Before and Beyond COVID-19:
The Interplay of Corruption, Logistics, and Economic
Growth in the EU through the RBV Lens

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Abstract

This study explores the complex interplay between corruption, economic growth, and logistics performance in EU nations, utilizing a mixed-method approach and data from pre- and post-pandemic periods. Applying the Resource-Based View (RBV) and Qualitative Comparative Analysis (QCA), it identifies critical conditions impacting GDP growth, highlighting the intertwined roles of pre-pandemic logistics and corruption perceptions. The findings, relevant for policymakers, underscore the importance of robust governance in navigating economic challenges. This novel approach combines RBV and QCA, offering insights into the dynamics of financial and logistical landscapes during global upheavals.

1. Introduction

In the rapidly changing landscape of global economics, the determinants of economic growth have persistently intrigued policymakers, researchers, and industry experts. Natural resources, capital accumulation, and technological advancements are traditionally considered primary drivers of a nation's economic strength. However, in an increasingly interconnected world, and especially in the aftermath of the global pandemic, the intricacies of economic growth have become more nuanced, demanding a broader understanding. Our study delves into the interplay between logistic performance and corruption perceptions as potential determinants of economic development. Uniquely, we apply the RBV principles—traditionally utilized at the firm level—to a national context, suggesting that a

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country's intangible resources, such as its logistic capabilities and governance quality, can profoundly shape its economic path.

Using the QCA, we identify configurations of economic growth, revealing patterns that conventional methods might miss. Our research uncovers specific configurations linked to growth in the post-pandemic era and highlights nations that defy these patterns. Our investigation reveals the multifaceted nature of economic growth. While we focus on logistic performance and corruption perceptions, it is evident that diverse factors influence economic development, including political stability, technological infrastructure, and education levels (Alesina et al., 1996; Hall & Khan, 2003; Psacharopoulos & Patrinos, 2002). The QCA, our chosen methodological tool, offers insights without limitations. While it excels at detecting patterns, complexities may need to be simplified. Our reliance on perception-based indices, such as corruption perceptions and logistics performance, brings challenges, as these may only sometimes align with ground realities.

Furthermore, our research is time-bound, focusing primarily on the post-pandemic period. As economies and governance structures evolve, our observed patterns may shift. Our insights might only sometimes apply within the European Union context, especially in regions with different economic structures. It is worth noting the unique trajectories of countries like Estonia, Ireland, Lithuania, Poland, and Spain, emphasizing the rich diversity of economic pathways.

Lastly, while our innovative use of the RBV nationally offers fresh perspectives, it might also invite critiques, given its traditional application at the firm level. This paper unfolds as follows: Section 2 delves into a comprehensive literature review, transitioning to the theoretical underpinnings of the RBV in Section 3. The methodology, including the use of the Qualitative Comparative Analysis and data sources, is presented in Section 4. Our findings, emphasizing logistics and corruption perceptions as pivotal influencers of GDP growth, are detailed in Section 5. Section 6 offers a broader contextual discussion, and Section 7 concludes the paper with implications and potential avenues for future research. Our exploration of the determinants of economic growth is comprehensive, yet it features complexities and caveats. Such an approach solidifies our research's credibility and highlights the layered nature of economic studies. Through rigorous literature review, methodological application, and nuanced analysis, we aim to contribute substantially to the discourse on economic growth determinants, offering a beacon for policymakers and stakeholders in the modern world.

2. The macro RBV in logistics, corruption, and economic growth.

2.1 Exploring the dynamics of logistics performance, corruption, and economic growth

The intricate dynamics of logistics performance, corruption, and economic growth construct a pivotal axis for understanding a nation's development trajectory.

While each element holds its weight, their interconnectedness offers profound insights for policymakers and strategists.

Efficient logistics systems underpinning international trade are associated with enhanced productivity, reduced costs, and a streamlined flow of goods (Santangelo et al., 2016; D'Aleo & Sergi, 2017). Such systems bolster FDI and spur entrepreneurial endeavors, particularly in dynamic sectors such as e-commerce (Mauro, 1995). Furthermore, nations with robust logistics can connect peripheral regions to bustling economic hubs, ensuring comprehensive development (Goel et al., 2021; Alnıpak et al., 2023; Kraaijenbrink et al., 2010). However, the shadow of corruption poses significant threats. It disrupts trade, repels foreign capital, and undermines the nation's economic stature (Acar & Kara, 2023; Uca et al., 2016; OECD, 2013). The multifaceted repercussions of corruption extend to societal aspects, affecting gender balance, equality, and even the integrity of financial flows (Aidt, 2016; Lambsdorff, 2003; McLinden, 2005).

While past literature has extensively studied the effects of logistics and corruption on economic growth, the post-pandemic world presents a unique scenario. The pandemic has disrupted global supply chains and altered governance mechanisms across countries, emphasizing the need to re-evaluate these determinants in the current context. The profound economic shocks of the pandemic and shifts in global trade dynamics require a fresh lens to understand the interplay of logistics, corruption, and economic growth.

Considering these factors, it is worth exploring a theoretical framework that captures the essence of resource management and utilization at the national level - the RBV.

2.2 Theoretical framework - the RBV

Historically, the RBV has been a beacon for understanding how entities leverage their distinct resources for competitive advantages. When we pivot this lens towards nations, it offers insights into resource management and strategic alignment in diverse scenarios. It was traditionally a cornerstone in strategic management literature, focusing predominantly on firm-level resources to decipher competitive advantage (Barney, 1991). However, as scholars and policymakers look to comprehend the intricacies of national growth and geopolitical advantage, an innovative application of RBV to nations emerges. Nations, unlike firms, have a multifaceted pool of resources. These resources span tangible assets like mineral reserves and intangibles like governance mechanisms or cultural heritage. The VRIN criteria, a foundational aspect of RBV, sheds light on these national resources:

• Valuable: Each nation possesses resources that bolster its economy and enhance its global prominence. For example, a country's unique cultural heritage can be a magnet for tourism (McKercher, 2002). Simultaneously, robust governance mechanisms become pivotal in drawing foreign investments (Kaufmann and Kraay, 2002).

• Rare: Certain resources are distinctive to specific nations. For instance, while mineral wealth might be widespread, specific minerals might be concentrated in particular countries, rendering them rare (David & Han, 2004). Similarly, historical events exclusive to a nation can be considered rare resources that shape its global image.

• Inimitable: The intangible resources of a nation, ranging from its historical narratives to cultural practices, are often challenging to replicate. This unique socio-political and cultural tapestry can offer a competitive edge in various global arenas (Porter, 1998).

• Non-substitutable: The historical significance of places, be it the ancient allure of Rome or the timeless essence of Athens, cannot be substituted or replicated, highlighting the non-substitutable nature of some national resources (Richards, 2001).

In today's globalized world, critics often highlight the shared nature of many resources, especially intangibles. They argue that in an era characterized by collaborations, shared knowledge, and treaties, the competitive dynamics emphasized by RBV might seem misaligned (Ohmae, 1990); RBV's competitive underpinnings, where entities strive for distinctive advantage, might not entirely resonate with nations, which often prioritize diplomacy, cooperation, and shared benefits over overt competition (Nye, 2005).

Despite these criticisms, the application of RBV to nations is not without merit:

• Shared Yet Unique: Even in a globalized milieu, nations have a distinctive flair for utilizing and governing shared resources. For instance, while renewable energy technology might be globally accessible, nations differ in adoption rates, governance, and scalability, offering competitive edges to some (Jacobsson & Bergek, 2004).

• Quest for Competitive Positions: Despite cooperative stances, nations often vie for competitive positions, be it in global trade dominance, hosts for international events, or as top tourism destinations, underlining their competitive pursuits (Crouch, 2011).

• Geopolitical Influence: In geopolitics, nations invariably leverage their tangible and intangible resources to bolster their global influence. Whether through soft power mechanisms like cultural exports or hard power avenues such as economic dominance, nations endeavor to carve unique niches on the international stage (Nye, 2008).

In conclusion, applying RBV to nations offers a fresh perspective, enabling a deeper understanding of how countries leverage resources for global advantage. This approach broadens the horizons of 'competitive advantage' beyond its traditional firm-centric confines, offering rich insights for scholars and policymakers. Logistics performance, in this context, is a function and a strategic resource pivotal for economic growth (Santangelo et al., 2016; Goel et al., 2021). Nations harnessing this resource stand out in the global economic landscape (Hitt et al., 2016). However, corruption can act as a bottleneck, hindering this potential.

Introducing the concept of "dynamic capabilities" by Teece (2007) refers to an entity's agility in adapting and realigning resources amidst change. Corruption can stifle these capabilities, leading to resource wastage and mismanagement.

Suppose we are to extrapolate the findings of Larson (Larson, 2021) in the study's context of SMEs emphasizing logistics capabilities as crucial for sustainable performance and competitiveness. In that case, the logistics infrastructure emerges as a strategic linchpin for nations when extrapolated to a national or regional scale. A robust logistics infrastructure can drive sustainable economic growth, bolstering a nation's GDP and promoting environmental and societal well-being. Moreover, superior logistics capabilities enhance a country's global competitiveness, attracting foreign investments and streamlining exports. Therefore, prioritizing investments in logistics, coupled with sustainable practices and regional collaboration, is paramount for policymakers aiming for holistic development. Koh and colleagues (Koh et al., 2018) use the RBV to analyze logistics performance in Asian countries. Through the RBV lens, we view nations as entities with unique resources. The study identifies that corruption hinders logistics, as measured by the LPI.

Effective governance, also known as Government Effectiveness (GE), can mitigate the harmful effects of corruption on logistics. The research emphasizes that minimizing corruption is vital for a nation's logistic competitiveness, aligning with the RBV's principle of leveraging rare and unique resources. In a globalized context, corruption-induced challenges become even more pronounced. Firms operating in corruption-ridden environments face operational hurdles, escalating costs, and the daunting task of safeguarding their unique resources (Peng, 2001; Kraaijenbrink et al., 2010). The pandemic further unveiled vulnerabilities, underscoring the importance of adaptive resource management (Kaplinsky & Morris, 2001).

In conclusion, exploring logistics and economic growth dynamics, including corruption, adds complexity. Our focus now shifts to this triadic relationship, aiming to unearth insights into how logistics, corruption, and economic growth merge, especially in a world reshaped by a pandemic.

3. Methodology

The study leverages the Qualitative Comparative Analysis (Dușa, 2019) approach to explore the interplay between corruption perceptions, logistics performance, and GDP per capita across pre- and post-pandemic contexts. The pre-pandemic period, spanning 2007-2018, is selected to encapsulate the economic dynamics of the 2008 financial crisis, ensuring a stable baseline for comparison. The post-pandemic period, 2022-2023, captures the immediate aftermath of the pandemic, revealing nations' adaptations and economic recalibrations.

While traditional regression analyses might highlight linear relationships, the QCA approach provides insights into complex configurations pivotal for economic growth, especially in the multifaceted post-pandemic landscape. After

calibrating raw data into fuzzy sets using established datasets, we constructed a truth table to outline potential configurations of conditions and corresponding outcomes, followed by a counterfactual analysis, enriching understanding by examining logically plausible configurations absent in the dataset.

The study employs R econometric software for a comprehensive analysis, presenting results through descriptive statistics tables, truth tables, prime implicants tables, and solution terms tables. This robust methodology offers insights into the convergence of logistics, corruption, and economic growth in the shadow of the pandemic's influence.

3.1 Data calibration, truth table construction, counterfactual analysis, and data analysis

We first calibrate the raw data into fuzzy sets using datasets from the World Bank for LPI and GDP per capita and Transparency International for CPI. These continuous scales, ranging from 0 (non-membership) to 1 (full Membership), transform the variables: CPI: The higher scores indicate reduced corruption, with approach values of 1. LPI: Elevated scores, signifying better logistics performance, are calibrated closer to 1. GDP per capita: Higher GDP per capita values, representing economic growth, are calibrated near 1.

Post-calibration, we construct a truth table enumerating all potential configurations of the conditions and their corresponding outcomes. This systematic approach aids in discerning configurations leading to either heightened or diminished economic growth in pre- and post-pandemic contexts.

After the initial configurations are derived, we undertake a counterfactual analysis that examines configurations not in our dataset but are logically plausible, enriching our understanding of variable interplay.

We employ R econometric software to analyze the configurations robustly. This software elucidates conditions or their combinations vital for achieving the targeted outcomes.

3.2 Presentation of descriptive and analytical results

To provide foundational insights, we will employ:
• Descriptive Statistics Table: We will display data distribution, including mean, median, standard deviation, and range for CPI, LPI, and GDP per capita across both periods.
• Truth Tables: We will enumerate all configurations for both the pre- and post-pandemic times.
• Prime Implicants Tables: After minimizing the truth tables, we will show essential configurations leading to outcomes (prime implicants) for both periods, accompanied by their consistency and coverage scores.

• Solution Terms Table (if applicable): If our results yield solution formulas merging prime implicants, they will be delineated in dedicated tables, providing combined configurations, raw and unique Coverage, and consistency.

By adopting this structured methodology, we aim to derive insights into how logistics, corruption, and economic growth converge, especially under the profound influence of the pandemic.

4. Results

4.1 Descriptive statistics

An analysis of the descriptive statistics (Table 1) reveals a significant enhancement in LPI post-pandemic, a slight average score decrease indicates a mild improvement in CPI post-pandemic, and a notable average GDP per capita increase post-pandemic indicates economic resurgence after pandemic disruptions.

Descriptive statistics table

Table 1

	LPI_pre_pandemic	LPI_2022	CPI_pre_pandemic	CPI_2022	GDP_pre_pandemic	GDP_2022
Mean	3.507143	3.6214286	64.13393	63.96429	33495.58	39598.94
SD	0.405196	0.3315029	14.80451	13.75037	22385.28	25903.25
Min	2.98	3.2	41.75	42	7520.19	13772.48
Median	3.455	3.6	60.5	61	26706.36	30370.46
Max	4.13	4.2	90	90	113051.75	126426.1

4.2 Interpretation of descriptive statistics

In conclusion, logistics performance improved noticeably in the post-pandemic era compared to the pre-pandemic period. Corruption perceptions also improved mildly, as indicated by a slight decrease in the average score. The average GDP per capita increased significantly post-pandemic, suggesting economic recovery or growth after the pandemic's disruptions.

- LPI: The positive change in the LPI indicates that logistics systems and infrastructures in EU countries might have adapted, innovated, or become more efficient post-pandemic. The disruptions caused by the pandemic could have led to innovations or new strategies in logistics to cope with challenges, leading to improved performance.

- CPI: While the improvement in corruption perceptions is modest, it suggests that the measures against corruption have slightly strengthened or that the public's perception of corruption in these countries has improved post-pandemic, a fact attributed to increased transparency, better governance, or other reforms introduced in response to the pandemic's challenges.

- GDP per Capita: The growth in GDP per capita in the post-pandemic era is a positive sign of economic recovery or resilience. Despite the pandemic's

economic disruptions, the average economic output per person in EU countries has grown, suggesting that economies have either bounced back from the pandemic's effects or found new avenues for growth.

In summary, as of 2022, the post-pandemic era has seen improvements in logistics performance and economic output per person in EU countries, along with a slight improvement in corruption perceptions, indicating that, despite the challenges posed by the pandemic, EU countries have shown resilience and adaptability in these critical areas. The Logistics Performance Index and GDP per capita for EU countries (including the UK) increased from the pre-pandemic to 2022. However, the Corruption Perceptions Index slightly decreased in 2022 compared to the pre-pandemic era, indicating a marginal improvement in corruption perceptions. Comparing pre- and post-pandemic periods paints a vivid picture of national adaptabilities and resilience in the face of global disruptions. A notable shift post-pandemic is how nations either bolstered or adjusted their logistic capabilities, reflecting their response to the supply chain challenges posed by the pandemic.

Furthermore, the pandemic increased global focus on governance, potentially influencing perceptions of corruption. As nations grappled with the challenges of the pandemic, those with transparent and efficient governance mechanisms might have seen improved perceptions of corruption. In contrast, others may have faced increased scrutiny and criticism.

4.3 Fuzzy set membership summary statistics

We ran the R code to print out the minimum, first quartile (Q1), median, mean, third quartile (Q3) (see Table 2), and maximum values for each variable's fuzzy set membership values, which will give us insights into the distribution of values and help determine appropriate thresholds. These summary statistics provide insights into the distribution of fuzzy set membership values for each variable in our data.

Summary statistics

Table 2

	Minimum value	1st Quartile (Q1)	Median	Mean	3rd Quartile (Q3)	Maximum value
LPI_pre_pandemic_fs	0.0000 (indicating no membership in the set of high LPI values before the pandemic)	0.2684	0.4501 (50% of countries have a membership value below this)	0.4794	0.7037	1.0000 (indicating full Membership in the set of high LPI values before the pandemic)
LPI_2022_fs	0.0000	0.2292	0.5000	0.4286	0.6667	1.0000

	Minimum value	1st Quartile (Q1)	Median	Mean	3rd Quartile (Q3)	Maximum value
CPI_pre_pandemic_fs	0.0000 (indicating no membership in the set of high CPI values before the pandemic)	0.2293	0.3886	0.4639	0.7176	1.0000 (indicating full Membership in the set of high CPI values before the pandemic)
CPI_2022_fs	0.0000	0.2240	0.3958	0.4576	0.6823	1.0000

These statistics provide an overview of the distribution of the EU member countries regarding logistics performance and corruption perception before and after the pandemic. The median fuzzy set membership value for LPI is slightly higher in 2022 compared to the pre-pandemic era, indicating a possible improvement in logistics performance for most countries. The mean and median values for CPI (corruption perception index) are relatively similar in the pre- and post-pandemic eras, suggesting that perceptions of corruption remained relatively constant across this period for EU member countries. The range between Q1 and Q3 provides insights into the interquartile range, representing the middle 50% of the data. For instance, the IQR for LPI_2022_fs is 0.4375 (0.6667 - 0.2292), suggesting that the median 50% of countries have fuzzy set membership values spread across this range for 2022 logistics performance.

4.3.1 Fuzzy set calibration thresholds

Guided by the principles established in Ragin's (2008) work, we have determined our fuzzy set calibration thresholds:

A.1. LPI Before the Pandemic:
• Full Non-Membership (0): Countries with an LPI score of 0.0000, indicating no membership in the set of high LPI values before the pandemic.
• Cross-over Point (0.5): Countries with an LPI score of 0.4501, representing the median, where 50% of countries have a membership value below this.
• Full Membership (1): Countries with an LPI score of 1.0000, indicating full Membership in the set of high LPI values before the pandemic.

A.2. LPI in 2022:
• Full Non-Membership (0): Countries with an LPI score of 0.0000.
• Cross-over Point (0.5): Countries with an LPI score of 0.5000, marking the median value.
• Full Membership (1): Countries with an LPI score of 1.0000.

B.1. CPI Before the Pandemic:

- Full Non-Membership (0): Countries with a CPI score of 0.0000, indicating no membership in the set of high CPI values before the pandemic.
- Cross-over Point (0.5): Countries with a CPI score of 0.3886.
- Full Membership (1): Countries with a CPI score of 1.0000, indicating full Membership in the set of high CPI values before the pandemic.

B.2. CPI in 2022:
- Full Non-Membership (0): Countries with a CPI score 0.0000.
- Cross-over Point (0.5): Countries with a CPI score of 0.3958.
- Full Membership (1): Countries with a CPI score 1.0000.

These thresholds serve as the foundation for our subsequent QCA and clearly distinguish between full non-membership, cross-over, and full Membership for each variable in our dataset.

4.4 Truth table analysis

The truth table displays combinations of conditions leading to specific outcomes. For instance, Configuration 1 (Row 1) suggests that countries with low LPI and CPI values pre- and post-pandemic experienced GDP growth, as observed in Bulgaria and Romania.

The QCA aims to identify which combinations of conditions (in this case, the calibrated values of the variables) lead to a particular outcome. The truth table outlines these combinations (Figure 1).

```
OUT: output value
  n: number of cases in configuration
incl: sufficiency inclusion score
 PRI: proportional reduction in inconsistency

    LPI_pre_pandemic_fs LPI_2022_fs CPI_pre_pandemic_fs CPI_2022_fs   OUT
1            0               0               0               0          1
2            0               0               0               1          0
3            0               0               1               0          1
5            0               1               0               0          0
12           1               0               1               1          1
13           1               1               0               0          0
16           1               1               1               1          1
     n   incl   PRI
1    9  0.905  0.905
2    1  0.857  0.857
3    1  0.937  0.937
5    1  0.729  0.729
12   1  0.925  0.925
13   2  0.727  0.727
16   9  0.939  0.939
```

Figure 1. The Truth Table (Source: R econometric)

Columns LPI_pre_pandemic_fs, LPI_2022_fs, CPI_pre_pandemic_fs, and CPI_2022_fs represent each condition's calibrated values (fuzzy sets). A value of 1 indicates full Membership in the set, while 0 indicates non-membership. Intermediate values between 0 and 1 indicate partial Membership. Column OUT represents the outcome variable, whether there was an increase in GDP (1) or not

(0). Column n shows the number of cases (countries) that fall into each combination of conditions. Column incl is the sufficiency inclusion score. A higher score (closer to 1) suggests that the condition combination is a sufficient condition for the outcome. For example, the last row shows that countries with a 1 in all conditions have a high probability (0.939) that they experienced increased GDP. Column PRI is the Proportional Reduction in Inconsistency. A higher score here indicates that the combination is more consistent in predicting the outcome. A score close to 1 suggests that the configuration is very consistent.

The QCA identifies specific conditions leading to particular outcomes using thresholds (Ragin, 2008). In studying the GDP growth of EU nations, these boundaries help unravel the relationship between logistics, corruption perceptions, and economic development. Key metrics include consistency, which measures the reliability of configurations, and Coverage, indicating the empirical relevance of a setup. While these thresholds, informed by prior research and empirical data, offer robust insights, they also present challenges. The analysis might exclude some countries due to their unique configurations. As the post-pandemic world unfolds, refining these methodologies will be crucial to capturing the evolving narratives of nations (Ragin, 2008).

Configuration 1 (Row 1): Countries with low values (near 0) for both LPI (before and after the pandemic) and CPI (before and after the pandemic) experienced a GDP increase. There are nine such cases in this configuration. The inclusion score of 0.905 suggests this configuration is a moderately strong predictor for increased GDP, including countries with low values (closer to 0) for LPI both before and after the pandemic and standard values for CPI both before and after the pandemic. Bulgaria, Romania, Croatia, Hungary, Malta, Slovak Republic, Cyprus, Greece, and Slovenia did not experience a GDP increase. Despite having various sizes and geographic locations, countries in this configuration, such as Bulgaria and Romania, share specific economic characteristics during the observed period, such as lower logistics performance and higher perceived corruption, contributing to a lack of GDP growth.

Configuration 2 (Row 2): Countries with low values for LPI (both before and after the pandemic) and CPI before but a higher value after the pandemic did not experience a GDP increase. Only one country falls under this configuration—countries with low values for all conditions except for post-pandemic CPI, which is high. Bulgaria did not experience a GDP increase. Despite having an increased post-pandemic CPI, Bulgaria saw no GDP growth, indicating that other factors played a more significant role in its economic stagnation.

Configuration 3 (Row 3): Countries with low values for LPI (before and after the pandemic) and CPI after the pandemic but a higher CPI value before the pandemic experienced a GDP increase. This configuration includes only one country - countries with low values for all conditions except for pre-pandemic CPI, which is high. Cyprus did not experience a GDP increase. Cyprus, which had a higher CPI before the pandemic, did not witness GDP growth, suggesting that other factors might have hindered its economic performance.

Configuration 5 (Row 5): Countries with increased LPI after the pandemic but low values for all other conditions did not experience a GDP increase. There is only one country in this configuration—countries with only high post-pandemic LPI values but low values for all other conditions. Hungary did not experience a GDP increase. Despite improving its logistics performance post-pandemic, Hungary did not see GDP growth, suggesting that a singular improvement in logistics may not be enough to drive economic growth.

Configuration 12 (Row 12): Countries with a high value for LPI before the pandemic and high values for both CPI before and after the pandemic experienced a GDP increase. This configuration includes only one country, with a high inclusion score of 0.925. Countries with high pre-pandemic LPI and high pre- and post-pandemic CPI values. Sweden did not experience a GDP increase. Despite strong pre-pandemic logistics performance and consistently high CPI scores, Sweden did not experience GDP growth, indicating the presence of other influencing factors.

Configuration 13 (Row 13): Countries with high LPI values before and after the pandemic but low CPI values did not experience a GDP increase. 2 countries fall under this configuration—countries with high values for both LPI scores but common values for both CPI scores. Italy and Greece did not experience a GDP increase. Despite strong logistics performance, Italy and Greece had lower CPI scores, contributing to their lack of GDP growth.

Configuration 16 (Row 16): Countries with high values in all conditions experienced increased GDP. Nine countries fall into this configuration, with a high inclusion score of 0.939. Countries with high values in all conditions. Denmark, Finland, Netherlands, Sweden, Germany, Belgium, Austria, United Kingdom, and Luxembourg experienced a GDP increase. Countries in this configuration exhibited strong logistics performance and low perceived corruption before and after the pandemic, likely contributing to their positive economic growth. This configuration emphasizes the combined importance of logistics and governance in driving financial success.

From the above configurations, we identify the countries that appear in more than one configuration – Bulgaria appears in Configurations 1 and 2; Cyprus in Configurations 1 and 3; Hungary in Configurations 1 and 5; Greece in Configurations 1 and 13; Sweden in Configurations 12 and 16.

Some possible explanations for these overlaps:

• Bulgaria: Both configurations signify countries with low values across the board and those with shared values but an improved post-pandemic CPI, suggesting that while Bulgaria generally had low LPI and CPI scores, there was a noticeable improvement in its CPI post-pandemic.

• Cyprus: Its presence in configurations for countries with overall low scores and those with an improved pre-pandemic CPI suggests that Cyprus had some areas of strength (like its pre-pandemic CPI) but still faced challenges in other areas.

• Hungary: Found in configurations for overall low scores and improved post-pandemic LPI. Hungary might have seen a boost in its logistics performance post-pandemic, but other factors (like corruption) could have hindered its GDP growth.

• Greece generally had low scores but also appeared in a configuration with an improved LPI post-pandemic, indicating that Greece made strides in logistics. However, other areas (like corruption) might have offset these gains.

• Sweden: Its presence in configurations for countries with high pre-pandemic LPI and those with high scores across the board suggests that Sweden consistently performed well in logistics and perceived integrity.

Countries appearing in multiple configurations highlight the complexity and multifaceted nature of their economic and governance situations. These overlaps suggest that while a country might meet the criteria for one specific configuration, other nuances or characteristics also align it with another configuration. It underscores the importance of understanding the broader context and not relying solely on quantitative configurations for interpretation. Countries such as the Czech Republic, Estonia, France, Ireland, Latvia, Lithuania, Poland, Portugal, Slovakia, and Spain do not fall within any of the configurations from the truth table, and this is due to several reasons:

1. Distinct Economic and Logistical Profiles: These countries might have unique economic and logistical profiles that do not fit the typical patterns identified in the configurations. For example, France has a large and diversified economy, while countries like Estonia and Latvia are small and might have different economic dynamics.

2. Data Completeness and Quality: There might be missing, incomplete, or inconsistent data for these countries, which could prevent them from fitting into any of the configurations.

3. Calibration Thresholds: The thresholds chosen for the fuzzy set calibrations might need to be more relaxed or lenient for these countries. They might have values that border the thresholds but must meet the configuration criteria.

4. Unique External Factors: Each country might have faced unique challenges or opportunities during the period in question. For instance, Ireland has a strong IT and pharmaceutical sector that might have had different dynamics than other EU countries during the pandemic (I.D.A. Ireland, 2020).

5. Interplay of Multiple Variables: The combined effects of LPI and CPI before and after the pandemic might have produced patterns in these countries that the configurations did not capture. For instance, a country might have a high LPI but a median CPI, creating a unique combination.

6. Historical and Geopolitical Factors: Some countries might have historical or geopolitical situations that influence their logistics and corruption perceptions in ways that are not typical for other EU countries. For instance, Poland and the Czech Republic, part of Central Europe, might have had different

post-communist transition experiences compared to Western or Southern European countries (Tismăneanu, 1999).

7. Economic Resilience and Adaptability: Some countries might have implemented successful economic strategies or reforms during or before the pandemic, which led to different outcomes regarding GDP growth, logistics, and corruption perceptions.

8. Other Unobserved Variables: There might be other crucial variables or factors not considered in the analysis that play a significant role in determining the logistics performance and corruption perception in these countries.

In summary, while the configurations provide insights into patterns across EU countries, it is essential to remember that each country has a unique context. A future, more in-depth country-specific analysis could explain why these countries do not fit into the identified configurations. However, the Czech Republic, Latvia, and Poland are close to the countries in Configuration 1, whereas Estonia and Lithuania are close to Configuration 2. Ireland and Portugal are near Configuration 12, Spain to Configuration 13, and France close to Configuration 16. In conclusion, while these countries did not directly fit into any configuration, they exhibit characteristics similar to those in specific configurations. Recognizing these patterns can help policymakers understand the challenges and strengths of each country and formulate appropriate strategies.

4.5 Prime implicants

Prime implicants represent essential configurations leading to specific outcomes:

- Pre-pandemic Prime Implicants: After minimizing the truth table for the pre-pandemic era, we will have a set of prime implicants (essential configurations that lead to the outcome).

- Post-pandemic Prime Implicants: After minimizing the truth table for the post-pandemic era, we will present the prime implicants with their consistency and coverage scores.

- LPI_pre_pandemic_fs: Countries with a low LPI before the pandemic.
- LPI_2022_fs: Countries with a low LPI in 2022.
- CPI_pre_pandemic_fs: Countries with a low CPI before the pandemic.
- CPI_2022_fs: Countries with a low CPI in 2022.

These configurations (sets of conditions) are the primary pathways that lead to a GDP increase. Countries with high logistics performance and corruption perception scores both before the pandemic and in 2022 tended to see a rise in GDP. Alternatively, countries with low logistics performance before the pandemic and 2022 and with a low corruption perception score in 2022 saw increased GDP, suggesting two pathways to GDP growth. One pathway is to be strong in logistics and have a high perception of corruption. The other path is having consistently weak logistics performance and a low corruption perception score in 2022.

Interestingly, high and low values in some variables can lead to GDP growth, highlighting the complexity of economic growth determinants. Policymakers and analysts would need to delve deeper into these findings, considering other contextual factors, to devise effective strategies based on this analysis.

4.6 Solution terms analysis

The Solution Terms Table (Figure 2) elaborates on the combined configurations generated from the prime implicants and provides metrics like raw Coverage, unique Coverage, and consistency for each solution term.

```
                                Solution_Term Raw_Coverage Consistency
1 LPI_pre_pandemic_fs*CPI_pre_pandemic_fs*CPI_2022_fs    0.4218922   0.9467117
2      ~LPI_pre_pandemic_fs*~LPI_2022_fs*~CPI_2022_fs    0.4041100   0.9099322
                    cases
1 22; 1,2,7,9,10,11,20,27,28
2 3,4,6,13,16,19,23,24,25; 5
```

Figure 2. The Solution Terms Table (Source: R econometric)

M1:   LPI_pre_pandemic_fs*CPI_pre_pandemic_fs*CPI_2022_fs   + LPI_pre_pandemic_fs * LPI_2022_fs * CPI_2022_fs => GDP_increase
   1. (M1.1): LPI_pre_pandemic_fs * CPI_pre_pandemic_fs * CPI_2022_fs
   2. (M1.2): LPI_pre_pandemic_fs * LPI_2022_fs * CPI_2022_fs
   LPI_pre_pandemic_fs*CPI_pre_pandemic_fs*CPI_2022_fs: This configuration indicates that a combination of high logistics performance before the pandemic, high corruption perception before the pandemic, and high corruption perception in 2022 leads to GDP increase.
   • Raw Coverage: This configuration explains 42.19% of the instances where the GDP increased.
   • Consistency: 94.67% of cases with this configuration also experienced a GDP increase.
   • Cases: The given indices represent the countries associated with this configuration.
   LPI_pre_pandemic_fs *LPI_2022_fs * LPI_2022_fs: This configuration indicates that a combination of low logistics performance both before the pandemic and in 2022, as well as common corruption perception in 2022, leads to GDP increase.
   • Raw Coverage: This configuration explains 40.41% of the instances where the GDP increased.
   • Consistency: 90.99% of cases with this configuration also experienced a GDP increase.
   • Cases: The given indices represent the countries associated with this configuration.
   The table presents two significant configurations that can explain GDP increase. The high consistency scores for both configurations show that these

patterns are reliable in explaining the outcome. The raw Coverage indicates the proportion of the outcome instances these configurations can explain. A list of countries that fall under each of the configurations is as follows:

• Configuration 1 Formula: LPI_pre_pandemic_fs*CPI_pre_pandemic_fs* CPI_2022_fs - Portugal, Austria, Belgium, Denmark, Finland, France, Germany, Netherlands, Sweden, United Kingdom. The countries listed under this configuration (primarily Western and Northern European nations) have a specific pattern of Logistics Performance Index and Corruption Perceptions Index both before and in 2022, suggesting that these countries maintained a certain level of logistics performance and corruption consistency through the pandemic years.

• Configuration 2 Formula: LPI_pre_pandemic_fs *LPI_2022_fs * LPI_2022_fs – Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Malta, Romania, Slovak Republic, Slovenia, Cyprus. The countries under this configuration (primarily Eastern and some Southern European nations) show a different pattern than the first. They have contrasting Logistics Performance Index and Corruption Perceptions Index patterns in the pre-pandemic period and 2022, implying that these countries had notable shifts or changes in their logistics and corruption performance metrics during the pandemic years.

4.7 Country-specific observations

Some countries did not fit into either of the two configurations:

1. Estonia: Estonia, one of the Baltic states, has a unique economic structure and history compared to many Western and Central European countries. Its relatively recent independence From the Soviet Union in 1991 and subsequent rapid economic development might give it a unique economic footprint that does not fit neatly into the identified configurations. Its quick transition to a market economy and technological advances (like being a pioneer in e-governance) might make it distinct from other European countries in specific economic metrics (Lumiste et al., 2008; Vassil, 2016).

2. Greece: Greece has faced significant economic challenges in the last few decades, including a major debt crisis. This crisis and the subsequent austerity measures, bailouts, and structural reforms have put Greece on a distinct economic trajectory compared to many other EU countries (Manasse & Roubini, 2009).

3. Ireland: Ireland's economic story is notable due to its rapid growth as the "Celtic Tiger" and subsequent financial crash in the late 2000s. Ireland has a unique economic profile. Factors such as its low corporate tax rate, the country's strong ties to global markets, especially the US, and its appeal as a tax haven for global corporations, which has attracted numerous multinational corporations and its heavy reliance on exports might contribute to its distinct configuration (Riain, 2000; Killian, 2022).

4. Italy: As one of the largest economies in the EU, Italy has a diverse and complex economic structure. Its challenges, such as high public debt and

significant regional economic disparities (between the industrialized north and the more agrarian south), could make its economic configuration distinct (Felice, 2016).

5. Lithuania: Another Baltic state with a unique post-Soviet transition history, Lithuania's economic trajectory may differ due to factors similar to those of Estonia. Its growth sectors, like IT and biotechnology, might also play a role (Danileviciene & Lace, 2017; Mastroeni & Rosiello, 2013).

6. Luxembourg: With one of the highest GDP per capita globally, Luxembourg's economy relies heavily on banking, finance, and international corporations. Small size and specialized economic sectors might not fit the general configurations identified for larger, more diversified economies (The Government of the Grand Duchy of Luxembourg, 2023).

7. Poland: As the largest economy in Central Europe, Poland has seen consistent growth since joining the EU in 2004. Even during the 2008 global financial crisis, its growth trajectory and resilience could make its economic profile unique. Its sizeable domestic market, coupled with economic reforms and strategic industries like coal, might lead to distinct financial metrics (Piatkowski, 2019).

8. Spain: Spain's economy suffered various challenges, including the 2008 property bubble burst and subsequent financial crisis. Its recovery process and regional economic disparities (such as between Catalonia and other regions) might give Spain a unique economic configuration. Significant regional disparities and challenges like high youth unemployment have marked its recovery (Royo, 2009, 2020).

Our study identifies standard economic patterns across nations, but some countries diverge from these configurations. These outliers highlight the vast diversity within global economies, shaped by unique historical, cultural, and political influences. While our main configurations are robust, the presence of these exceptions underscores the complexity of global economic landscapes. This divergence offers a promising avenue for future research. Exploring these outlier countries can provide a deeper understanding of the multifaceted factors driving their unique economic trajectories. Moreso, Estonia, Ireland, Lithuania, Poland, and Spain did not fit into any configurations identified in the truth tables either. In future studies, we aim to explore these outlier nations, employing other variables or unique historical/cultural factors.

5. Conclusions and discussion

Each country has a unique economic history, challenges, and structures that might not fit into the broader configurations identified for other EU countries. Considering these individual factors when analyzing and interpreting QCA results is essential. The results indicate two prominent pathways to GDP growth in EU countries post-pandemic: strong logistics and high corruption perception and consistently weak logistics and low corruption perception in 2022.

High and low values in some variables as determinants of GDP growth underscore the multifaceted nature of economic growth drivers.

The RBV theoretical framework posits that firms can achieve sustainable competitive advantage by leveraging their unique resources and capabilities. These resources and capabilities should be valuable, rare, inimitable, and non-substitutable (often called VRIN). Applying the RBV to countries rather than firms, we can interpret countries' unique resources and capabilities as the determinants behind their distinct economic trajectories. Using the RBV framework, we can integrate the findings from the configurations in the solutions table with the countries that did not fit into any category.

1. Configuration1 (Countries with high pre-pandemic LPI, high pre-pandemic CPI, and high 2022 CPI): Portugal, Austria, Belgium, Denmark, Finland, France, Germany, Netherlands, Sweden, and the United Kingdom.

- Resources & Capabilities: These countries have well-established infrastructures, robust governance systems, and mature economies. They likely have efficient logistic and anti-corruption mechanisms before and after the pandemic.

- RBV Insight: Their established systems and robust economies are valuable and rare resources. Combining efficient logistics and low corruption can offer a competitive advantage in the global economy, making it hard for other countries to imitate quickly.

2. Configuration2 (Countries with low pre-pandemic LPI, low 2022 LPI, and low 2022 CPI): Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Malta, Romania, Slovak Republic, Slovenia, and Cyprus.

- Resources & Capabilities: These countries might be undergoing economic transitions or facing challenges in establishing efficient logistics and governance systems. They may be grappling with issues related to corruption and infrastructural development.

- RBV Insight: Their transitional phase or challenges can be seen as opportunities. If these countries can invest in and nurture their resources, they can turn them into unique capabilities in the future. Their current state can be a starting point for building something rare and valuable, provided the right strategies and investments

3. Countries without configuration: Estonia, Ireland, Lithuania, Poland, and Spain.

- Resources & Capabilities: As discussed previously, these countries have unique strengths and challenges that make them stand apart from the configurations identified: Estonia's e-governance, Ireland's tax policies, Lithuania's economic transition, Poland's consistent growth, and Spain's cultural heritage.

- RBV Insight: These countries have distinct resources and capabilities, making them valuable in their own right. A combination of historical, cultural, and economic factors determines their paths. These unique resources can be hard to imitate and can provide them with a competitive advantage in specific sectors or scenarios.

The RBV framework offers a lens to understand why certain countries fall into specific configurations and others stand apart. Every country possesses resources and capabilities leveraged for sustainable growth, whether fitting into a configuration or not. Recognizing and investing in these assets is crucial for future economic strategies and policy-making.

The global economic landscape is dynamic, influenced by geopolitical decisions and technological advancements. As the world grapples with the aftermath of a worldwide pandemic, understanding the intricacies that underlie economic growth becomes pivotal. Our literature review underlined the significance of logistic performance and corruption perceptions in economic development, highlighting their intertwined nature. While logistic capabilities enhance a country's ability to engage in efficient trade, reducing barriers and friction, corruption, on the other hand, acts as an impediment, stifling growth and deterring foreign investments. The RBV framework, prominent in strategic management literature, emphasizes the role of unique resources and capabilities in determining competitive advantage. It is a theoretical foundation for our study, propelling us to explore how countries leverage their logistic capacities and governance mechanisms as strategic resources.

Using QCA, our study meticulously analyzed how countries differ based on logistics performance and corruption levels. This comprehensive method revealed complex patterns that more conventional statistical approaches might miss. By utilizing truth tables and identifying prime implicants, we could pinpoint distinct groupings of countries based on shared characteristics.

Our findings highlighted two significant groups: countries with well-developed logistic and governance infrastructures and nations experiencing transitional phases marked by significant challenges. Countries such as Estonia, Ireland, Lithuania, Poland, and Spain did not conform to these groups, illustrating different nations' diverse economic paths and unique conditions.

These insights are crucial for policymakers. Understanding their countries' conditions allows them to devise strategies that leverage their strengths and mitigate their weaknesses. For countries that do not fit into typical categories, we need a more customized approach that utilizes their unique resources as the RBV envisioned. This approach helps craft strategies that capitalize on their specific capabilities and circumstances.

In closing, our research underscores the complex tapestry of global economies. The interplay of logistics, corruption, and economic growth is intricate, and understanding this can pave the way for informed policies and sustainable growth trajectories. As the world moves towards a post-pandemic era, such insights become the bedrock for future economic resilience and prosperity.

6. Potential limitations

• Scope of Variables: Our study focused on logistic performance and corruption perceptions, but we did not consider other factors influencing economic

growth. Factors like political stability, level of education, and technological infrastructure could also play pivotal roles.

• Methodological Limitations: The QCA offers a unique lens through which to study configurations. However, it may sometimes oversimplify complex relationships. Additionally, the chosen threshold for consistency and Coverage might exclude specific configurations of interest.

• Data Constraints: The data used in this study, especially for perceptions of corruption and logistics performance, might have inherent biases. These indices are based on perceptions and might not capture the nuanced realities on the ground.

• Temporal Limitations: This study provides a snapshot of the post-pandemic era. Economic conditions, governance mechanisms, and logistic capabilities evolve. Thus, the configurations identified might change in the future.

• Country-Specific Nuances: While our research identified specific configurations, it is essential to acknowledge that each country has its unique historical, cultural, and socio-political context. These unique backgrounds could influence the indices and, consequently, the configurations.

• External Validity: The findings, while insightful, might not be generalizable to all countries or regions outside the scope of this study, especially those with significantly different economic structures or those not included in the dataset.

• Potential for Omitted Variable Bias: Given the focus on specific variables, other significant determinants of economic growth could be omitted, which could bias the results.

• RBV's Applicability: The RBV framework is a theoretical foundation traditionally used for firms, not countries. Extending its principles to nations, while innovative, might have its critiques.

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