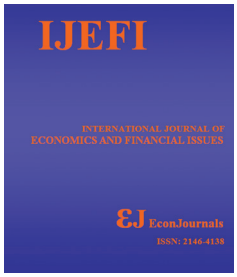

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National Debt Capacity of the Mindanao Economy: A Cointegration Analysis

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ABSTRACT

This paper aims to determine the debt-bearing capacity of Mindanao's regional economies in relation to the national debt from 2000 to 2024. Obtaining the Gross Regional Domestic Product (GRDP) data sourced from the Philippine Statistics Authority and national debt figures from the Department of Finance, the study computes economic capacity as a function of GRDP-to-debt ratios. Employing the Johansen Cointegration Test, which identifies long-run equilibrium relationships among the six Mindanao regions shows that while Mindanao's aggregate economic capacity increased significantly, averaging 33% of the national total, regional differences continue. Northern Mindanao and SOCCSKSARGEN exhibit strong capacity and rapid adjustments to disequilibrium, serving as economic stabilizers. While BARMM and Caraga display slower adjustment, reflecting structural constraints. The cointegration analysis reveals that shocks or growth in one region significantly influence others, reinforcing the interdependence of Mindanao's regional economies. To achieve sustained national debt management and inclusive growth requires regionally integrated policy interventions, investment in infrastructure, and equitable fiscal strategies. A Mindanao-wide development framework, rather than region-specific planning, is essential to maximize the island's collective capacity and contribution to national wealth.

Keywords: Mindanao, GRDP, Economic Capacity, National Debt Cointegration, Fiscal Policy
JEL Classifications: E10, H3

1. INTRODUCTION

Mindanao plays a crucial role in the country's total development due to its abundant natural resources, strategic geographic location, and diverse socio-cultural composition. Studies highlight the critical importance of understanding these interrelationships to foster inclusive growth (MinDA, 2021; MinDA 2022; MinDA 2023) and reduce regional disparities (Acosta et al., 2019; Habito, 2010; Katigbak, 2017; Ramiro, 2002).

The regional economies in Mindanao demonstrates significant interdependence, such that the economic shocks and the regional growth paths are supported by various regional studies that document how infrastructure development, resource sharing, and investment flows contribute to interconnected growth patterns across Mindanao's regions (Bautista and Llanto, 2019; Reyes, 2020; Llanto, 2007; Manasan and Chatterjee, 2003).

Econometric techniques like cointegration analysis were effectively employed to capture the long-run equilibrium relationships among proximate economies, detecting the presence of stable and enduring economic linkages over time (Engle and Granger, 1987; Johansen, 1988; Geldi, 2012).

More so, the Mindanao cointegration context reveals economic capacities in one region can influence neighboring regions (Boschma et al., 2017) through spatial spillovers (Pasion and

Morga, 2023), reinforcing the importance of coordinated regional. These findings highlight the need to understand that Mindanao's regional economies do not operate in isolation (Concepcion et al., 2003) but rather form an integrated system for a collective performance that shapes the island's contribution to national wealth.

Empirical studies further support the idea of economic linkages within Mindanao. Cuenca (2019) underscored the Mindanao's regional economies spillover effects from Western Mindanao extending to adjacent regions, contributing to economic diversification and enhanced market integration. The findings are illustrative of the collective potential for the long-run equilibrium relationships indicating that shocks or growth in a region have ripple influence (Kim and Shin, 2015) across the entire island.

These economic interdependencies are vital for formulating a Mindanao-wide development strategy (Ramiro, 2002) that leverages regional synergies. Strategic roll-out of infrastructure, investment, and governance across the island can enhance these spillover benefits, reduce developmental gaps, and accelerate inclusive growth.

This study builds on these insights by employing cointegration methods to analyze the long-run relationships and adjustment dynamics of Mindanao's regional economies, thereby contributing to evidence-based policymaking aimed at sustained economic expansion by investigating the cointegration of economic capacities across Mindanao's regions to provide insights into how regional economies in Mindanao are interlinked and how these linkages can be leveraged for robust wealth creation and inclusive growth at both regional and national levels.

This study seeks to evaluate the economic capacities of Mindanao and its constituent regions in the context of fluctuations in the national debt. Specifically, it aims to address the following research questions:

1. What has been the economic performance of
   a. Mindanao as a whole, and
   b. its individual regions over the period from 2000 to 2024?
2. How does the economic capacity of Mindanao relate to changes in the national debt during this timeframe?
3. Do the economic capacities of Mindanao's regions exhibit cointegration, indicating long-run equilibrium relationships?

Null hypothesis: There is no cointegration (no long-run equilibrium relationship) among the economic capacities of Mindanao's regions.

2. LITERATURE REVIEW

Numerous studies emphasize the need to understand the economic and spatial interrelationships of the regional economies in Mindanao to address persistent regional disparities, effectively address poverty and establish inclusive development trajectory (Acosta et al., 2019; Habito, 2010; Katigbak, 2017; Ramiro, 2002). According to the studies, these interdependencies are structural and dynamic requiring a systems-level and island-wide view of regional interactions.

The economic growth of Mindanao regions reveals significant interdependence (Mangahas, 2010) evident in the manner the infrastructure development is defined, the cross-region investment flows (Cerutti and Li, 2021), and the natural resource distribution (Oki, 2014) contribute to shared growth outcomes. Bautista and Llanto (2019), Reyes (2020), and Manasan and Chatterjee (2003) all document how interconnected infrastructure and complementary policies generate positive spillover effects, particularly when regional capacities align. Llanto (2007) further notes that decentralization policies must be matched with coordinated investment strategies to avoid deepening existing inequalities between core and peripheral areas.

To quantify these complex economic relationships, econometric techniques such as cointegration analysis have been widely adopted (Hendry and Juselius, 2000). Engle and Granger (1987) and Johansen (1988) pioneered the use of cointegration to establish long-run equilibrium relationships among economic variables. Applied in regional contexts, these models help uncover stable linkages between proximate economies (Yussuf, 2022) that move together over time, despite short-term fluctuations (Geldi, 2012). In the case of Mindanao, such models illuminate the interconnectedness of regional economies and the enduring nature of their economic alignments.

Boschma et al. (2017) expand on this by introducing the concept of regional capacities and their influence through spatial economic spillovers. In the Mindanao context, spatial dependencies are increasingly being recognized as critical to development strategy. Pasion and Morga (2023) provide empirical support for these spillover dynamics, demonstrating how development in one region can stimulate economic activity in neighboring areas. These findings resonate with the policy position that calls for integrated, cross-regional economic planning as a lever for inclusive growth (Dumlao, 2010).

The spillover and feedback effects among Mindanao's regions are further explored by Cuenca (2019), who observed how the economic expansion of Western Mindanao positively influenced adjacent areas through increased trade and investment integration. Similarly, Kim and Shin (2015) highlight the importance of recognizing regional economic shocks and booms as island-wide phenomena, suggesting that long-term development planning must account for these ripple effects. These insights reinforce the notion that Mindanao's regional economies function not as isolated units, but as an integrated economic system shaped by mutual reinforcement and shared vulnerabilities.

The empirical foundation for these arguments underlines the need for a Mindanao-wide development framework that leverages regional synergies, mitigates asymmetries, and enhances coordinated governance. Ramiro (2002) argues for a unified strategy that channels infrastructure investment and institutional

reforms toward building sustainable regional linkages. This view is further supported by current policy directions that emphasize connectivity, logistics integration, and regional convergence to unlock Mindanao's full economic potential.

Building upon these theoretical and empirical insights, the present study employs cointegration analysis to assess the long-run relationships and adjustment dynamics among Mindanao's regional economies. By examining the statistical cointegration of GRDP data across regions, this study aims to uncover how economic capacities move together over time, and how these linkages can inform more coherent, evidence-based policymaking. The understanding these interregional relationships is vital to formulating strategies that promote robust wealth creation and inclusive growth—not only for Mindanao, but for the national economy at large.

3. METHODS

This study employs the quantitative approach tested on the data obtained from the Philippine Statistics Authority (PSA). To obtain the economic capacity of the regions in Mindanao, the GRDP was obtained from the PSA for period 2000 to 2024, and the national debt from the Bureau of Local Government Fund (BLGF) of the Department of Finance.

The Economic Capacity is hereby presented in the following equation, $E_i = \left(\frac{G_i}{D_i}\right)\times 100$, where G_i is the GRDP at year i, D_i is the national debt at year i, E_i is the economic capacity for the same year, and the n as the number of years. Such the Total Economic Capacity is presented as the $\sum_{i=1}^{n} E_i = \sum_{i=1}^{n}\left(\frac{G_i}{D_i}\times 100\right)$, and that the Average Economic Capacity is also presented as $E = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{G_i}{D_i}\times 100\right)$.

After obtaining the economic capacity for Mindanao, and its regions, the study proceeded the cointegration test of the regional economies in relation to the economic capacity to pay-off the national debt.

Cointjegration Test. In introducing the cointegration of the variables, the Johansen Cointegration Formula was employed. It follows that a Vector Error Correction Model (VECM) follows the representation as

Given a VAR model of order p:, then the equation becomes $X_t = A_1X_{t-1}+A_2X_{t-2}+\ldots+A_pX_{t-p}+\varepsilon_t$, this in effect can be re-written in the VECM format as follows $\Delta X_t = \prod X_{t-1} + \sum_{i=1}^{i=p}\Gamma_1\Delta X_{t-1} + \varepsilon_t$, where X_t is an nxl vector of $I(1)$ variables, Δ as the first difference operator, $\prod = \sum_{i=1}^{i=p} A_i - I$ which represents the long-run relationships, and the $\Gamma_i = \sum_{j=1}^{j=p} A_j$, and the ε_t is a white noise error term.

In relation to the Cointegration Test Using Johansen, the equation follows Johansen focuses on the rank of the matrix Π: if $rank(\Pi) = 0 \rightarrow$ No cointegration, if $rank(\Pi) = (r<0<r<n) \rightarrow$ r cointegirating vectors, and if $rank(\Pi) = n \rightarrow$ All variables are stationary.

The Matrix Π is decomposed as $\Pi = \alpha\beta'$, where β is an $n \times r$ matrix of cointegrating vectors, and α is an $n \times r$ of adjustment coefficients. The Test Statistics of the Johansen provides two test to determine the number of the cointegrating vectors, Trace statistic and Maximum Eigenvalue statistic, given as $Trace = T\sum_{i=r}^{i=n}\ln(1-\lambda_i)$, while the $Max\text{–}Eigen = -T\ln(1-\lambda\{r+1\})$, where λ_t are the estimated eigenvalues derived from the matrix used in the test, while T represents the sample size.

4. RESULTS AND DISCUSSION

Figure 1 presents the Mindanao GRDP and the national debt. The Mindanao GRDP, which amounted to Php 4.7 Trillion in 2024 from Php579 Billion in 2000, demonstrated a 716% rate of increase in 24 years. This increase can be attributable to the increasing size of the population, inter-region mobility leading to better trade (PIDS, 2020) better trade and commerce activities, investment flows, and improving regional productivity.

On the other hand, the national debt increased by 641% in the same period, from Php2.16 Trillion in 2000 to Php16 Trillion 24 years after. The nature of the national debt is a composite of two types, including internal and external debts. Internal debts (Garcia, 2020) are those borrowed from sources such as banks, government securities, and other government financial institutions within the Philippines. The external debts are those borrowed from foreign governments, multilateral institutions, or through bonds of international markets.

The country's national debt is considered as an essential fiscal tool to pursue developmental expansion, macroeconomic stability, and intergenerational equity, as these borrowings are expenditures of the present with long-term and sustainable impacts in the future.

If the budget share distribution is to be distributed to the wide grouping of islands as Luzon except NCR, NCR, Visayas and Mindanao, the Mindanao as an island has a regional wealth in most instance higher than a quarter, from 21% to 23% for years 2002 to 2005. From 2006 to 2024, Mindanao's economic capacity oscillate between 26% in 2006 and 42% in 2019, with a 24-year average of 33%.

This means that Mindanao had been posting an improving GRDP-to-national- debt capacities, with a posture of taking a third (33%) of the nation's national debt, from 27% in 2000.

Mindanao economic capacity[1]. Based on the dub-level category of

1 Assume that 25% is the maximum Economic Capacity (i.e., the benchmark or ideal capacity). All scores are interpreted as a percentage of this benchmark. Any score above 25% indicates over-performance or exceeding

Adjusted %	Category	Description
>160% (40+)	Exceptional	Significantly exceeds target capacity; possibly due to data outliers or unique conditions.
120-160% (30-40)	Very Strong	Well above benchmark; strong fiscal and economic performance.
100-119% (25-29)	Strong	Meets or slightly exceeds benchmark capacity.
80-99% (20-24)	Moderate	Slightly below ideal; room for fiscal or structural improvement.
< 80% (<20)	Weak	Well below target capacity; indicates high debt or low output.

Figure 1: Mindanao GRDP versus National Debt

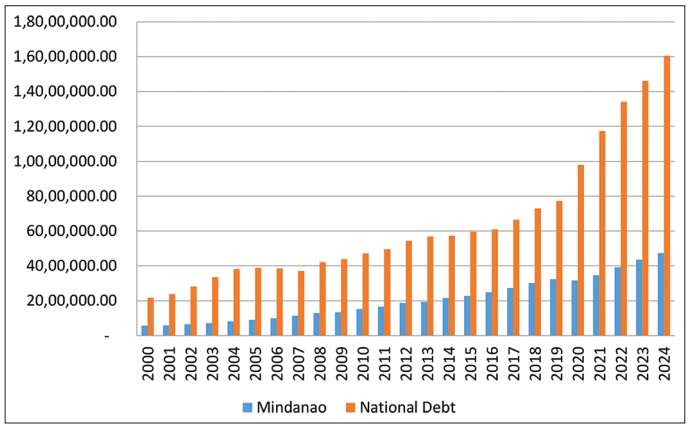
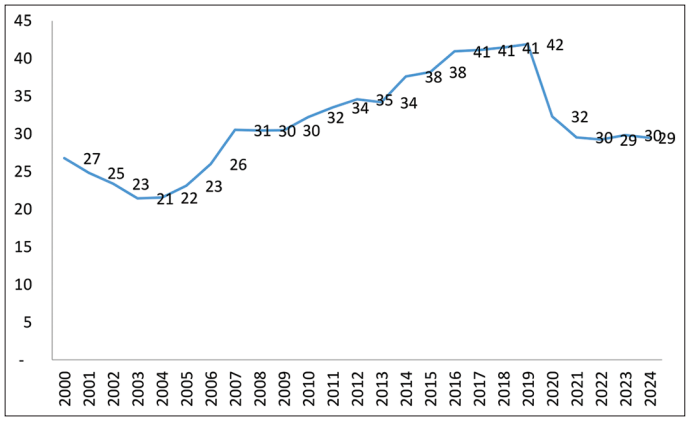


Figure 2: Debt Capacity of Mindanao Econ



the economic performance presented in Table 1 where it accounts that Mindanao takes 25% of contribution of national debt burden as the remaining 75% is distributed to Luzon net of NCR, NCR, and Visayas.

Given the assigned share of the regions relative to Mindanao's share to national contribution for debt management, Western Mindanao demonstrated improvement on its national contribution given its economic capacity for periods 2015-2019 compared to all other periods since 2000-2024. For the said period, the adjusted scores of economic capacity was classified as moderate.

expectations. Rescaling scores relative to 25% Formula: Adjusted Score = (Economic Capacity / 25) × 100.

Region 10 showed wealth expansion that led to exceptional contribution to the management of national debt. This happened from 2016 to 2019. Moreover, there were also instances where very strong contribution to managing the national debt such as in year 2007-2015, 2020-2024. The region had moderate contribution in relation to managing national debt through its economic capacity for periods 2000-2001, 2003-2004, and a strong contribution for years 2004-2005, and also in 2002.

Economic capacity of Region 11 in relation to national debt showed capacities ranging from moderate to exceptional, whereby indicating the regional economic health of Davao. In 2000-2001, Davao Region had strong economic capacity, dipped in 2002-2005 to moderate economic capacity, yet expanded in 2006, breaching the next higher capacity of very strong economic capacity from 2007 to 2015, and even expanding to exceptional economic capacity in 2016 until 2019, yet returned to very strong category in 2020-2024.

Region 12 has an inverse U-shape economic capacity performance from 2000 to 2024. With weak economic capacity in 2000-2005, it improved performance to moderate for the next 9 years from 2006 to 2015, demonstrated strong economic capacity for 2 years, from 2016 to 2017, faltered to moderate economic capacity in the couple of years, in 2018-2019, then slid back to weak economic capacity in 2020 to 2024.

While Regions Caraga and BARMM posted weak economic capacities from 2000 to 2024, though there are showing of marginal improvement reaching double digit adjusted scores for Region 13 from 2009 till 2024, and BARMM showing least capacities for debt contribution.

4.1. Cointegration of Regional Economies using Johansen Test

The Johansen Cointegration Test determines how a group of non-stationary time series variables cointegrate suggesting long-run equilibrium relationship even if each of the variable is non-stationary, in this study, the cointegration of the Mindanao regional economies in achieving economic stability. The Johansen Test proved at least one cointegration relationship among the Mindanao Regions in terms of their economic capacity.

As presented in Table 2, economic capacities of Mindanao Regions in relation to contribution to managing the national debt showed cointegration with at least one variable to achieve equilibrium.

More so, since the cointegration occur on the rank level 1, then attention is given on the firs column of the renormalized beta for the cointegrating vectors, as presented in Table 3, where Western Mindanao was normalized ($\beta = 1$) on account of cointegration test Rank of at most one ($R = 1$). On this, reference is made on Western Mindanao timeseries non-stationary variable. As presented in column 1, Table 3, Northern Mindanao, Davao Region, SOCCSKSARGEN and CARAGA posted a negative long-run equilibrium, while BARMM maintains positive long-run equilibrium.

A negative long-run relationship between Western Mindanao with

Table 1: Adjusted scores of economic capacity

Year	Region 9	Region 10	Region 11	Region 12	Region 13	BARMM
2000	13.20	24.90	37.64	16.81	9.14	5.38
2001	14.05	22.62	34.19	15.27	8.30	4.89
2002	12.86	25.50	24.53	18.25	7.48	4.96
2003	11.68	23.70	22.60	16.79	6.59	4.40
2004	11.57	23.57	23.04	17.00	6.52	4.56
2005	12.44	25.51	24.71	17.99	6.83	4.96
2006	14.01	28.80	27.39	20.31	8.02	5.50
2007	16.34	33.58	31.89	23.90	10.40	6.03
2008	16.43	34.32	31.93	23.78	9.46	5.91
2009	16.21	31.51	32.63	20.09	11.38	10.11
2010	16.54	33.49	34.20	21.38	12.15	11.16
2011	16.99	35.25	35.35	22.38	12.64	11.45
2012	17.42	34.77	40.12	21.42	13.27	11.35
2013	17.83	35.90	34.87	22.84	13.72	11.62
2014	19.29	39.75	38.74	24.60	15.61	12.44
2015	20.22	40.91	40.50	23.83	15.80	11.62
2016	21.17	44.62	44.27	25.07	16.52	12.12
2017	20.72	44.37	45.01	25.26	16.42	12.67
2018	20.81	45.04	46.15	24.92	15.94	12.91
2019	20.65	45.80	47.73	24.57	15.67	13.18
2020	16.12	35.14	36.37	19.08	11.95	10.63
2021	14.60	32.36	32.98	17.19	11.32	9.71
2022	14.61	31.92	32.67	16.82	11.23	9.74
2023	14.55	32.35	34.35	17.06	11.10	9.92
2024	14.52	31.73	34.31	16.84	10.94	9.62

Legend: Range, Category, Color

Category	Range	Color
Weak	<80% (<20%)	Red
Moderate	80-99% (20-24%)	Orange
Strong	100-119% (25-29%)	Yellow
Very Strong	120-160 (30-40%)	Blue
Exceptional	>160% (40+)	Green

Table 2: Cointegration Johansen test

Rank	Eigenvalue	Trace test	P-value
0	0.93354	137.08	0.0000
1	0.73579	72.013	0.0312
2	0.54865	40.069	0.2221
3	0.34821	20.977	0.3696
4	0.25078	10.704	0.2344
5	0.14553	3.7746	0.0520

Regions Northern Mindanao, Davao, SOCCSKSARGEN and CARAGA indicate that as economic wealth or regional spending of the latter regional economies, Western Mindanao responds in the opposite direction slowing down the economic growth of the Western Mindanao.

This is a case of competitive dynamics resulting from competition in investment, human resource, and other potentials including tourism. In addition, it might appear that owing to the limitation in the potential of Western Mindanao due to lacking infrastructures, water, and energy sustainability which are attractors of huge investment locators, these locators may have opted to relocate either in Northern Mindanao, Davao Region, SOCCSKSARGEN, and CARAGA causing economic divergence and displacement effects. The gains of other regions are at the expense of the other region. This relationship can be corrected in the long run if the necessary elements that cause the disparity are addressed such as the connectivity infrastructures, water and energy investments.

4.2. Economic Disequilibrium Adjustments

The analysis on the adjustment vectors or the alpha coefficients are necessary to identify variables in the system, the economic capacities of regional economies, respond to long-run disequilibrium. It would show how fast or slow, and to which direction each regional economy moves in relation to equilibrium. It would show the economic reaction to structural changes happening in the regional economies. It must be noted that a large alpha value of the variable suggests faster adjustments, while a small alpha value indicates stability. In addition, a positive sign of the coefficient alpha means that the regional economy expands in relation to disequilibrium, a negative alpha suggests a decline.

As presented in Table 4, Northern Mindanao and SOCCSKSARGEN Regions have positive and high magnitude adjustment vectors, while regional economies like Davao Region, Caraga and BARMM have positive but lower magnitude adjustment vector. Finally, Western Mindanao maintained negative but lower coefficient.

These signs and magnitudes of effect are suggestive of the divergence or convergence of the regional economies. For example, Northern Mindanao and SOCCSKSARGEN are crucial regional economies to restore equilibrium in Mindanao as the other economies tend to react less establishing stability in the long for the Regions Davao, Caraga and the BARMM. The thing is that

Table 3: Renormalized beta to determine cointegration of regional economic capacities

Mindanao regions	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Western Mindanao	1	−2.7776	−1.9836	1.3406	−0.69296	−0.092936
Northern Mindanao	−0.035487	1	4.3338	−0.18305	1.0627	−0.019288
Davao Region	−0.11304	−0.4796	1	−0.00255	−0.24698	0.26621
SOCCSKSARGEN	−0.25937	0.095866	−2.3497	1	−1.5475	−0.025592
CARAGA	−0.5159	1.3854	−10.072	1.4382	1	−0.6395
BARMM	0.14711	0.19814	3.358	−3.1677	-0.66236	1

Table 4: Renormalized alpha to determine reaction to disequilibrium

Mindanao regions	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Western Mindanao	−0.50005	0.17578	−0.082852	−0.055603	−0.13064	−0.1296
Northern Mindanao	1.9694	0.15409	−0.25158	−0.13963	−0.0022363	−0.25632
Davao Region	0.64681	1.1869	−0.16213	−0.011432	−0.17263	−0.33645
SOCCSKSARGEN	1.3923	−0.051201	−0.12459	−0.15232	0.13694	−0.16458
CARAGA	0.70897	0.16606	−0.043111	−0.039046	−0.29042	−0.12011
BARMM	0.81165	0.02811	−0.0080279	0.056189	−0.26954	−0.13034

Figure 3: Gross Regional Domestic Product of Mindanao Regions, 2000-2024 (in millions Pesos)

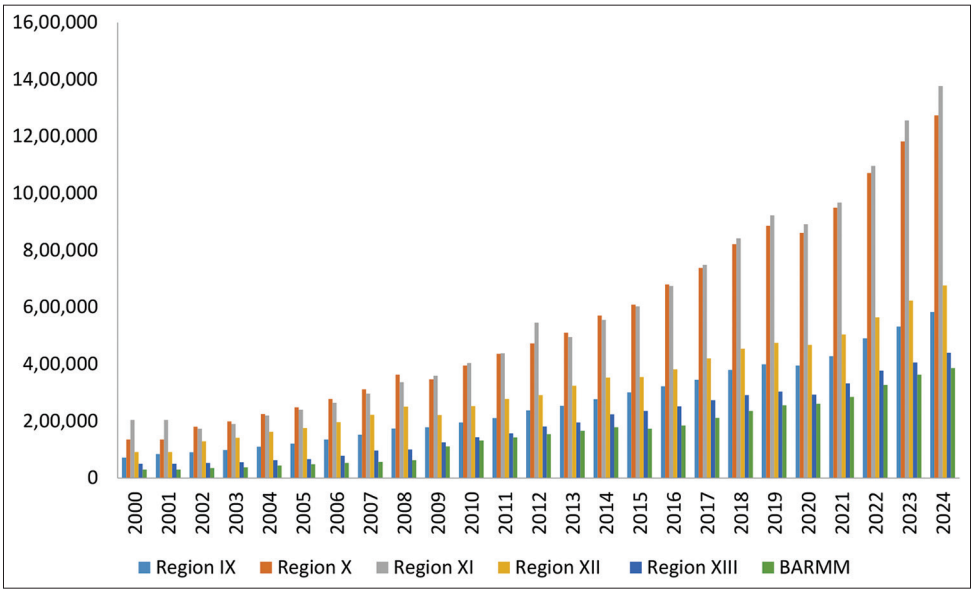
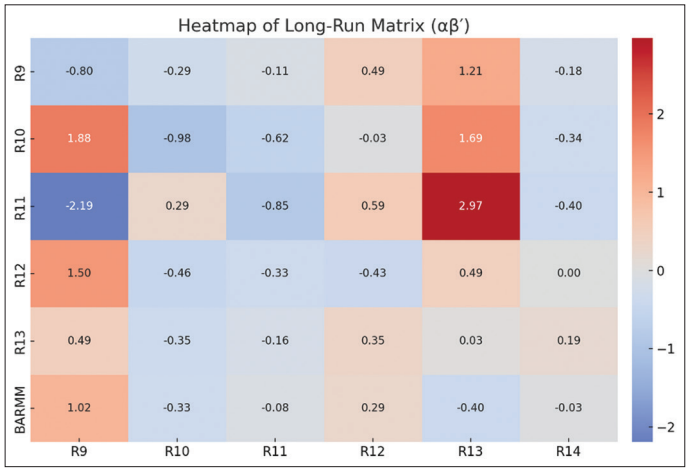


Figure 4: Economic Capacity Heatmap of Regions showing long-run cointegration relationships



Western Mindanao tend to adjust faster to long-run equilibrium, and that these two regions tend to increase as reaction to the positive deviation from the equilibrium such that when Western Mindanao responds to disequilibrium, it moves in the opposite direction with respect to the rest of the regional economies. It may appear that the economic expansion of other regions attracts labor movement from Western Mindanao to where economic boom happens, affecting the growth of Region 9.

4.3. Long Run Dynamic Impact

The economic capacity heatmap shows the long-run dynamic effects of the cointegrating relationship of the regional economies including the Western Mindanao, Northern Mindanao, Davao Region, SOCCSKSARGEN, CARAGA, and the BARMM. The matrix below is a result of the multiplication of the alpha (α) and beta (β), where the former represents the speed of adjustment to

disequilibrium, and the latter represents the long-run equilibrium relationships of the regional economies.

As shown in the heatmap, Western Mindanao acts as stabilizer in most long-run relationships however, it derives benefits from the shocks in the relationships tied to BARMM, SOCCSKSARGEN and the CARAGA. While Northern Mindanao is a regional economy that is highly sensitive to long-run disequilibrium which is indicative of the economic growth drivers or development shocks tied to BARMM, Central Mindanao integration.

The Davao Region contracts whenever positive disequilibrium occurs in the cointegrating relationships, which is an apparent competition if not divergence from the long-run regional trend. However, there are indications of co-movement with the regional growth drivers of SOCCSKSARGEN and CARAGA. This is proof of economic interdependence, such as when CARAGA deviates from its equilibrium path, Davao Region adjusts effectively which might be attributed to changes in trade, labor flows, or investment links.

SOCCSKSARGEN demonstrates little modest role in the long-run economic system, however, the region obtains bigger positive deviations in cointegrations link to Mindanao agriculture and trade, more particularly when its trading partner is the BARMM.

The same was noted for CARAGA which showed mild positive and low magnitude effects. This only means that Caraga offers weak supportive role in the island-wide cointegration, indicating that it does not play significant role in the cointegration, but it adjusts slowly and consistently to long-run changes. This is a demonstration of economic catchup.

It was also shown that BARMM's regional economy is sensitive, particularly negative, to the economic shocks in Western Mindanao, Northern Mindanao, and Davao Region. CARAGA Region maintains positive long-run spillover into BARMM, showing potential strategic partnership for development coordination. This co-movement of the regional economies may be derived from their complementarity rather than direct competition owing that CARAGA has industrial and resource extraction as growth drivers, while BARMM remains largely agrarian and fisheries-based economy. The labor migration of BARMM workers to CARAGA for logging, mining, and transport work also provide plausible explanation.

4.4. Strong Long-run Linkages

Taken as general directorial economic implications, it can be made that Davao Region has strong long-run economic linkages with Caraga Region through trade, migration, and investment flows. Northern Mindanao as well with Western Mindanao via logistics, agri-based industries, and related connectivity infrastructures.

4.5. Cross-regional Adjustments and Spillovers

Economic activities in Western Mindanao have spillover effects to SOCCSKSARGEN and CARAGA. These adjustments and economic spillovers are implied from the domestic strengths of the regions. Western Mindanao produces marine and agricultural products that feed into the processing and distribution networks in General Santos, Koronadal and Butuan, evidencing the benefits of shared supply chains among these regions.

Cointegration among Mindanao's regional economies signifies that national wealth enhancement depends on the strength and equity of regional economic linkages. Economic policy must therefore shift from isolated interventions to systems-level planning, regional convergence strategies, and spillover-sensitive investments.

Some of the regions adjust faster like Northern Mindanao to disequilibrium due to growth or contraction, suggesting that they act as stabilizers, while others like the BARMM, adjust slower showing vulnerability, or lower economic flexibility like Davao Region.

It can be noted that these finding signals differentiated investment approach such that investment flows can be made swifter in more developed or strategically located regions like SOCCSKSARGEN and Northern Mindanao in order to jumpstart sustainable economic expansion in the lagging regions like the BARMM. The intention is to take advantage of the robust regional interlinkages extending development gains to the developing areas by co-developing transport corridors, harmonization of trade zones, and the agricultural trading.

In this way, the regional wealth creation is made collective and interdependent, suggesting growth in one region having positive ripple effect to the national economy, indirectly through the strong effect of regional linkages. In this manner, the creation of national economic wealth on one hand, and the economic capacity of the regions to carry the burden of the national debt on the other, bears clear indication for government to prioritize and pursue a Mindanao-wide development framework rather than an isolated region-specific development model.

The economic policies need to move away from region-specific approaches towards a broad-based model. The traditional economic planning which assumes regions to function independently creates a laggard economic movement. This study had proven the urgency for an integrated and synchronized and island-wide interregional programs and projects particularly those that involve infrastructure, agri-industrial value chains, and labor mobility effects. It is most shown that the network or ripple effects in economic performance take higher premium in development planning.

5. CONCLUSION

The cointegration analysis of Mindanao's regional economies confirms the existence of a long-run equilibrium relationship. This confirms the economic activities across Mindanao regions are structurally interlinked. Northern Mindanao and CARAGA actively correct deviations from equilibrium, signaling their role as economic anchors in the broader Mindanao economy. On the other hand, the slow-adjusting regions like BARMM suggest developmental gaps that require targeted interventions.

These findings underscore a crucial economic analysis, that is, regional economies in Mindanao do not operate in isolation. The economic shocks and growth happening in one region influences

another through the long-run spillovers and short-run adjustments. This interdependence underscores the opportunity for massive wealth creation carried through a Mindanao-wide development perspective.

To do this, it is important to pursue strategic interlinking and policy harmonization across regions. The integrated infrastructure planning and programming, consistent with investment priorities, and collaborative governance mechanisms amplify positive spillovers that can effectively reduce regional disparities and fast-track convergence leading to shared prosperity.

Adopting a unified Mindanao development strategy that leverages cointegrated economic behavior fosters robust and inclusive regional economies enhancing Mindanao's contribution to national wealth.

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