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Spatial Analysis of Urban Competitiveness in Metro Manila and Its Periphery: Identifying Leading and Lagging Clusters through CMCI Indices (2015-2023)

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Abstract

Local competitiveness has become a critical policy concern in the Philippines, as cities within and around Metro Manila experience uneven growth trajectories. The Cities and Municipalities Competitiveness Index (CMCI) of the Department of Trade and Industry provides a systematic benchmarking framework, yet the spatial dynamics of competitiveness across Metro Manila and its contiguous local government units (LGUs) remain underexplored. This study examined whether competitiveness is randomly distributed or spatially clustered within the National Capital Region (NCR) and its first- and second-degree neighboring LGUs, using CMCI data from 2015, 2020, and 2023. A two-stage methodological framework was applied: (1) exploratory visualization through GIS-based choropleth mapping, and (2) inferential spatial statistics using Global Moran's I and Local Indicators of Spatial Association (LISA), complemented by standardized z-scores for identifying leading and lagging LGUs. Results revealed shifting spatial dynamics: significant clustering in 2015, largely random patterns in 2020, and renewed clustering in 2023, particularly in Economic Dynamism and Innovation. A high-performing "hot spot" cluster was observed in the core LGU of Makati City, while a spatial outlier was observed in Pasay City, being a high scorer surrounded with lower scores. Sub-pillar analysis highlighted common drivers of competitiveness, notably infrastructure, governance efficiency, business registration, investment inflows, and health service capacity. Findings underscore the polycentric nature of Metro Manila's competitiveness and its uneven spillovers into adjacent LGUs, with implications for metropolitan-scale cooperation, regional planning, and policies that promote balanced growth across localities.

1. Introduction

The Cities and Municipalities Competitive Index (CMCI), established by the Department of Trade and Industry (DTI) and the National Competitiveness Council (NCC) in 2013, is a measure of regional competitiveness through a structured index. Competitiveness in the CMCI was defined based on location and the productivity that companies can achieve in the area (Porter, 2004). In the CMCI, a local government unit's (LGU) overall score has a total index value of 100. This total is the sum of the indices from five (5) identified pillars namely, Economic Dynamism, Government Efficiency, Infrastructure, Resiliency, and Innovation, each amounting to 20% of the LGU's CMCI Overall Score. Similarly, each of these pillars has ten (10) sub-pillars, each amounting to 2% of the pillar's index (CMCI Website, n.d.).

Economic Dynamism's sub-pillars are Local Economy Size, Local Economy Growth, Active, Establishments in the Locality, Safety Compliant Business, Employment Generation, Cost of Living, Cost of Doing Business, Financial Deepening, Productivity, and Presence of Business and Professional Organizations.

Government Efficiency's sub-pillars are Compliance to National Directives, Presence of Investment Promotion Unit, Compliance to ARTA Citizens Charter, Capacity to Generate Local Resource, Capacity of Health Services, Capacity of School Services, Recognition of Performance, Getting Business Permits, Peace and Order, and Social Protection

Infrastructure's sub-pillars are Road Network, Distance to Ports, Availability of Basic Utilities, Transportation Vehicles, Education, Health, LGU Investment, Accommodation Capacity, Information Technology Capacity, and Financial Technology Capacity.

Resiliency's sub-pillars are Land Use Plan, Disaster Risk Reduction Plan, Annual Disaster Drill, Early Warning System, Budget for DRRMP, Local Risk Assessments, Emergency Infrastructure, Utilities, Employed Population, and Sanitary System.

Finally, the Innovation pillar's sub-pillars are ICT Plan, Innovation Financing: R&D Expenditures Allotment, ICT Use: E-BPLS Software, Online Payment Facilities, STEM graduates, Intellectual Property Registration, Internet Capability, Availability of Basic Internet Service, Start-up and Innovation Facilities, and New Technology.

The focal point of this study is the issue of how, despite the rapid economic growth of NCR, significant disparities exist among LGUs in terms of competitiveness. As can be seen in the CMCI data, while NCR cities consistently rank at the top across pillars like Economic Dynamism, Government Efficiency, Infrastructure, and Innovation, many LGUs outside NCR continue to register noticeably lower scores in these same dimensions.

Ultimately, the goal of this research study is to formulate strategies to enhance overall regional development by leveraging the strengths of leading LGUs and addressing the weaknesses of lagging ones. This research study attempts to accomplish this goal by: (a) examining the spatial distribution patterns of CMCI pillar indices and sub-pillar indices, across LGUs in NCR and first to second-degree adjacent LGUs; (b) characterizing the attributes of leading and lagging LGU clusters in NCR and first to second-degree adjacent LGUs based on their CMCI pillar indices; (c) determining the specific CMCI sub-pillar components that significantly distinguish leading LGU clusters from lagging ones within the urban landscape of NCR and first to second-degree adjacent LGUs; and (d) identifying strategies for fostering spatial complementarity and

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inter-LGU collaboration between leading and lagging clusters towards enhancing inclusive and regionally balanced economic development in NCR and first to second-degree adjacent LGUs.

2. Literature Review and Conceptual Framework

Existing studies primarily examine the CMCI from a singular perspective or without considering the geographical implications of competitiveness among LGUs. Existing literature emphasized the significance of contiguity in fostering agglomeration through industry clustering and initiating complementarity (Porter, 1998; Tobler, 1970). This research study contributes to the literature by utilizing spatial analysis to map and understand the relationships between LGUs and their CMCI rankings holistically.

The concept of a growth pole was introduced by Perroux, and later expanded by Boudeville, to describe the concentration of economic development in a region that is expected to stimulate growth in surrounding areas (Perroux, 1950; Boudeville, 1966). As the country's political, economic, and cultural center, NCR likewise became the center for infrastructure, labor migration, investment, and innovation. Over time, this centralization led to the development of an urban agglomeration. This was marked by high relations between cities and municipalities, urban densities of different sizes, and a complex web of transportation, economic, and institutional linkages (Chen et al., 2022).

Usually, this agglomeration effect brings about positive externalities such as knowledge spillovers, labor market pooling, and shared infrastructure (Duranton et al., 2004). Theoretically, these benefits should radiate outward from NCR, generating spatial equity and regional uplift for at least the 1st and 2nd-degree adjacent LGU. Studies on Philippine urban development, however, suggest that this has not fully materialized, as disparities in governance capacity, infrastructure readiness, and economic opportunities remain stark between NCR and its neighboring LGUs (Navarro, 2014; World Bank, 2017).

Urban expansion, both planned and unplanned, has compounded these inequalities (Murakami et al., 2005). While NCR's cities continue to attract high-value industries and public investments, contiguous municipalities often face challenges such as underdeveloped infrastructure, governance bottlenecks, and limited access to innovation ecosystems (World Bank, 2017). These spatial and institutional challenges contribute to uneven competitiveness, even among LGUs that are geographically proximate. As a result, despite theoretical expectations of regional uplift through proximity, some peripheral LGUs continue to lag significantly in CMCI rankings.

This spatial mismatch raises important questions about the effectiveness of NCR's growth pole dynamics and the need for more integrative, data-driven strategies to promote inclusive development. By mapping CMCI performance spatially and identifying clusters of leading and lagging LGUs, this research study seeks to bridge the gap between theory and current regional realities.

As shown in Figure 1, this research study anchors itself on the CMCI as the main basis for assessing the competitiveness of LGUs in the Philippines. The CMCI Overall Score represents a composite measure, and is derived from the aggregation of the index's five (5) major pillars, reflecting the multidimensional capacity of LGUs to foster economic growth, deliver efficient services, maintain resilient communities, and drive innovation.

Following the assessment of the overall competitiveness scores, this research study distinguishes LGUs by analyzing two (2) major categories of attributes:

Spatial: Mainly refers to contiguity, and whether geographic proximity to more competitive LGUs influences performance
Non-Spatial: This involves examining performance across the different sub-pillars while taking note of similarities among leading LGUs to identify common strengths and possible gaps to target.

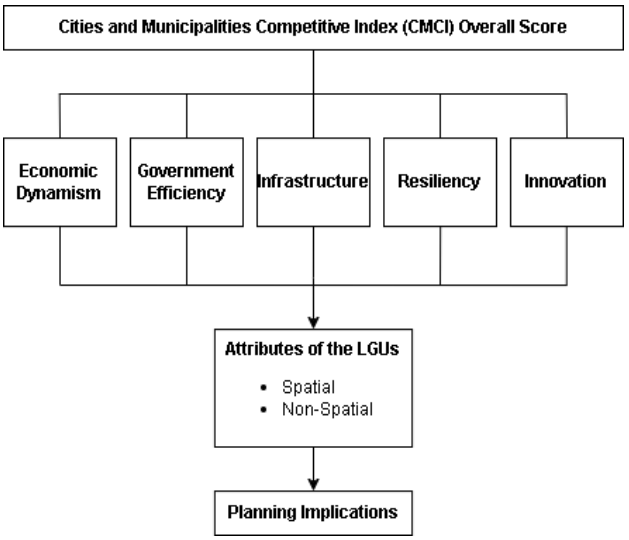

Figure 1. Conceptual Framework of the study.

By integrating spatial and non-spatial analyses, this research study offers a comprehensive understanding of the dynamics shaping LGU competitiveness.

From this understanding, it is intended that there will be implications in how the planning process should evolve moving forward. Ideally, complementation strategies will be more emphasized, such as fostering collaboration between leading and lagging LGUs, promoting regional cooperation, knowledge transfer, joint investments, and coordinated policy interventions.

3. Materials and Methods

The study employed a spatial-statistical approach to examine the dynamics of local competitiveness among the 17 LGUs in Metro Manila and its first- and second-degree contiguous LGUs. The methodology integrates spatial autocorrelation with non-spatial CMCI indicators to identify clusters of leading and lagging LGUs over three temporal points, specifically for the year 2015, 2020, and 2023. This approach operationalizes the conceptual framework linking growth pole theory and urban agglomeration theory with multidimensional LGU performance, allowing empirical evaluation of whether proximity to Metro Manila facilitates higher competitiveness at the periphery. The overall workflow is presented in Figure 2.

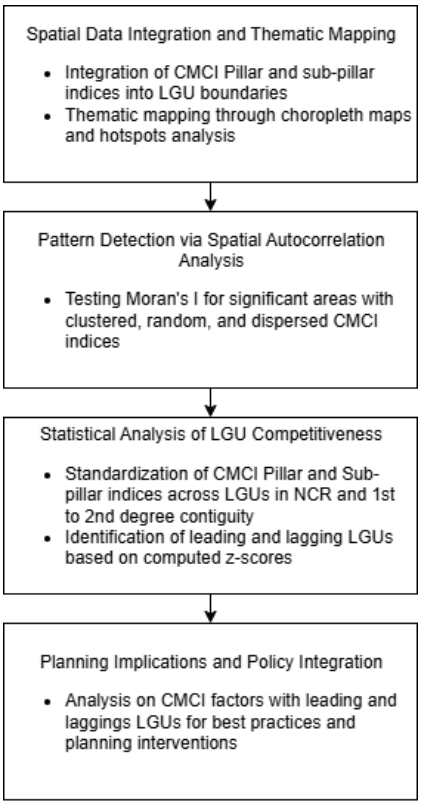

Figure 2. Methodological framework.

3.1 Study Area

3.1.1 Metro Manila as the Core Region: The Metropolitan Manila, consisting of 16 highly urbanized cities, namely, Caloocan, Las Pinas, Makati, Malabon, Mandaluyong, Manila, Marikina, Muntinlupa, Navotas, Paranaque, Pasay, Pasig, Quezon, San Juan, Taguig, and Valenzuela, along with the municipality of Pateros, makes up the largest metropolitan region in the country. It is the most densely populated region in the Philippines, with a recorded population of 13,484,462 in 2020, accounting for 12.37% of the total Philippine population (Philippine Statistics Authority, 2020), representing the primary economic core of the country. The region has seen urbanization first in the country, and has continued to expand as the primary growth center of economic and infrastructural development in the country. Its high urban density and concentration of economic activity provide a natural laboratory for analyzing spatial spillovers in competitiveness. The region is highlighted in green, in Figure 3.

3.1.2 First-degree Periphery LGUs: First-degree LGUs are those sharing borders with the core in terms of contiguity. These include LGUs from the provinces of Rizal from the northeast, Bulacan from the northwest, Laguna from the southeast, and Cavite from the southwest. Included are the cities of Antipolo, Bacoor, Dasmarinas, Meycauayan, San Jose del Monte, and San Pedro, and the municipalities of Cainta, Rodriguez, San Mateo, Taytay, Marilao, and Obando, highlighted in purple in Figure 3.

3.1.3 Second-degree Periphery LGUs: Second-degree LGUs are the contiguous neighbors of the first-degree LGUs. They are considered extensions of the spatial scope to capture broader regional interactions. Similarly, these include LGUs from the provinces of Rizal and Quezon from the northeast, Bulacan from the northwest, Laguna from the southeast, and Cavite from the southwest. Included are the cities of Binan, Gen. Trias, and Imus, and the municipalities of Angono, Baras, Morong, Tanay, Teresa, General Nakar, Bocaue, Bulakan, Norzagaray, Santa Maria, Gen. Mariano Alvarez, Kawit, and Silang. The municipality of Carmona, Cavite was also included as it is geographically surrounded and bordered on all sides by other classified second-degree LGUs, as shown in red in Figure 3.

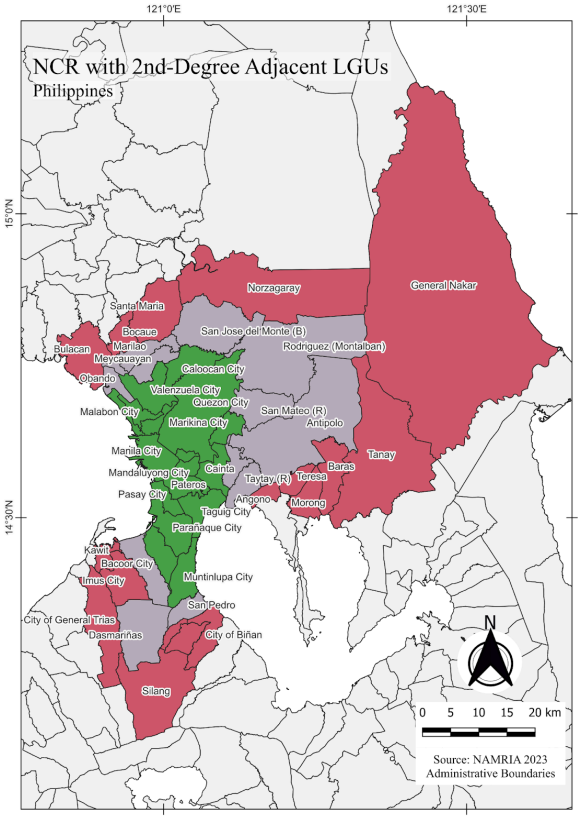

Figure 3. Map of study area: Metro Manila (in green) with 1st-degree Periphery LGUs (in purple), and 2nd-degree Periphery LGUs (in red).

3.2 Data Acquisition and Preparation

CMCI data for the Economic Dynamism, Government Efficiency, Infrastructure, Resiliency, and Innovation pillars and their respective sub-pillars were obtained from the DTI CMCI Data Portal (Department of Trade and Industry - Competitiveness Bureau, n.d.). To incorporate temporal variability, three time points were analyzed, specifically the year 2015, 2020, and the most recent data of 2023.

Administrative boundaries were sourced from the 2023 NAMRIA dataset. All spatial datasets were integrated and visualized using ArcGIS. Data harmonization ensured consistency across years, including projection standardization (UTM Zone 51N) and alignment of LGU polygons.

Data for the pillars of Economic Dynamism, Government Efficiency, and Infrastructure were available for the year 2015, as these were part of the original set of pillars considered in the CMCI. The Resiliency pillar, introduced in 2017, had data available only for 2020 and 2023. Meanwhile, the Innovation pillar, which was added in 2020, had data available only for 2023. In total, 15 scenarios were considered for the spatial mapping and further analysis.

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3.3 Spatial Autocorrelation Analysis

Spatial patterns of LGU competitiveness were analyzed using global Moran's I to assess clustering, randomness, or dispersion of CMCI total scores (Moran, 1950; Esri, n.d.). Parameters included:

- Spatial weights: Queen contiguity, including edge and corner neighbors, capturing first- and second-degree contiguity.
- Distance metric: Euclidean, compatible with UTM 51N projection.
- Row standardization: Normalizing contributions of neighboring LGUs.

The resulting Global Moran's I will be in the form of a coefficient that ranges from the values of negative one (-1) to positive one (+1), with values signifying a dispersed to a clustered dataset, respectively. A zero (0) coefficient indicates a random spatial pattern within the dataset. Statistical significance was assessed via the standard deviation (z-scores) and probability (p-values).

In addition, Local Indicators of Spatial Association (LISA) were carried out to identify localized hot spots and cold spots, and augment the visualization generated through choropleth mapping for finer-scale analysis of spatial dependence. These localized patterns allow identification of specific LGUs driving overall clustering trends.

3.4 Statistical Analysis of LGU Competitiveness

To identify LGUs with extreme performance, CMCI scores were standardized using z-scores, enabling comparisons across pillars with different ranges and distributions. Assumptions include approximate normality within each pillar dataset. This involved calculating the mean to determine central tendency and computing the z-score to assess each LGU's relative position in the dataset. LGUs with z-scores exceeding ±2 were classified as leading or lagging, consistent with conventional thresholds capturing approximately 95% of a normally distributed dataset (Moore et al., 2017).

Further analysis disaggregated the overall scores into pillars and sub-pillars to determine their contribution to LGU performance. Leading and lagging LGUs were identified within each pillar, and their sub-pillar scores were examined to trace consistent patterns of advantage or disadvantage. This approach highlighted the pillars and sub-pillars exerting the strongest influence on overall competitiveness.

3.5 Pillar and Sub-Pillar Analysis

Following identification of leading and lagging LGUs, performance was further disaggregated across pillars and sub-pillars to determine the drivers of competitiveness. This included:

1. Ranking LGUs based on their available scores within each pillar to identify consistent top and bottom performers.
2. Examining sub-pillars (e.g., business registration, health services, IT infrastructure, innovation capacity) to detect structural patterns underlying overall performance.
3. Comparing temporal patterns across 2015, 2020, and 2023 to assess the differentiation, pattern (direction, shape, and consistency through time) and dynamic changes in competitiveness clusters.

This analysis integrates spatial and non-spatial dimensions, linking geographic proximity to pillar-specific performance, and provides actionable insights for regional policy interventions, inter-LGU learning, and replication of high-performing practices.

4. Results and Discussion

4.1 Thematic Mapping

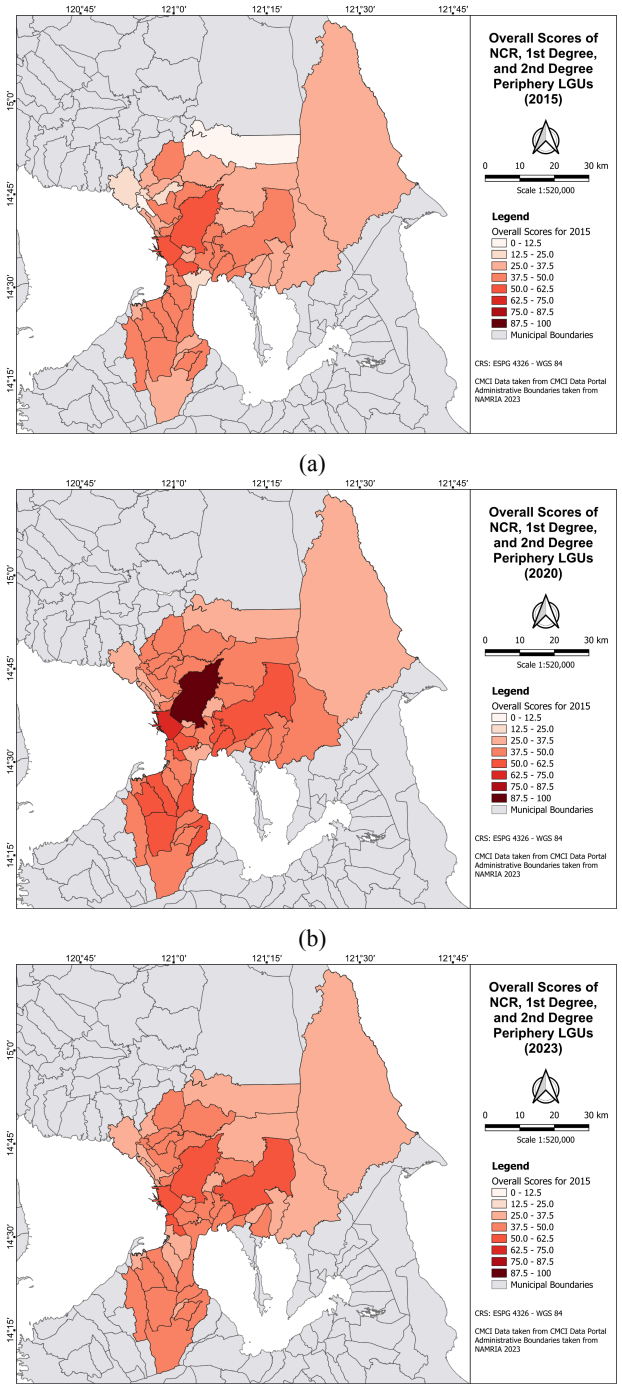
Choropleth mapping was employed to visualize the spatial distribution of CMCI Overall Scores across Metro Manila and its adjacent LGUs in 2015, 2020, and 2023, as shown in Figure 4.

In 2015, a pronounced core–periphery divide emerged. Metro Manila cities, particularly Manila, Makati, and Quezon City dominated the clustering in higher score ranges (1.68-2.14), while most first- and second-degree LGUs scored significantly lower, particularly in Bulacan (Bulakan, Meycauayan, and Bocaue), and Quezon (General Nakar). This distribution aligns with Friedman's core-periphery model (Klimczuk & Klimczuk-Kochańska, 2019), reflecting a concentration of competitiveness in the core and lagging conditions at the periphery.

By 2020, the distribution of competitiveness became more balanced as the scoring scale shifted upward, with values ranging from 29.3 to 100. While NCR remained relatively stagnant, adjacent LGUs—particularly in Cavite (Dasmariñas and Bacoor) and Rizal (Antipolo, Cainta, and Taytay)—demonstrated notable improvements, signaling the emergence of a visible spillover effect from Metro Manila's economic and governance strengths. However, the onset of the COVID-19 pandemic during this period likely disrupted growth trajectories, highlighting differences in resilience and adaptability across LGUs that moderated the expected diffusion of competitiveness. Despite gains in Cavite and Rizal, several LGUs in more remote areas, such as the easternmost part of Rizal and Quezon, continued to exhibit low overall scores.

In 2023, the trend of improvement continued, with higher scores becoming more widespread across Cavite, Laguna, and Rizal. This indicates gradual convergence and the spillover effects of NCR's growth pole dynamics, resulting in a more balanced pattern of regional development. NCR remained the leader with the highest scores, but several adjacent LGUs demonstrated moderate to high performance, reinforcing evidence of spatial diffusion. Nonetheless, remote and geographically isolated municipalities such as General Nakar and Norzagaray persisted in the lowest categories, underscoring the uneven pace of competitiveness gains.

The maps show NCR as the economic core, with competitiveness gradually radiating outward and narrowing the core–periphery gap through regional development gains. Yet, improvements remain uneven, as peripheral and distant LGUs face structural constraints. This suggests that spatial proximity alone is insufficient without complementary governance, infrastructure, and institutional support, underscoring the need for targeted national interventions to reinforce CMCI insights.



(a)

(b)

(c)

Figure 4. Maps of Overall Scores (a) 2015, (b) 2020, and (c) 2023.

4.2 Spatial Autocorrelation Resulting Parameters

Global Moran's I analysis was conducted for overall CMCI scores and individual pillars across the years of 2015, 2020, and 2023. It can be noted that out of the fifteen scenarios tested for NCR and up to first and second-degree adjacent LGUs, only five pillar scenarios exhibited significantly clustered results, while the rest reported random patterns. Resulting parameters of the global Moran's I for the clustered pillar scenarios are shown on Table 1.

Pillar Scenario	Global Moran's I Parameters	
Overall 2015 (clustered; significant at 97% confidence)	Moran's I:	0.166556
	z-value:	2.119098
	p-value:	0.034082
Infrastructure 2015 (clustered; significant at 99% confidence)	Moran's I:	0.226223
	z-value:	2.721704
	p-value:	0.006495
Economic Dynamism 2015 (clustered; significant at 93% confidence)	Moran's I:	0.136657
	z-value:	1.754291
	p-value:	0.079381
Economic Dynamism 2023 (clustered; significant at 91% confidence)	Moran's I:	0.130049
	z-value:	1.651670
	p-value:	0.098602
Innovation 2023 (clustered; significant at 94% confidence)	Moran's I:	0.149199
	z-value:	1.859791
	p-value:	0.062915

Table 1. Global Moran's I parameters of the pillar scenarios with significantly clustered results.

The clustered pattern of the Overall 2015 scores can be attributed to the clustering pattern also observed at the pillar level for economic dynamism and infrastructure. The Infrastructure 2015 scenario returned the highest Moran's I index of 0.226, and the lowest p-value that reports that only less than 1% probability that the observed pattern is due to random chance. This confirms that there is significant concentration of infrastructure in the region. The observed clustering in the Economic Dynamism 2015 pillar must have also affected the development of infrastructure and vice versa, as infrastructure is a main driver for economic dynamism at the same time that economic growth increases the demand for infrastructure (Cuenca, 2020).

Results of the 2020 scenarios show a lack of significant clustering across the overall scores and pillars. This random spatial pattern can be attributed to the varying levels of coping capacity and adaptability cities and municipalities must have exhibited during the period of national emergencies such as the 2019 Coronavirus (COVID-19) pandemic.

Results of the 2023 scenarios highlighted the clustering in the pillars of economic dynamism and innovation. As the innovation pillar was only introduced in 2021, its clustering pattern in 2023 suggests an emerging spatial concentration of LGUs that have begun integrating innovation-driven strategies into governance and economic development. Similarly, the renewed clustering in economic dynamism likely signals the post-pandemic recovery of the economy.

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4.3 Identified Leading and Lagging LGUs

Tables 2, 3, and 4 display the top 10 LGUs in each pillar in the years 2015, 2020, and 2023 respectively, as based on the computed z-scores.

Rank	Ranking of LGUs per CMCI Pillar				
	Economic Dynamism	Government Efficiency	Infrastructure	Resiliency	Innovation
1	Quezon City	Makati	Manila	N/A	N/A
2	Makati	Manila	Dasmariñas	N/A	N/A
3	Gen. Trias	Valenzuela	Antipolo	N/A	N/A
4	Paranaque	Pasay	Bacoor	N/A	N/A
5	Imus City	Marikina	Angono	N/A	N/A
6	Manila	Muntinlupa	Taytay	N/A	N/A
7	Santa Maria	Paranaque	Cainta	N/A	N/A
8	Caloocan	Quezon City	Caloocan	N/A	N/A
9	Cainta	San Juan City	Imus	N/A	N/A
10	San Pedro	Las Pinas	Makati	N/A	N/A

Table 2. Top performing LGUs in the CMCI across five pillars for year 2015.

Rank	Ranking of LGUs per CMCI Pillar				
	Economic Dynamism	Government Efficiency	Infrastructure	Resiliency	Innovation
1	Quezon City	Quezon City	Quezon City	Quezon City	N/A
2	Makati	Manila	Manila	Muntinlupa	N/A
3	Gen. Trias	Antipolo	Antipolo	San Mateo	N/A
4	Paranaque	Cainta	Bacoor	Valenzuela	N/A
5	Imus City	Taytay	Pasay	Antipolo	N/A
6	Manila	Dasmarinas	Makati	Manila	N/A
7	Santa Maria	Valenzuela	Imus	Makati	N/A
8	Caloocan	Silang	Cainta	Binan	N/A
9	Cainta	Caloocan	Taytay	Imus	N/A
10	San Pedro	Makati	Muntinlupa	Pasig	N/A

Table 3. Top performing LGUs in the CMCI across five pillars for year 2020

Rank	Ranking of LGUs per CMCI Pillar				
	Economic Dynamism	Government Efficiency	Infrastructure	Resiliency	Innovation
1	Pasay	Manila	Quezon City	Quezon City	Quezon City
2	Cainta	Pasay	Manila	Muntinlupa	Manila
3	Quezon City	Pasig	Muntinlupa	Manila	Pasay
4	Binan	Valenzuela	Antipolo	San Mateo	Binan
5	Dasmarinas	Quezon City	Pasay	Valenzuela	Muntinlupa
6	Taytay	Antipolo	Dasmarinas	Antipolo	Dasmarinas
7	Carmona	Makati	Makati	Pasay	Carmona
8	Makati	Caloocan	San Pedro	Pasig	San Mateo
9	Santa Maria	Cainta	Caloocan	Makati	Morong
10	Antipolo	Binan	Gen. Trias	Imus	Antipolo

Table 4. Top performing LGUs in the CMCI across five pillars for year 2023

Then, at the overall score level, it was seen that there were six (6) leading LGUs. These were found to be Manila 2015, Makati 2015, Quezon City 2020, Quezon City 2023, Pasay 2023, and Manila 2023. The lagging LGUs on the other hand, were Bulakan 2015 and Taguig 2015, as seen in Table 5.

Leading/Lagging	LGU and Year
Leading LGUs	1. Manila 2015 2. Makati 2015 3. Quezon City 2020 4. Quezon City 2023 5. Pasay 2023 6. Manila 2023
Lagging LGUs	1. Bulakan 2015 2. Taguig 2015

Table 5. List of Overall Score leading and lagging LGUs.

To determine which pillars and sub-pillars most contributed to overall scores, the leading LGUs of each pillar were identified along with the sub-pillars where most overall score leaders excelled. Of the six overall score leaders, five also led in Infrastructure, four in Government Efficiency, three in Economic Dynamism, two in Resiliency, and one in Innovation.

In the Economic Dynamism pillar, the leading LGUs were Quezon City 2015, Makati 2015, Quezon City 2020, Pasay 2020, Pasay 2023, and Cainta 2023, while Tanay 2023 is the only lagging LGU. Among these leading LGUs, Makati 2015, Quezon City 2020, and Pasay 2023 were also leading LGUs at the overall score level. It was seen that the Economic Dynamism sub-pillars where they all commonly led in were Local Economy Size and Employment Generation.

In the Government Efficiency pillar, the leading LGUs were Manila 2015, Quezon City 2020, Manila 2020, Manila 2023, and Pasay 2023, with Taguig 2015 as the only lagging LGU. It was only Manila 2020 that was not a leading LGU at the overall score level, and the findings showed that the Capacity of Health Services sub-pillar was the common sub-pillar that the rest of them led in.

Out of all of the pillars, the Infrastructure was the most led by the studied LGUs. There are 8 LGUs that led the Infrastructure pillar, and five (5) of them also led in the overall score level. These are namely, Manila 2015, Quezon City 2020, Quezon City 2023, Manila 2023, and Pasay 2023. The commonly led Infrastructure sub-pillars among them were Health, Information Technology Capacity, and Financial Technology Capacity.

The Resiliency pillar had five (5) LGUs that led it, where three (3) of which, namely Quezon City 2020 and 2023, and Manila 2023, were also overall score leading LGUs. The commonly led sub-pillars among these three (3) were Emergency Infrastructure and Employed Population.

Finally, the Innovation pillar had only one (1) leading LGU and lagging LGU each. These are namely, Quezon City 2023, which was also an overall score leading LGU, and Bocaue 2023, respectively. Quezon City 2023 led in the Intellectual Property Registration and New Technology sub-pillars.

4.4 Cluster and Outlier Analysis

The LISA results, through the Anselin Local Moran's I, add nuance to the choropleth analysis by showing localized clustering within the broader core–periphery dynamic. A Cluster and Outlier Analysis of the CMCI data is shown as Figure 5.

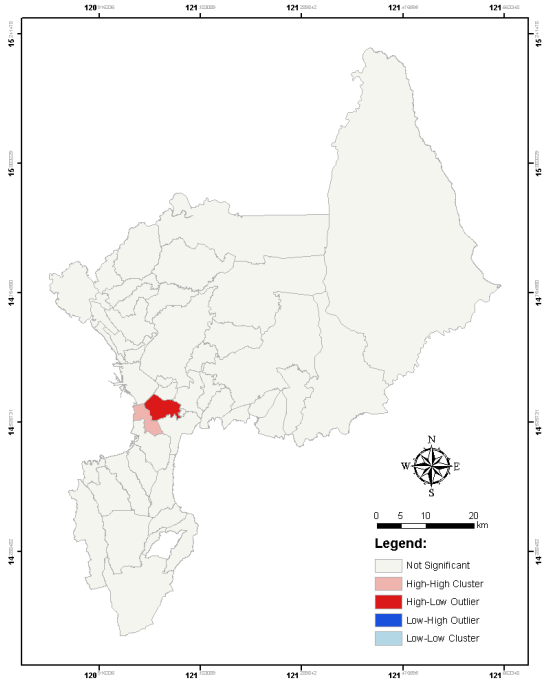

Figure 5. Resulting Local Indicators of Spatial Association (LISA) Analysis.

Makati emerged as a High–High cluster, reflecting both its strong competitiveness score and proximity to other high-performing LGUs, reinforcing how advantages concentrate within the urban core, consistent with agglomeration effects highlighted in the choropleth mapping of NCR. In contrast, Pasay appeared as a High–Low outlier, scoring highly despite being adjacent to weaker LGUs, indicating localized disparities where spillover effects are uneven. Taken together with the 2015–2023 trends, these results underscore the dual nature of competitiveness diffusion: regional convergence is visible through improvements in Cavite, Rizal, and Laguna, yet hotspots and outliers reveal persistent structural barriers—such as governance capacity, infrastructure gaps, and uneven institutional readiness—that shape outcomes at finer scales.
This highlights the need to support both broad regional integration and targeted efforts to address intra-metropolitan disparities that may otherwise constrain the diffusion of competitiveness from NCR's core to its peripheries.

4.5 Planning Implications

Having identified the leading and lagging LGUs at each level, several inferences on best practices and possible policy or intervention targets can be made. The LGUs that topped the overall score rankings also excelled in specific sub-pillars under Economic Dynamism, Government Efficiency, Infrastructure, Resiliency, and Innovation, suggesting common drivers of high performance. These can serve as benchmarks and models for replication in other LGUs. The recurrence of sub-pillars such as Local Economy Size and Employment Generation under Economic Dynamism indicates that LGUs with diversified economies and active labor markets are better positioned to compete. Similarly, high performance in the Capacity of Health Services under Government Efficiency underscores the role of accessible, well-managed health systems. In Infrastructure, leaders excelled in Health Infrastructure, IT Capacity, and Financial Technology, showing the value of integrated, future-oriented investments.

Planning offices and development stakeholders can use these insights to design peer learning programs, promote inter-LGU collaboration, and implement pilot initiatives that emulate success factors. At the same time, gaps in lagging LGUs point to policy priorities. Weak performance in Resiliency sub-pillars, such as Emergency Infrastructure and Employed Population, highlights deficiencies in disaster preparedness and workforce participation, while low scores in Innovation sub-pillars, such as Intellectual Property Registration and New Technology Adoption, indicate limited innovation ecosystems and gaps in R&D support. Addressing these weaknesses is crucial to prevent LGUs from falling further behind and to build more balanced competitiveness across regions.

The DTI's CMCI serves as a powerful tool for shaping urban planning in the Philippines by evaluating LGUs across the five pillars of competitiveness. Its comprehensive and data-driven framework enables planners to identify development gaps, prioritize investments, and design urban strategies that respond directly to local needs. This framework also aligns closely with the United Nations' Sustainable Development Goal (SDG) 11, which calls for inclusive, safe, resilient, and sustainable cities. By systematically assessing LGU performance, the CMCI empowers decision-makers to pursue policies that advance both national development priorities and international commitments.

Moreover, the CMCI fosters localized, context-sensitive planning essential for addressing diverse LGU challenges. Its disaggregated data supports decentralized decision-making, enabling local leaders to craft place-based policies that reduce spatial inequalities and promote balanced development. Public accessibility of CMCI data also encourages citizen participation, accountability, and transparency, ensuring urban development reflects community aspirations. Ultimately, the CMCI functions not just as a benchmarking tool but as a strategic governance instrument that aligns local competitiveness with global goals, advancing inclusive, resilient, and future-ready urban development in the Philippines.

5. Conclusion

This study employed spatial statistics and standardized z-scores to examine the competitiveness of Metro Manila and its first- and second-degree adjacent local government units (LGUs) using the Cities and Municipalities Competitiveness Index

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(CMCI) for 2015, 2020, and 2023. Moran's I revealed shifting spatial patterns—clustered, dispersed, and random—indicating that competitiveness is not consistently shaped by proximity to the metropolitan core. These findings suggest that growth pole effects in Metro Manila are not automatic; rather, differentiated governance, infrastructure, and policy environments drive outcomes across LGUs.

Leading LGUs such as Manila, Quezon City, Makati, and Pasay demonstrated balanced strengths across multiple CMCI pillars, with recurring advantages in infrastructure, governance efficiency, and economic dynamism. Sub-pillar analysis highlighted common drivers of success, including business registration, health service capacity, investment inflows, and IT infrastructure. The absence of persistent spatial clustering further implies that competitiveness is not geographically confined, creating opportunities for spatial complementation where LGUs can leverage one another's strengths through collaboration rather than rivalry.

By integrating CMCI with spatial dependence theory, this study contributes a novel geospatial perspective to urban and regional competitiveness assessment. The results call for a shift in planning and policy from competition-driven benchmarking to collaboration-oriented strategies consistent with the objectives of the Sustainable Development Goals, particularly SDG 11 on inclusive and sustainable cities.

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