50). Figure 2 demonstrates the top five and bottom five corridors for each region based on the recovery index. High-recovery corridors, such as *United Arab Emirates* ⟶ *Saudi Arabia* (54.9) and *South Africa* ⟶ *Eswatini* (51.5), are relatively rare and tend to reflect strong economic or geographic connectivity. In contrast, low-recovery corridors—including *Ukraine* ⟶ *Canada* (4.19) and *Indonesia* ⟶ *Qatar* (4.98)—often correspond to long-distance or logistically challenging routes. Ukraine also signals where there may have been disruption due to war. Overall, the distribution is skewed toward moderate recovery, highlighting that most corridors have partially rebounded while a subset remains highly vulnerable.

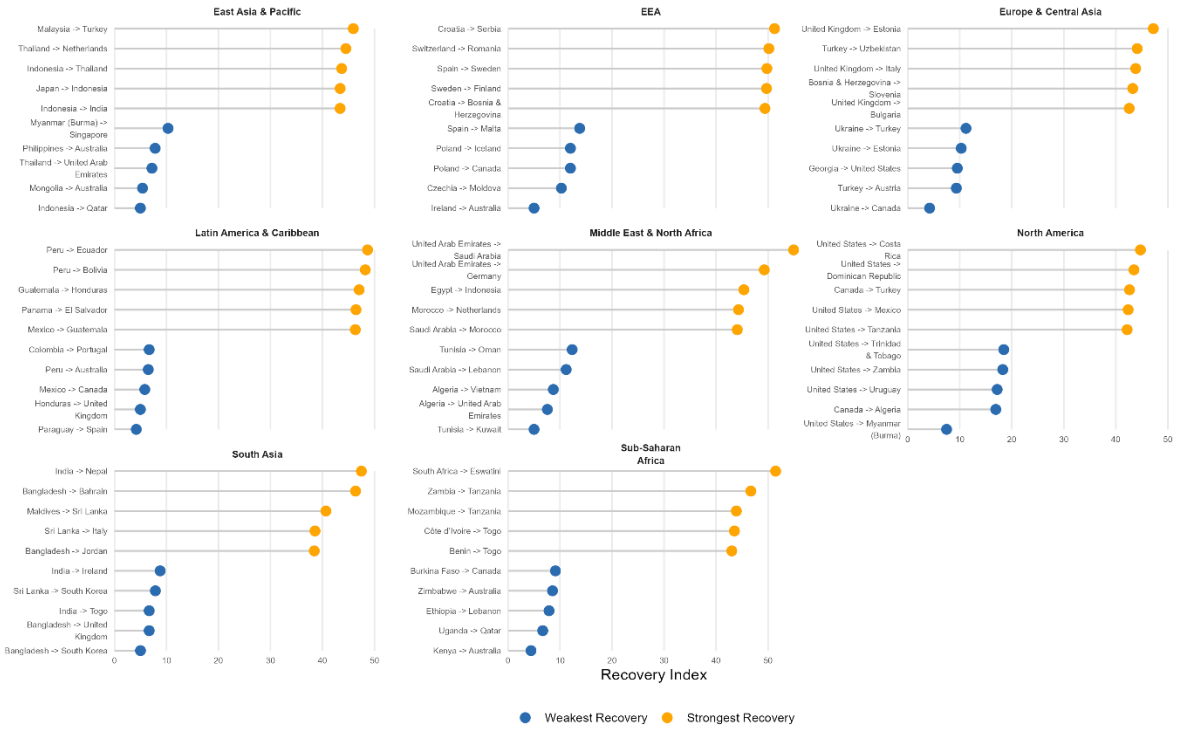

Figure 2. Variation in Mobility Recovery by Origin Region
Top and bottom recovery corridors based on the Migration Recovery Index (MRI. 0-100)

Figure 3 presents the fixed effects from the multilevel model. Results suggest that EU membership of the origin or destination, stronger rule of law in origin countries, common language, and larger destination populations are all associated with stronger recovery. Conversely, greater geographical distance, colonial history, and stricter

destination-level pandemic measures and rule of law are associated with weaker recovery. These preliminary findings highlight institutional integration and share socio-cultural characteristics contributed to more rapid and stable migration rebounds. However, where distance was greater and where there was stricter enforcement of pandemic restrictions in the destination recovery was weaker.

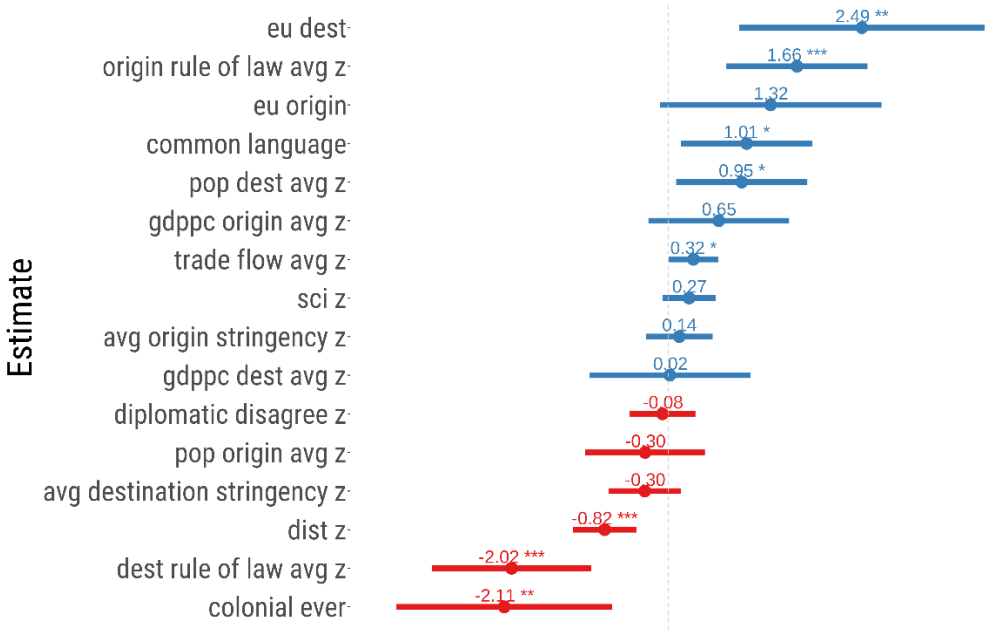

Figure 3. Fixed effects results for drivers of Mobility Recovery

Preliminary Discussion

This study seeks to advance the understanding of how global migration systems responded to and recovered from the COVID-19 shock, By integrating high-frequency digital trace data, a novel multidimensional recovery index, and multilevel modelling, it provides new empirical evidence on migration resilience and inequality in the post-pandemic landscape, and also sheds light on the influence on policy and restriction on human mobility.

We plan to further extend these analyses in a number of ways. Firstly, building on the MRI, we plan to apply Dynamic Time Warping (DTW) and hierarchical clustering to identify distinct patterns of post-pandemic migration recovery across O–D pairs. This approach will reveal groups of corridors exhibiting similar recovery trajectories and link these typologies to corridor characteristics. Further, we will add further variables to our models, considering elements like whether countries neighbour one another and if conflict is present. Given this time-period was marred by several significant disruptions (Russian invasion of Ukraine, Brexit), and it will be valuable to understand more about where something is pandemic related and where perhaps it is related to another external event.

Beyond empirical evidence, the study seeks to speak to broader theoretical debates on the resilience and transformation of migration systems. Uneven recovery trajectories reflect structural changes in global mobility, where institutional robustness and connectivity mediate adaptive capacity. Conceptualising recovery not as a simple return to equilibrium but as a form of systematic adaptation highlights the dynamic and uneven nature of post-crisis mobility, offering insight into how migration systems evolve under pressure and global uncertainty.