DEVELOPMENT TRAPS IN SMALL EU ECONOMIES: INSIGHTS FROM CROATIA'S LOCAL TRAJECTORIES

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Abstract

This paper examines the long-term dynamics of local development traps in Croatia, a small and open EU economy that experienced profound structural shocks between 2006 and 2022, including the global financial crisis and the COVID-19 pandemic and EU accession in 2013. The concept of the development trap has recently gained prominence in the literature, identifying territories that struggle to sustain economic dynamism relative to national and European peers (Iammarino et al., 2020; Diemer et al., 2022; Rodríguez-Pose et al., 2024). While previous research has highlighted the structural and institutional underpinnings of such traps, less attention has been devoted to the different development paths of local sub-national unites in small and open economies. Using a unique dataset covering all 556 Croatian municipalities and towns for 4 three-year periods from 2006 till 2022., this study applies a standardized, multi-period framework to identify two forms of development traps: (1) a stable trap reflecting persistent positioning within the same income decile (DT1) and (2) a downward trajectory trap marked by monotonic decline in standardized income (DT2). A key finding is that development traps vary heterogeneously even within the same county-level units, underscoring the importance of fine-grained territorial perspective. The results also reveal strong path dependence substantial spatial rigidity and pronounced territorial polarization between coastal and continental areas. DT1 and DT2 are not evenly distributed, suggesting differentiated structural vulnerabilities across counties. By providing new evidence from a small EU economy like Croatia, the paper offers a nuanced operationalization of development traps and highlights the need for targeted, place-sensitive policies aimed at reversing entrenched disparities and preventing further territorial divergence.

Keywords: Local development traps, Income dynamics, path dependence, spatial disparities, Croatia

JEL classification: R11, R12, O18,

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Introduction

Recent dynamics of spatial inequalities in Europe have sharpened both academic and policy attention on the forces shaping uneven territorial development. A growing body of research highlights not only persistent differences in regional performance levels, but also marked variation in the direction and pace at which key socioeconomic indicators evolve across European regions (European Commission 2017a, 2017b, 2022; Iammarino, Rodríguez-Pose and Storper 2019, Constantin, Daniela-Luminița, and Clara-Alexandra Volintiru. 2024.). These findings indicate that disparities are no longer confined to static gaps in key economic indicators; rather, they reflect divergent development paths, where some territories accelerate while others stagnate or decline.

Within this context, the concept of the regional development trap has gained significant traction. Development traps refer to situations in which territories experience persistent stagnation or erosion of economic dynamism despite broader macroeconomic improvements (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022). Such traps are increasingly observed not only in structurally weak or peripheral areas but also in intermediate and relatively affluent regions whose institutional or productive structures fail to adapt to technological change, global competition or demographic pressures.

Existing research has also emphasized the broader socioeconomic and political implications of such traps. Regions facing prolonged stagnation often exhibit rising dissatisfaction with central authorities, declining trust in institutions and increasing support for anti-establishment

or Eurosceptic movements, phenomena associated with the emerging "geography of discontent" (Rodríguez-Pose et al. 2024; Diemer et al. 2022). The persistence of these traps poses serious challenges for development and cohesion policy, particularly as they risk reinforcing territorial divides and fueling political polarization.

Despite the progress made in conceptualizing and identifying development traps, the empirical literature has remained overwhelmingly focused on higher territorial levels, especially NUTS 2 and NUTS 3 regions (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022; Çınar 2023a, 2023b Rodríguez-Pose et al. 2024; Balland and Boschma 2024; Tessarin et al. 2025).

Analyses at these scales have been crucial in advancing theoretical understanding, yet they may obscure substantial heterogeneity within regions (Constantin, Daniela-Luminița. 2021). Indeed, structural vulnerabilities, adaptive capacities, and exposure to shocks often manifest at much finer spatial scales (Constantin, Daniela-Luminița. 2021), such as municipalities and towns (Local Administrative Units - LAU). Up to the knowledge of the author, no prior study has examined development traps at the LAU level, even though these are the administrative entities where development outcomes has been especially heterogenic.

Croatia provides a compelling empirical case for this type of investigation. As a small and open post-socialist EU economy, Croatia experienced one of the deepest and longest recessions in the European Union during the global financial crisis, with a cumulative contraction unmatched by most member states. These shocks were spatially asymmetric, disproportionately affecting localities with weaker diversification and lower administrative capacity.

Moreover, Croatia's EU accession in 2013 introduced new opportunities and challenges through regulatory harmonization, access to cohesion funding and integration into the Single Market. Differences in administrative capacity and strategic orientation shaped how LAUs were able to benefit from EU membership, thereby contributing to increasingly divergent development trajectories.

Finally, the COVID-19 pandemic posed yet another major shock. Owing to the Croatian economy's strong dependence on tourism and face-to-face services, the pandemic had an asymmetric spatial impact, reinforcing pre-existing disparities across municipalities and towns.

Despite the importance of these transformations, and despite Croatia's two-tired, highly fragmented sub-national system of 556 local government units, there has been no systematic analysis of development trajectories at this granular level. Understanding long-term development paths within this administrative structure is essential, where structural vulnerabilities accumulate and where resilience is most directly tested.

To address this gap, the present study provides the first comprehensive, long-term examination of income-based development traps across all Croatian municipalities and towns during the period 2006–2022, a uniquely dynamic and turbulent timeframe for Croatia. This period captures three major and conceptually relevant phases: the global financial and economic crisis (2008–2014), during which Croatia experienced one of the deepest and longest recessions in the EU, the country's accession to the European Union in 2013, which introduced new development opportunities, regulatory adjustments and financial instruments and the COVID-19 shock (2020–2021), which had particularly strong spatial consequences given Croatia's dependence on tourism. Together, these events created markedly heterogeneous local trajectories, making the 2006–2022 window especially suitable for identifying structural vulnerabilities and testing the persistence of stagnation or decline at the local level.

Building on the existing development trap literature (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022, Rodríguez-Pose et al. 2024) we apply a readjusted and context-sensitive income-based methodological framework specifically adapted to the structural features of Croatia's local economy, its administrative fragmentation and its pronounced spatial heterogeneity. Within this modified framework, we identify two forms of income-based development traps: a first type (DT1), which captures persistent stagnation within the same relative income tier (decile), and a second type (DT2), which reflects a downward developmental trajectory manifested as a monotonic decline in standardized income.

The empirical findings reveal strong path dependence, entrenched territorial divides and significant spatial clustering of stagnation and decline. Continental counties exhibit particularly high concentrations of DT1 on low level of income and DT2 municipalities, while coastal and urban areas more often maintain stable high-income trajectories. By integrating these patterns

into a cohesive analytical framework, the paper contributes to the understanding of development traps in small EU economies and offers evidence for designing place-sensitive development policies tailored to structurally vulnerable localities.

2. Conceptual Background and Literature review

Understanding the dynamics of territorial disparities, particularly in small and open EU economies, requires a conceptual framework that captures not only structural disadvantages, but also the long-term mechanisms that constrain upward mobility. The notion of the regional development trap, as recently formalized in EU-level research, offers one such framework (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022; Balland and Boschma 2024).

It enables the detection of territories that, despite being embedded within the same macroeconomic and institutional environment, systematically fail to improve their socioeconomic position or even experience gradual decline. This section provides the conceptual foundations for the analysis, synthesizes key insights from the literature, and positions the Croatian case within broader European debates.

2.1 Origins of the Development Trap Concept

The notion of a development trap has evolved from a broader effort to understand why some economies fail to sustain long-term growth and structural transformation. Early conceptualisations emerged from the macroeconomic literature on the middle-income trap, which describes countries that achieve moderate levels of development but subsequently struggle to converge toward high-income status (Gill and Kharas 2015; Felipe 2012). Although originally developed for national economies, the analytical intuition behind the middle-income trap, persistent stagnation despite broader opportunities, laid important groundwork for subsequent regional applications.

More recently, scholars have adapted these ideas to the European regional context. The landmark contribution by Iammarino et al. (2020) and Diemer et al. (2022) conceptualised the regional development trap as a situation in which territories experience persistent stagnation or decline across key socio-economic dimensions, even when national-level indicators show improvement. Their framework highlights how deep-rooted structural conditions—weak institutions, demographic pressures, inadequate innovation systems, and rigid industrial structures—can lock regions into trajectories of low productivity and limited adaptive capacity.

Following this conceptual shift, several empirical studies have explored the prevalence and drivers of development traps across European regions (Diemer et al. 2022; Rodríguez-Pose et al. 2024). This body of work extends the idea beyond purely economic stagnation, showing that regions caught in development traps often also exhibit increasing socio-political discontent, reduced trust in institutions, and heightened support for anti-establishment parties. This connection with the "geography of discontent" underscores that development traps are multidimensional phenomena with implications for economic performance, territorial cohesion and democratic stability.

In parallel, complementary perspectives have emerged within evolutionary economic geography, offering a different but compatible lens for interpreting development traps. Recent work by Balland and Boschma (2024) proposes an evolutionary approach to regional development traps, focusing on capability accumulation, technological relatedness and long-term path dependency. According to this view, regions become trapped not only because of low productivity or institutional weaknesses, but because their existing capability bases are structurally misaligned with new technological opportunities. Regions lacking related capabilities, diversified knowledge bases or access to innovation networks are more likely to persist in low-complexity activities, making structural upgrading difficult. This evolutionary perspective enriches the broader conceptual landscape by highlighting the role of technological change, capability building and regional branching processes in shaping long-term development trajectories.

Taken together, these different approaches, macro-level analyses of middle-income traps, structural-institutional theories of regional development traps and evolutionary-economic perspectives offered a multidimensional understanding of why some territories diverge from

sustainable development paths. While they place emphasis on different mechanisms, they converge on a central insight: territories fall into development traps when they lack the institutional, economic, or capability foundations required to sustain adaptation, diversification and long-term resilience.

Despite the richness of this emerging literature, most empirical studies of development traps remain focused on higher territorial levels, primarily NUTS 2 and NUTS 3 regions (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022; Çınar 2023a, 2023b Rodríguez-Pose et al. 2024; Balland and Boschma 2024; Tessarin et al. 2025).. As acknowledged by Iammarino et al. (2020), Diemer et al. (2022) and Rodríguez-Pose et al. (2024), this focus is partially a consequence of data availability and the EU's institutional emphasis on NUTS levels in cohesion policy. However, this scale may mask crucial intra-regional heterogeneity, particularly in countries characterised by fragmented local governance, substantial economic diversity within regions and unequal distribution of administrative capacities across municipalities. For such contexts, analyses implemented at Local Administrative Unit (LAU) levels offer finer-grained insights into territorial vulnerabilities and development trajectories (Constantin, Daniela-Luminița. 2021.)

The importance of examining development dynamics at sub-regional scales is strongly reinforced by the public administration literature. For instance, the study by Wänström and Persson (2024), demonstrates that municipalities often play a central role in shaping local development outcomes, possessing institutional capacities, strategic priorities and governance practices that differ substantially from those of regional authorities. Their findings highlight that the effectiveness of regional development strategies depends not only on the design of regional frameworks but also on how municipalities interpret, adapt and implement these strategies on the ground, as well as on the functioning of coordination mechanisms between regional and local bodies.

Such insights strongly motivate the application of development trap frameworks at the LAU level, particularly in institutional contexts where local government units are numerous, heterogeneous, and hold substantial responsibilities in development planning.

2.2. Relevance of the Development Trap Concept for Croatia

Croatia presents an especially compelling environment for LAU-level analysis of development traps. As a small, open, and post-socialist economy, it has undergone profound structural transformations over the past two decades. These include EU accession, deeper integration into global markets, and exposure to major external shocks such as the global financial crisis and the COVID-19 pandemic. The global financial crisis hit Croatia particularly hard, resulting in the longest and deepest recession among EU member states, and its effects were unevenly distributed across the country. Some municipalities experienced prolonged stagnation due to declining industrial bases, demographic ageing, outmigration, or dependence on vulnerable sectors such as tourism. Conversely, others demonstrated greater resilience owing to more diversified economic structures or stronger institutional capacities. The COVID-19 shock reinforced and magnified these disparities—tourism-intensive coastal municipalities were severely affected, while many continental areas continued to struggle with long-standing structural weaknesses and population decline. These dynamics underscore the need for analytical frameworks capable of detecting stagnation or decline at the level where such processes are actually experienced: the municipality.

Beyond its economic profile, Croatia's administrative architecture further strengthens the rationale for conducting development trap analysis at the LAU level. The country comprises 556 municipalities and towns (LAU 2), marked by pronounced fragmentation, substantial variation in administrative capacity. This heterogeneity is not merely institutional, it shapes how localities formulate development priorities, respond to external shocks, and navigate long-term structural pressures. Unlike Member States with stronger regional governance structures, Croatian municipalities are the primary units responsible for local development planning. They therefore operate as crucial arenas in which development traps can form, persist, or be overcome. Analyses conducted at the NUTS 2 or NUTS 3 level inevitably flatten this diversity, masking the fact that high-performing and stagnating municipalities can coexist within the same region while following sharply divergent development trajectories.

Furthermore, the intersection between development traps and political dynamics, illuminated by recent "geography of discontent" research, is particularly relevant for Croatia. Local economic stagnation among EU regions has been associated with rising dissatisfaction with national policies, lower levels of institutional trust and varying degrees of Euroscepticism (Rodríguez-Pose et al. 2024). Identifying where development traps are most acute at the local level is therefore not only analytically useful but policy relevant, as these traps may influence broader patterns of political behaviour, community resilience and citizens' perceptions of territorial fairness.

Taken together, these considerations provide a strong conceptual, empirical, and policy rationale for applying the development trap framework at the municipal (LAU) level in Croatia. The Croatian case, characterised by structural heterogeneity, demographic pressures, exposure to multiple external shocks, and a fragmented local governance system, offers a natural laboratory for analysing how development traps emerge, persist, and interact with macroeconomic and institutional transformations. By integrating insights from the multidimensional, economic, and evolutionary approaches to development traps with findings from public administration research, this study contributes to a more nuanced understanding of territorial divergence in small EU economies, while highlighting the importance of local governance structures in shaping long-term development trajectories.

3. Data and Empirical Strategy

This section outlines the empirical foundations of the study and presents the methodological framework used to identify income-based development traps across all 556 Local Government Units (LGUs) in Croatia over four three-year periods between 2006–2022. The goal is to produce a coherent, longitudinal classification of LGU trajectories that reflects both persistent structural stagnation and systematic decline. The approach builds on the emerging development trap literature (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022; Rodríguez-Pose et al. 2024) while adapting and refining it to the specific institutional and territorial characteristics of Croatia and data limitations.

The empirical strategy is anchored in two complementary trap concepts. The first (DT1) focuses on long-term positional rigidity, where an LAU remains confined to the same segment of the national income distribution across all periods. The second (DT2) captures monotonic deterioration, identifying LAUs that consistently lose relative ground. By jointly considering stagnation and decline, the approach provides a nuanced typology of developmental trajectories that can support more precise place-based policy design.

3.1. Data

The empirical analysis draws on official national datasets corresponding to four reference periods used in Croatia's Index of Development (*hr. Index razvijenosti*), the central instrument for assessing and classifying municipalities and towns (LAUs) under the Croatian local and regional development framework. The evaluation and classification of all municipalities, towns and counties were first officially implemented in 2010 on the basis of the Law on Regional Development of the Republic of Croatia (Official Gazette 153/09). The initial cycle followed the methodological provisions defined in the 2010 Regulation on the Development Index (Official Gazette 63/10), which specified the indicators, the calculation procedure, and the relevant data sources. Between 2010 and 2017, two official assessment cycles were carried out (Official Gazette 89/10, 158/13). In 2017 new adoption of the Indexed has been implemented (Official Gazette 131/17), which harmonised indicator definitions and provided the methodology used in the latest cycle.

These institutional and methodological developments underpin the four official reference periods used in this study:

- 2006–2008 (used in the 2010 Index),
- 2010–2012 (used in the 2013 Index),
- 2014–2016 (used in the 2018 Index),
- 2020–2022. (used in the 2024 Index),

Although the official Development Index is a composite measure combining several socio-economic indicators, income per capita is the indicator that appears in all four official calculation cycles, from 2010 to the latest 2024 update.

For each of the 556 LAUs, the datasets contain the LAU name, county (hr. županija), and the average income per capita for the corresponding three-year period. To ensure comparability across all four periods, all income values were re-standardised using a uniform statistical procedure, allowing the construction of consistent decile distributions and the identification of development trap dynamics.

3.2. Development Trap Typology: Conceptual Overview

Before classifying Croatian LAUs into specific development trap categories, it is essential to clarify the underlying conceptual distinction between the two mechanisms examined in this study. Development traps may manifest either through long-term positional rigidity or through gradual deterioration (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022; Rodríguez-Pose et al. 2024), and capturing both patterns is crucial for understanding the diversity of local development trajectories. To reflect this, the empirical strategy operationalises two complementary trap types.

The first type of development trap, DT1, captures LAUs that remain persistently confined to the same relative segment of the national income distribution over 2006–2022 period. An LAU is classified as DT1 if it does not experience any upward movement into a higher decile band and consistently remains within the same three-decile block—whether low (deciles 1–3), middle (deciles 4–6), or high (deciles 7–9). Finally, there is specific subgroup for LAUs which remain in top decile (decile 10). This persistent positional stability signals a form of structural immobility, indicating that the LAU is effectively "locked in" to its long-term socioeconomic status. Even in cases where relative values do not deteriorate, the inability to upgrade reflects an absence or insufficient activation of key development drivers such as innovation, economic diversification, entrepreneurial dynamism, demographic vitality, or administrative capacity. DT1 therefore denotes territories characterised by chronic stagnation: places that do not fall behind but also do not progress.

The second trap type, DT2, focuses on dynamic deterioration rather than stability. It identifies LAUs whose standardized income values follow a strictly decreasing trajectory across all observed four periods, signalling a continuous loss of relative position within the national distribution. Unlike DT1's structural stagnation, DT2 reflects territories for which development conditions, manifested through income indicator, are actively worsening. When these two mechanisms overlap, when an LAU is both persistently low-income and continuously declining, the resulting combination represents the most severe form of developmental vulnerability.

3.3. Methodological framework and Empirical strategy

Keeping in mind the conceptual perspective, the empirical strategy consists of several sequential steps designed to capture long-term developmental trajectories of LAUs in Croatia. Because the focus of this study is on persistent relative performance and directional change over time, the methodology combines standardized indicators, relative income rankings and longitudinal classification rules. The approach follows four main stages: (1) standardisation of income per capita for each period, (2) assignment of LAUs to income deciles, (3) identification of DT1 traps through persistent positional stability, and (4) detection of DT2 traps based on monotonic decline in standardized values. Together, these steps form a coherent analytical framework capable of distinguishing between stagnation and decline—two structurally distinct development dynamics that are central to the understanding of territorial divergence.

The first step involves transforming raw income per capita into standardized z-scores for each reference period. This procedure ensures full comparability across time despite shifts in the national income distribution.

For each LAU i in period t, the z-score is calculated as:

$$Z_{i,t} = (X_{i,t} - \bar{X}_t) / s_t, \quad (1)$$

where $X_{i,t}$ denotes the LAU's income per capita, $\bar{X}_t$ is the national mean, and s_t the standard deviation for that period. Standardisation places each period's distribution on a

common metric, centred at zero and expressed in units of variation, allowing for the identification of meaningful upward or downward movements relative to the national context. This approach is particularly important in the Croatian case, where macroeconomic volatility, EU accession and post-crisis adjustments altered absolute income levels across the sixteen-year window.

The second step uses these standardized values to construct income deciles for each period. Each LAU is assigned to one of ten equally sized groups, ranging from the lowest (decile 1) to the highest (decile 10) segment of the national income distribution. Deciles provide a non-parametric and distribution-free measure of relative socioeconomic standing, making them well-suited for identifying persistent structural positions. The sequence of decile values across the four periods forms the empirical basis for diagnosing DT1 development traps.

A DT1 trap occurs when an LAU remains within the same three-decile block (1–3, 4–6, or 7–9) across all periods without any upward movement, signalling chronic stagnation. Three variants—DT1_low, DT1_middle and DT1_high—capture the different structural contexts within which stagnation can occur (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022). There is also fourth group for LAUs that have been constantly in highest decile 10 (DT1_top).

The third component of the methodology identifies DT2 traps by focusing on directional decline rather than positional stability. An LAU is classified as DT2 if its standardized income values form a strictly decreasing sequence across all four reference periods. Since z-scores reflect relative performance within each national distribution, a monotonic downward pattern indicates that the LAU is consistently losing ground—not only stagnating, but structurally deteriorating over time. DT2 therefore captures localities experiencing deepening developmental challenges, eroding fiscal capacity or reduced economic dynamism. The final step integrates both dimensions, distinguishing units that exhibit only stagnation (DT1), only decline (DT2), or combined vulnerabilities. The combined classification identifies the most structurally fragile LAUs—those locked into persistent income positions and experiencing worsening performance—thus enabling a nuanced, policy-relevant understanding of territorial divergence in Croatia.

By combining DT1 and DT2, our approach consolidates four categories of LAUs: I) DT1-only units, divided into four internal subtypes; II) DT2-only units; III) units that fall under both DT1 and DT2; IV) and those that do not fall into either developmental trap. Through this classification, it becomes possible to distinguish several critical groups: structurally entrenched low-income LAUs, LAUs that are on a downward trajectory regardless of their initial conditions, those experiencing compounded vulnerabilities by being both DT1_low and DT2, and finally, LAUs that sustain or improve their relative performance. This integrated approach enhances the analytical precision of diagnosing developmental traps and highlights where targeted policy interventions may be most needed.

4. Results

The empirical distribution of development traps across Croatian municipalities demonstrates a strong pattern of structural immobility, consistent with the theoretical expectations laid out in the development-trap literature (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022). As shown in Table 1, more than half of all LAUs remain persistently locked into the same relative income tier over the entire 2006–2022 period, with particularly large shares in the DT1_low (20.1% of all LAUs), DT1_middle (13.1%), and DT1_high (15.3%) categories. This confirms the presence of long-term positional rigidity, a hallmark of DT1-type stagnation. Meanwhile, DT2 traps, capturing monotonic deterioration, affect 10,1 % of all LAUs. Although numerically smaller, this group represents a critical subset of localities in which development fundamentals are actively worsening rather than merely failing to improve. These findings resonate with the broader European evidence that structural vulnerabilities are persistent and deeply path-dependent (Iammarino, Rodríguez-Pose, and Storper 2020; Diemer et al. 2022; Rodríguez-Pose et al. 2024, Balland and Boschma 2024), while demonstrating that the phenomenon is equally salient at the highly granular LAU level.

Table 1. Summary of development trap classifications (number and percentage of LAUs)

Group	Number	Percent
DT1_low	112	20.1%
DT1_middle	73	13.1%
DT1_high	85	15.3%
DT1_top	29	5.2%
DT1 = 0	257	46.2%
DT2 = 1	56	10.1%
DT2 = 0	500	89.9%
DT1 only	267	48.0%
DT2 only	24	4.3%
DT1 & DT2	32	5.8%

Source: Author's calculation based on harmonised LAU dataset (2006–2022).

The spatial distribution of these traps on regional level (NUTS 3), across counties (Table 2) further reinforces the argument that Croatia exhibits a "diverging development trajectory" characteristic of small, open and structurally heterogeneous economies. In first place, it reveals a marked spatial polarisation that aligns closely with the conceptual expectations laid out in the development trap literature (Iammarino, Rodríguez-Pose and Storper 2020; Diemer et al. 2022). Moreover, the results point to substantial variation not only between counties but also *within* the same county-level units, underscoring the importance of analysing these phenomena at a finer, local scale.

Table 2. Regional distribution of development traps by county (number and percentage of LAUs)

County (NUTS 3)	Total	DT1_low	DT1_middle	DT1_high	DT1_top	DT1=0	DT2=1	DT2=0
Bjelovar–Bilogora County	23	12 (52.2%)	4 (17.4%)	2 (8.7%)	0 (0.0%)	5 (21.7%)	4 (17.4%)	19 (82.6%)
Brod–Posavina County	28	16 (57.1%)	0 (0.0%)	1 (3.6%)	0 (0.0%)	11 (39.3%)	2 (7.1%)	26 (92.9%)
Dubrovnik–Neretva County	22	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	22 (100.0%)	0 (0.0%)	22 (100.0%)
City of Zagreb	1	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	1 (100.0%)
Istria county	41	0 (0.0%)	0 (0.0%)	4 (9.8%)	7 (17.1%)	30 (73.2%)	3 (7.3%)	38 (92.7%)
Karlovac County	22	3 (13.6%)	2 (9.1%)	6 (27.3%)	1 (4.5%)	10 (45.5%)	3 (13.6%)	19 (86.4%)
Koprivnica–Križevci County	25	12 (48.0%)	5 (20.0%)	1 (4.0%)	1 (4.0%)	6 (24.0%)	4 (16.0%)	21 (84.0%)
Krapina–Zagorje County	32	0 (0.0%)	2 (6.2%)	13 (40.6%)	2 (6.2%)	15 (46.9%)	3 (9.4%)	29 (90.6%)
Lika–Senj County	12	1 (8.3%)	0 (0.0%)	2 (16.7%)	0 (0.0%)	9 (75.0%)	2 (16.7%)	10 (83.3%)
Međimurje County	25	6 (24.0%)	6 (24.0%)	1 (4.0%)	0 (0.0%)	12 (48.0%)	1 (4.0%)	24 (96.0%)
Osijek–Baranja County	42	15 (35.7%)	7 (16.7%)	4 (9.5%)	1 (2.4%)	15 (35.7%)	3 (7.1%)	39 (92.9%)

County (NUTS 3)	Total	DT1_low	DT1_middle	DT1_high	DT1_top	DT1=0	DT2=1	DT2=0
Požega–Slavonia County	10	5 (50.0%)	0 (0.0%)	2 (20.0%)	0 (0.0%)	3 (30.0%)	1 (10.0%)	9 (90.0%)
Primorje–Gorski Kotar County	36	0 (0.0%)	0 (0.0%)	6 (16.7%)	12 (33.3%)	18 (50.0%)	7 (19.4%)	29 (80.6%)
Sisak–Moslavina County	19	2 (10.5%)	4 (21.1%)	3 (15.8%)	1 (5.3%)	9 (47.4%)	5 (26.3%)	14 (73.7%)
Split–Dalmatia County	55	8 (14.5%)	7 (12.7%)	9 (16.4%)	0 (0.0%)	31 (56.4%)	6 (10.9%)	49 (89.1%)
Varaždin county	28	3 (10.7%)	6 (21.4%)	10 (35.7%)	1 (3.6%)	8 (28.6%)	1 (3.6%)	27 (96.4%)
Virovitica–Podravina County	16	9 (56.2%)	2 (12.5%)	2 (12.5%)	0 (0.0%)	3 (18.8%)	5 (31.2%)	11 (68.8%)
Vukovar–Srijem County	31	13 (41.9%)	5 (16.1%)	2 (6.5%)	0 (0.0%)	11 (35.5%)	0 (0.0%)	31 (100.0%)
Zadar County	34	1 (2.9%)	9 (26.5%)	4 (11.8%)	0 (0.0%)	20 (58.8%)	0 (0.0%)	34 (100.0%)
Zagreb County	34	4 (11.8%)	6 (17.6%)	12 (35.3%)	3 (8.8%)	9 (26.5%)	3 (8.8%)	31 (91.2%)
Šibenik–Knin County	20	2 (10.0%)	8 (40.0%)	1 (5.0%)	0 (0.0%)	9 (45.0%)	3 (15.0%)	17 (85.0%)
Republic of Croatia	556	112 (20.1%)	73 (13.1%)	85 (15.3%)	29 (5.2%)	257 (46.2%)	56 (10.1%)	500 (89.9%)

Source: Author's calculation based on harmonised LAU dataset (2006–2022).

Continental counties (e.g. Bjelovar–Bilogora, Koprivnica–Križevci, Osijek–Baranja, Požega–Slavonia, Virovitica–Podravina, and Vukovar–Srijem) show some of the highest concentrations of DT1_low municipalities, often exceeding 40–55% of all local units within the county. These patterns indicate persistent structural stagnation among territories already positioned at the bottom of the national income distribution. The high shares of DT1_low reflect not only economic rigidities but also signalling structural weaknesses widely recognised as drivers of regional development traps across Europe (Iammarino et al. 2020; Balland & Boschma 2024)

At the same time, several northern counties, located in relative proximity to the City of Zagreb and the EU internal border, most notably *Zagreb County, Varaždin,* and *Krapina–Zagorje County*, exhibit the highest concentration of DT1_high municipalities and towns, reflecting their comparatively stronger structural conditions and improved long-term positional stability.

In contrast, the coastal counties (e.g. Istria, Primorje–Gorski Kotar, Split–Dalmatia, and Zadar) display a very different developmental profile, characterised by a high concentration of municipalities not affected by any development trap (DT1 = 0). For instance, in Primorje–Gorski Kotar County, approximately 50% of local units fall outside any DT1 trap category, while the remaining half are persistently located in the highest income decile groups (DT1_high and DT1_top). This pattern could indicate the structural and spatial advantages enjoyed by coastal, tourism-intensive regions, which have benefited from favourable global demand trends, stronger economic diversification and the ability to leverage opportunities arising from EU membership.

Obviously, the coastal–continental divide emerges clearly here. While coastal counties tend to sustain stable or high-income positions (DT1_high, DT1_top), continental counties, especially those in the Slavonia region, remain locked in structurally weaker developmental positions (DT1_low). By contrast, northern counties appear to benefit from effects associated with proximity to the capital city and cross-border economic linkages, which help stabilise or elevate their long-term development trajectories.

Perhaps the most concerning finding from a policy perspective is the uneven territorial distribution of DT2 traps, which capture severe and persistent monotonic decline. Counties such as Sisak–Moslavina and Virovitica–Podravina county show above-average shares of DT2 municipalities, with some exceeding 30%, nearly three times the national average of 10.1%. These downward trajectories indicate not only persistent stagnation but a deepening loss of developmental capacity, consistent with the "erosion mechanism" described in evolutionary trap theory (Balland & Boschma 2024) and the broader geography of discontent literature (Dijkstra et al. 2019; Rodríguez-Pose et al. 2024).

The absence of DT1_low or DT2 traps in counties such as Istria and Dubrovnik–Neretva county highlights the resilience of certain coastal territories and reinforces the earlier argument that Croatia's long-term territorial divergence is shaped by multi-scalar, path-dependent processes tied to sectoral specialisation and exposure to external shocks. In sum, the county-level results not only reaffirm the existence of development traps but also reveal the territorial geometry of stagnation and decline in Croatia, a pattern fully consistent with Croatian structural conditions and broader European empirical evidence. This strengthens the case for applying a development trap framework at the LAU scale, where fine-grained vulnerabilities are most visible and where targeted, place-sensitive interventions can be most effective for reversing entrenched spatial inequalities.

4.1. Robustness checks

To ensure the validity and stability of the findings presented in the previous section, it is essential to conduct a set of robustness checks capable of assessing whether the identified development traps (DT1 and DT2) reflect genuine long-term structural patterns rather than artefacts of the specific classification criteria or periodisation. In this respect, the application of Markov transition matrices provides a robustness exercise. By tracing the probabilities of upward, downward or stationary movements across income deciles between consecutive reference periods, these matrices uncover the underlying mobility structure driving LAU-level trajectories.

Before interpreting the results of the four transition matrices (Table 3a, 3b, 3c and 3d), it is important to clarify how these tables should be read and what their values represent. Each matrix reports row-wise percentages, meaning that every row (1–10) sums to 100% and describes the *full distribution of possible destinations* for local units (LAUs) starting in a given income decile in the earlier period. The rows (1–10) indicate the decile in which an LAU was located in the *earlier* reference period, with row 1 corresponding to the lowest-income decile and row 10 to the highest-income decile. The columns (1–10) represent the decile in which the same LAUs are found in the *later* reference period, again ranging from the lowest (1) to highest (10) decile. Each cell (i, j) therefore shows the percentage of all LAUs that began in decile i in the earlier period and moved to decile j in the later period. Because rows sum to 100%, the matrices provide a probabilistic representation of decile mobility, indicating the likelihood that a municipality either remains in the same decile, moves upward (cells to the right of the diagonal), or moves downward (cells to the left of the diagonal). The diagonal cells (i = j) capture positional stability, while the off-diagonal cells provide insight into upward or downward movement within the national income distribution. Taken together, these matrices provide a dynamic, mobility-based complement to the DT1 and DT2 classifications, allowing for a deeper examination of stagnation, limited mobility, and decline across Croatian LAUs.

The results presented in Table 3a confirm that the period encompassing the global financial crisis (2006–2008 → 2010–2012) produced limited upward mobility and strong positional persistence across Croatian municipalities. The lowest-income LAUs (decile 1) display extraordinarily high stability, with 84% remaining in the bottom decile, while only marginal shares move upward. Similarly, top-decile municipalities remain overwhelmingly stable (decile

10 - 83,7%). This asymmetric rigidity in the distribution emphasised the prevalence of long-term stagnation among structurally weaker territories (DT1_low) and the entrenched advantages of high-performing municipalities and towns (DT1_high, DT1_top). The crisis acted not as a shock that reshuffled territorial hierarchies, but rather as a shock that reinforced existing structural divides, mirroring the development-trap dynamics highlighted by Iammarino, Rodríguez-Pose and Storper (2020) and Diemer et al. (2022).

Table 3a. Transition matrix 2006–2008 → 2010–2012 (row-wise percentages)

Decile	1	2	3	4	5	6	7	8	9	10
1	84.0	12.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
2	10.4	60.4	25.0	2.1	0.0	2.1	0.0	0.0	0.0	0.0
3	6.0	20.0	44.0	26.0	2.0	2.0	0.0	0.0	0.0	0.0
4	0.0	8.2	20.4	38.8	22.4	10.2	0.0	0.0	0.0	0.0
5	0.0	2.0	6.0	18.0	48.0	22.0	2.0	2.0	0.0	0.0
6	0.0	0.0	4.1	6.1	24.5	38.8	22.4	2.0	2.0	0.0
7	0.0	0.0	0.0	2.0	2.0	22.4	49.0	20.4	4.1	0.0
8	0.0	0.0	0.0	0.0	0.0	2.0	20.0	58.0	18.0	2.0
9	0.0	0.0	0.0	0.0	0.0	0.0	6.0	16.0	62.0	16.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	14.3	83.7

Source: Author's calculation based on harmonised LAU dataset

The transition patterns in Table 3b (2010–2012 → 2014–2016), covering the period of national economic decline (till 2014) but also period of Croatia's EU accession, continue to show pronounced diagonal dominance but modestly higher mobility in the middle deciles (4–6). Yet, even during this relatively favourable phase, a clear majority of municipalities remained in the same income decile. Although the moderate upward movements observed in some middle-income LAUs suggest selective improvements, overall pattern confirmed that EU membership did not automatically and in short-run translate for the most of LAUs into upward developmental trajectories.

Table 3b. Transition matrix 2010–2012 → 2014–2016 (row-wise percentages)

Decile	1	2	3	4	5	6	7	8	9	10
1	76.9	23.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	19.2	53.8	21.2	3.8	1.9	0.0	0.0	0.0	0.0	0.0
3	1.9	19.2	48.1	25.0	5.8	0.0	0.0	0.0	0.0	0.0
4	0.0	3.8	25.0	48.1	17.3	3.8	1.9	0.0	0.0	0.0
5	0.0	0.0	1.9	19.2	48.1	21.2	9.6	0.0	0.0	0.0
6	1.9	0.0	1.9	3.8	25.0	36.5	28.8	1.9	0.0	0.0
7	0.0	0.0	0.0	0.0	1.9	30.8	28.8	32.7	3.8	1.9
8	0.0	0.0	0.0	0.0	0.0	2.0	31.4	45.1	17.6	3.9
9	0.0	0.0	0.0	0.0	0.0	2.0	0.0	20.4	63.3	14.3
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	17.6	80.4

Source: Author's calculation based on harmonised LAU dataset

In Table 3c (2014–2016 → 2020–2022), covering the not only period of the post EU accession and national economic growth, but also shaped by the COVID-19 shock, decile transitions display even lower mobility than in previous intervals. The bottom deciles again exhibit overwhelming positional rigidity, while top-decile LAUs remain exceptionally stable. This is consistent with the spatially uneven exposure to the pandemic documented in previous section, where high-performing counties maintained their long-term comparative advantages. Conversely, many weaker municipalities continued to lack the adaptive capacity necessary to improve their relative position, reinforcing the logic of DT1_low traps. The near-absence of upward transitions highlights that Croatia's regional development hierarchy remained largely unchanged despite major external shocks, precisely in line with the development-trap literature that conceptualises stagnation as a long-term structural condition rather than a short-term fluctuation.

Table 3c. Transition matrix 2014–2016 → 2020–2022 (row-wise percentages)

Decile	1	2	3	4	5	6	7	8	9	10
1	84.9	11.3	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0
2	20.8	62.3	13.2	3.8	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	19.2	51.9	23.1	1.9	3.8	0.0	0.0	0.0	0.0
4	0.0	9.4	32.1	32.1	17.0	9.4	0.0	0.0	0.0	0.0
5	0.0	3.8	5.8	30.8	46.2	9.6	3.8	0.0	0.0	0.0
6	0.0	0.0	0.0	11.3	26.4	35.8	22.6	3.8	0.0	0.0
7	0.0	0.0	0.0	3.8	7.5	24.5	41.5	20.8	0.0	1.9
8	0.0	0.0	0.0	0.0	3.8	13.5	15.4	44.2	21.2	1.9
9	0.0	0.0	0.0	0.0	0.0	1.9	13.2	28.3	41.5	15.1
10	0.0	0.0	0.0	0.0	0.0	1.9	1.9	1.9	26.9	67.3

Finally, the long-run transition matrix in Table 3d (2006–2008 → 2020–2022) provides the clearest confirmation of deep territorial path dependence. Over the full 16-year period and severe external shocks (global financial crisis, EU accession, COVID-19 crisis), upward transitions are exceedingly rare across all starting deciles, while the majority of municipalities remain in, or return to, their original relative position.

Table 3d. Long-run transition matrix 2006–2008 → 2020–2022 (row-wise percentages)

Decile	1	2	3	4	5	6	7	8	9	10
1	78.0	20.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	20.0	50.0	14.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0
3	8.0	18.0	48.0	14.0	4.0	8.0	0.0	0.0	0.0	0.0
4	2.0	12.2	26.5	24.5	22.4	10.2	2.0	0.0	0.0	0.0
5	0.0	6.0	8.0	26.0	34.0	18.0	8.0	0.0	0.0	0.0
6	2.0	0.0	0.0	10.0	30.0	20.0	26.0	12.0	0.0	0.0
7	0.0	0.0	0.0	6.1	4.1	36.7	24.5	22.4	6.1	0.0
8	0.0	0.0	0.0	2.0	4.0	10.0	28.0	34.0	20.0	2.0
9	0.0	0.0	0.0	0.0	0.0	2.0	6.0	28.0	38.0	26.0
10	0.0	0.0	0.0	0.0	0.0	0.0	2.0	6.1	28.6	63.3

This long-horizon rigidity goes in line with previous identification of nearly half of all LAUs as being persistently locked in DT1 stagnation. The long-run matrix thus captures the cumulative effect of structural stagnation and decline: LAUs in DT1_low overwhelmingly remain in the bottom deciles, while a significant proportion of DT2 municipalities demonstrate clear downward movement. This confirms that development traps in Croatia operate as durable, multi-period processes, shaped by structural economic legacies, demographic shrinkage, and uneven institutional capacity, reinforcing the broader European evidence on path-dependent territorial divergence (Rodríguez-Pose et al. 2024; Balland & Boschma 2024).

Taken together, Tables 7a–7d provide robust, complementary evidence supporting that Croatian LAUs face severely constrained upward mobility and that both stagnation (DT1) and decline (DT2) are deeply embedded in the regional development landscape. The Markov-based robustness checks thus not only validate the earlier classification results but also reveal the probabilistic structures through which development traps persist, evolve, and intensify across time.

Conclusion

This paper set out to provide the first systematic analysis of income-based development traps at the local level for a small and open EU economy like Croatia. By applying a standardized, multi-period framework to all 556 municipalities and towns from 2006 to 2022, the study offers new empirical evidence on the long-term mechanisms of territorial stagnation and decline in a context marked by administrative fragmentation, pronounced spatial heterogeneity and uneven economic resilience.

The results reveal several important insights. First, nearly half of all LAUs are persistently locked in the same relative income tier across the entire 16-year period, confirming the presence of strong path dependence and deep-seated positional immobility. Second, although fewer in number, more than 10% of LAUs exhibit a monotonic decline in standardized income,

signalling structural deterioration rather than mere stagnation. Third, Croatia displays a clear developmental geometry: coastal counties and selected urban areas maintain stable or high-income positions, while many continental and Slavonian municipalities remain trapped in structurally weak positions or experience erosion of their income base.

Perhaps the most notable finding is the substantial heterogeneity observed not only between counties but also within them. Municipalities located in the same county, subject to the same regional institutions, development strategies and macroeconomic environment, nonetheless follow sharply divergent trajectories. This intra-county variation demonstrates that development traps form and persist at a much finer territorial scale than typically captured by NUTS 2 or NUTS 3 analyses. For small and open economies such as Croatia, where local capacities, productive structures, demographic pressures and fiscal constraints differ widely across municipalities, a localised perspective is indispensable for correctly identifying structural vulnerabilities and opportunities for recovery.

The Markov-based robustness checks further reinforce these findings by showing that upward mobility across income deciles is extremely rare, while downward or stationary patterns dominate. Even major systemic events, the global financial crisis, EU accession, and the COVID-19 shock, did not significantly alter the long-term developmental hierarchy, underscoring the durability of development traps as multi-period, structural processes.

Taken together, these insights highlight the need for place-sensitive and fine-grained development policies capable of addressing entrenched disparities at the level where they are actually produced and experienced: the municipality. National or regional strategies designed at higher territorial levels risk overlooking the highly uneven local trajectories documented in this study. Approaches tailored to local administrative capacities, productive specialisation, demographic conditions, and institutional constraints are essential if policymakers aim to reverse stagnation, mitigate decline, and prevent further territorial divergence.

By uncovering the depth and territorial complexity of development traps at the local scale, this paper contributes to both academic debates and policy practice. It demonstrates that in structurally heterogeneous, small EU economies, understanding development traps requires a zoom-in approach, one capable of identifying vulnerabilities and potentials invisible at broader spatial scales.

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