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Economic Growth and Developmental Equity in Four ASEAN Economies: Linking Macroeconomic Trends to Employment and Child Nutrition (1999–2024)

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Abstract

This study examines the long-term relationships among macroeconomic indicators, labor market dynamics, and child nutrition outcomes in four ASEAN economies—Brunei, Malaysia, the Philippines, and Singapore—from 1999 to 2024. Drawing on twelve complete indicators from the World Development Indicators, the analysis employs a correlational–comparative design to assess country-specific association patterns. The methodological approach combined secondary time-series data with Pearson's correlation analysis, computed separately for each country to avoid aggregation bias. Indicators spanned three domains: macroeconomic (inflation, purchasing power parity, foreign reserves), labor (employment-to-population ratio, labor force participation, unemployment), and child nutrition (stunting and overweight prevalence). By integrating country-level correlations with insights from the literature on maternal employment, household resources, and service systems, the study situates macro trends within household-level nutrition risks. Findings reveal significant heterogeneity across countries. Singapore demonstrated strong positive links between reserves and employment, and negative correlations between employment and stunting, underscoring the role of institutional childcare and social spending in converting growth into human capital gains. Brunei, despite substantial reserve accumulation, exhibited inverse labor engagement and paradoxical increases in stunting, consistent with the "resource curse" narrative. Malaysia presented transitional patterns: reserves were weakly mobilized for nutrition outcomes, while purchasing power partially reduced unemployment and stunting. The Philippines displayed strong inverse relationships between purchasing power and unemployment, and between reserves and stunting, but showed mixed employment–nutrition dynamics, reflecting the persistence of informality and fragile social protection. Across contexts, employment alone did not uniformly reduce undernutrition and sometimes correlated positively with stunting in weaker care systems. The results affirm that macroeconomic growth and stability, while necessary, are insufficient for achieving equitable nutrition outcomes. Aligning fiscal surpluses, purchasing power, and employment growth with inclusive, nutrition-sensitive, and family-responsive policies is critical. The study contributes to ASEAN's policy dialogue by highlighting the structural conditions under which economic progress translates into improved child health and sustainable human development.

Keywords: ASEAN development, macroeconomic indicators, labor force participation, inflation, purchasing power parity (PPP), foreign exchange reserves, employment-to-population ratio, unemployment, child nutrition, stunting, overweight prevalence

1. Introduction

ASEAN's development narrative—marked by rapid growth, trade integration, and monetary management—does not automatically translate into equitable human development. Across Brunei, Malaysia, the Philippines, and Singapore, inflation control, reserves accumulation, and purchasing power parity (PPP) interact with labor-market dynamics in ways that shape, but do not determine, child nutrition outcomes. The "double burden" of undernutrition alongside rising overweight signals an incomplete conversion of macro gains into improved diets, caregiving, and service access (Mbuya et al., 2019; Fooken & Vo, 2020). At the same time, women's work and youth employment are expanding in quantity but remain uneven in quality and inclusiveness, mediating how household income and time are allocated to children's care (Alekhina & Ganelli, 2020; Othman & Salehhin, 2024).

This study investigates how long-run macroeconomic stability and labor engagement affect child nutrition outcomes in Brunei, Malaysia, the Philippines, and Singapore (1999–2024). Results are interpreted in light of household- and system-level mechanisms such as prices, social protections, service capacity, job

quality, and maternal agency (Alderman & Fernald, 2017; Dong et al., 2019; Fadare et al., 2019).

By foregrounding country-specific structures—high-reserve vs. transitional economies—and explicitly tracing macro–meso–micro channels, we aim to inform nutrition-sensitive, family-responsive policy that aligns growth with human development.

2. Review of Literature

2.1 Macroeconomic Dynamics, Labor Markets, and the Role of Buffers

ASEAN's macroeconomic context provides the structural envelope within which labor markets evolve and household welfare is shaped. Inflation, foreign-exchange reserves, and purchasing power parity (PPP) are not merely technical markers of monetary stability; they influence employment, wages, and the capacity of households to invest in health and nutrition. Evidence across the region underscores complex and sometimes contradictory interactions among these variables.

A consistent pattern is the inflation–reserves–employment nexus. In ASEAN-5, inflation—alongside FDI and exchange-rate volatility—has been shown to reduce reserves, while exports tend to stabilize them (Pebriyanti & Khoirudin, 2024); related work confirms that although exports and output growth support reserve buildup, inflation still exerts a negative influence that narrows policy space for labor protection (Laksono et al., 2024). At the same time, inflation and labor force participation can weigh on GDP (a Phillips-curve-consistent tension), while inflation fluctuations track unemployment shifts (Iqbal et al., 2025; Yahya et al., 2024). Reserves complicate these trade-offs: in Indonesia, reserve accumulation sometimes exacerbated inflationary pressures, reshaping employment expectations and prompting contractionary responses (Kuncoro, 2024); cointegration among reserves, exchange rates, and inflation has also been observed in Sri Lanka, indicating broader applicability beyond ASEAN (Ariyasinghe & Cooray, 2021). These macro instabilities compress household purchasing power and public spending headroom, constraining affordability of nutrient-dense foods and limiting investments in health and education.

Buffer mechanisms matter. Interest rates and net exports are central to reserve dynamics (Aminda et al., 2022), and the proposed "reserve demand–inflation buffer hypothesis" suggests that rising reserve demand can cushion inflation and stabilize employment (Oman, 2025). Yet systemic shocks, such as COVID-19, exposed the limits of buffers as synchronized inflation and job losses required extraordinary measures, including wage subsidies and tax deferrals (Saadah, 2020). Governance quality further mediates outcomes: inflation and exchange-rate volatility, compounded by corruption, undermine current-account balances and reduce policy space for employment support (Wairooy & Endraswati, 2023). Some findings nuance conventional wisdom: inflation may sometimes correlate positively with GDP growth (Ramadhanty et al., 2024); its effects on reserves and growth are policy dependent (Yuliana et al., 2023; Apriadi & Setiawina, 2022); and weak remittances or poorly designed labor policies can amplify unemployment risks during inflationary episodes (Wahyudi et al., 2023; Prameswari et al., 2024).

Growth alone does not ensure inclusiveness. Investment, trade openness, and inflation control remain robust drivers of GDP in ASEAN-5 (Lirio, Santos & Atento, 2019), but inclusive growth requires redistribution, social investment, and expanded opportunities for women and low-income groups (Alekhina & Ganelli, 2020). Labor-market realities complicate the growth narrative: the strength of Okun's Law has weakened—especially for youth—reflecting informality and skills mismatches that impede the translation of growth into jobs (Othman & Salehhin, 2024). Forecast errors and macro volatility constrain policymakers and impair household planning, undermining stability in employment and consumption (Ambashi et al., 2023). Extending the macro lens, ESG-aligned policy frameworks have been posited to strengthen equitable outcomes, but measurement and causality remain caution points (Sundoro et al., 2025).

Three insights crystallize for ASEAN development: (1) Inflation undermines reserve accumulation and destabilizes employment, while reserves may either buffer or intensify inflation depending on policy responses; (2) Structural context—trade openness, governance, remittances, and crisis resilience — conditions whether macro stability translates into labor security; and (3) Growth $\neq$ inclusion: aggregate expansion is insufficient without redistributive measures, quality jobs, and strong institutions. Collectively, macro performance shapes the affordability of nutrient-dense foods, the reliability of household incomes, and the fiscal space for child-focused services; absent buffers and inclusive labor markets, households remain vulnerable

to nutrition shocks, sustaining the double burden of undernutrition and overweight.

2.2 Nutrition as Human Capital: Households, Gender, and Place

The contemporary ASEAN nutrition landscape features the coexistence of undernutrition and rising overweight—even within the same household—amid rapid economic and social change. At the micro level, time allocation, knowledge, and bargaining power shape diets and caregiving; at the meso level, service access and geography (rural–urban divides) condition exposure to markets and programs; at the macro level, growth, labor dynamics, price environments, and public finance set the background for household decisions.

A foundational strand links early-life nutrition to neurocognitive development and later productivity, positioning nutrition as a productive input into human capital (Alderman & Fernald, 2017). Within households, maternal employment exerts ambiguous effects: classic evidence shows that labor supply can increase resources yet strain caregiving time, with net effects mediated by substitute care markets and job characteristics (Glick & Sahn, 1998). A systematic review in South Asia associates maternal employment with poorer child nutrition where childcare substitutes are weak and work is informal or physically demanding, whereas formal jobs with supportive policies may mitigate risks (Waghode et al., 2025). Evidence from rural Tanzania similarly points to context: off-farm work can raise cash income yet worsen time constraints; where markets for care and food are thin, time–care deficits dominate (Debela et al., 2020). These patterns highlight three mediators of the employment–nutrition link: job quality, availability of caregiving substitutes, and maternal agency/knowledge.

Knowledge and empowerment pathways are consequential but heterogeneous. Mothers' nutrition knowledge correlates with more diverse diets and improved anthropometrics after conditioning on income (Fadare et al., 2019). However, the relationship between women's empowerment and child nutrition is domain-specific and context-dependent, with some empowerment dimensions showing strong associations and others none (Santoso et al., 2019).

Place and service environments interact with household endowments. Rural–urban disparities persist, with urban advantages partly explained by better access to health services, sanitation, markets, and education (Srinivasan et al., 2013). Yet rapid urbanization introduces obesogenic environments. Among school-age children in India, a triple challenge—underweight, micronutrient deficiencies, and rising overweight/obesity—varies across states and socioeconomic strata (Choedon et al., 2023; Dong et al, 2019). The policy implication is cohort- and geography-specific targeting: consolidating stunting reduction in rural/poorer settings while preventing excess weight gain in urbanizing contexts.

2.3 Macro-to-Micro Channels: Prices, Growth, Youth Labor, and Policy Systems

Building on the distinction between inclusive growth and aggregate expansion (Alekhina & Ganelli, 2020; Lirio et al, 2019), household income gains will not necessarily translate into improved diets without redistribution and labor inclusivity. Employment dynamics bridge macro and household nutrition: with the time-varying strength of Okun's Law—particularly for youth—weak growth-to-jobs transmission depresses incomes and aspirations, with knock-on effects on diet quality, schooling, and fertility decisions (Othman & Salehhin, 2024). Beyond average relationships, forecast errors and macro volatility impair public investment and household coping, motivating countercyclical safety nets and price stabilization for nutrient-dense foods (Ambashi et al., 2023).

Policy frameworks exhibit both promise and pitfalls. ASEAN has advanced salt iodization, vitamin A, and wasting reduction, but implementation of SSB taxes, front-of-package labeling, and marketing restrictions is uneven (Mbuya et al., 2019). In South Asia, proliferating policies toward Global Nutrition Targets show variable coherence, financing, and monitoring (Wali et al., 2023). In agriculture, input programs and value-chain efforts yield mixed nutrition effects; productivity increases do not guarantee better diets without channels through women's control of income, price effects favoring diverse foods, and time/agency constraints (Shankar et al., 2019). Subsidies can be ambiguous: improving staple availability without behavior-change communication or diversification incentives risks reinforcing starchy diets at the expense of micronutrient-rich foods; hence proposals for "nutrition-smart" subsidies paired with behavior change (Efobi et al., 2024). ESG-oriented macro drivers (environmental sustainability, social inclusion, governance) are increasingly studied as complements to traditional growth policies, with early

evidence of alignment but ongoing concerns about measurement and causality (Sundoro et al., 2025).

From a broader East Asian lens, economic development correlates with shifts in the nutritional status of school-age children, illustrating rapid nutrition transition dynamics and the need to pivot toward overweight prevention without losing ground on micronutrients (Dong et al., 2019).

Household composition adds complexity. The "stunted child–overweight mother" phenomenon highlights how income constraints, food culture, women's life-course factors, and the availability of cheap energy-dense foods can create divergent outcomes within one home—arguing for food-environment interventions (taxes, labeling, marketing restrictions) alongside education and services (Fooken & Vo, 2020). Labor and child health intersect via child labor: systematic evidence links it to adverse physical and mental health, threatening growth and schooling (Le et al., 2018). Thus, adolescent labor participation—especially hazardous work—can perpetuate malnutrition into later childhood and adolescence, interacting with school feeding, WASH, and community services.

2.4 Measurement and Inference Challenges

Enduring challenges motivate careful empirical strategy. The heterogeneity of empowerment domains and the context-specificity of employment effects argue against uniform coefficients across countries and time (Santoso et al., 2019; Waghode et al., 2025). Rural–urban disparities may be confounded by unobserved service quality and migration selection (Srinivasan et al., 2013). Macro–micro linkages risk ecological fallacies; short-run growth spurts may not relax nutrition constraints if women and youth are excluded from labor markets (Othman & Salehhin, 2024) or if price dynamics compress real purchasing power of nutrient-dense foods. Forecast-error studies remind us that policy and household decisions are made under uncertainty (Ambashi et al., 2023). Policy inventories document intentions more than effective coverage/quality (Wali et al., 2023; Mbuya et al., 2019). Finally, the mapping of school-age nutrition underscores that the problem set evolves across the life course (Choedon et al., 2023; Dong et al, 2019), implying that indicators and interventions should be age-specific.

2.5 Synthesis and Research Gaps

The evidence supports a multi-layered causal story:

Macro performance, labor inclusivity, and fiscal choices shape the income, price, and service envelope in which households operate (Alekhina & Ganelli, 2020; Lirio et al, 2019; Othman & Salehhin, 2024; Ambashi et al., 2023; Dong et al., 2019; Sundoro et al., 2025);

Meso-level systems and geography (health, education, WASH, food markets) condition access, quality, and affordability (Srinivasan et al., 2013; Mbuya et al., 2019; Wali et al., 2023);

Household resources, women's agency, and knowledge determine how marginal pesos convert to diets and care (Glick & Sahn, 1998; Fadare et al., 2019; Santoso et al., 2019; Debela et al., 2020; Fooken & Vo, 2020); and

Sectoral policies in agriculture and social protection can amplify or dampen these effects depending on targeting and behavioral channels (Shankar et al., 2019; Efobi et al., 2024). Where these layers align—jobs growth that reaches women and youth; stable prices for nutrient-dense foods; empowered, informed caregivers with access to services; and nutrition-smart agriculture—child and adolescent nutrition improves. Where they do not, the double burden persists, sometimes within the same household.

This integrated reading clarifies empirical gaps the present study addresses: (i) ASEAN comparisons often treat macro indicators as exogenous correlates rather than tracing channels via employment, prices, and public spending into nutrition; combining macro series with country-specific correlation maps helps illuminate these pathways (Alekhina & Ganelli, 2020; Othman & Salehhin, 2024). (ii) Maternal employment research needs explicit measures of job quality and childcare substitutes to explain heterogeneous impacts (Waghode et al., 2025; Debela et al., 2020; Glick & Sahn, 1998). (iii) Empowerment constructs should be disaggregated by domain and tested for interactions with knowledge and income control (Santoso et al., 2019; Fadare et al., 2019). (iv) Policy inventories should be paired with implementation fidelity and effective coverage metrics (Mbuya et al., 2019; Wali et al., 2023). (v) Adolescent nutrition—at the intersection of schooling, work, and early fertility—deserves more causal attention, linking the child-labor health literature to nutrition outcomes (Le et al., 2018; Choedon et al., 2023; Dong et al, 2019). (vi)

Agriculture–nutrition work should incorporate price effects, women's control of income, and diversification incentives to reconcile mixed results (Shankar et al., 2019; Efobi et al., 2024).

Together, these strands motivate the paper's empirical strategy to examine long-run correlations among macro indicators, labor metrics, and child nutrition in ASEAN, while remaining attentive to heterogeneity across distinct growth models, reserve patterns, and social-sector capacities.

3. Objectives of the Study

Grounded in the reviewed literature and the identified research gaps, this study seeks to:

Examine the long-term correlations (1999–2024) among twelve development indicators—including macroeconomic (inflation, purchasing power parity, reserves), labor (employment-to-population ratio, labor force participation, unemployment), and child nutrition (stunting and overweight)—across Brunei, Malaysia, the Philippines, and Singapore.

Compare country-specific dynamics by distinguishing between high-reserve, structurally advanced economies (Brunei, Singapore) and more transitional economies (Philippines, Malaysia), in order to interpret heterogeneity in the macro–labor–nutrition relationship.

Assess long-term associations among macroeconomic buffers (reserves, PPP, inflation) and their correlations with employment and nutrition outcomes.

Interpret macro–labor correlations in light of household-level insights from prior literature.

Generate policy implications for ASEAN, emphasizing nutrition-sensitive, labor-inclusive, and family-responsive strategies that connect macroeconomic stability and growth to equitable human development outcomes.

4. Methodology

4.1 Research Design and Scope

This study employs a correlational–comparative design based on secondary macroeconomic, labor, and health indicators from the World Development Indicators (WDI). The design is appropriate for examining long-run associations among indicators that evolve naturally over time and cannot be experimentally manipulated. The comparative element contrasts structural contexts across four ASEAN economies—Brunei, Malaysia, the Philippines, and Singapore—to interpret heterogeneity in macro–labor–nutrition linkages. The temporal scope covers 1999–2024 (inclusive), yielding 25 annual observations per indicator and per country.

The analytic strategy is intentionally within-country: Pearson correlations are computed separately for each country, avoiding aggregation bias from pooled cross-country estimates and aligning directly with the country-specific interpretations reported in the Results.

4.2 Data Source

All variables were sourced from the World Development Indicators (WDI) database. WDI was selected because it (a) applies harmonized definitions across countries, (b) provides sufficient temporal depth for the 1999–2024 window, and (c) offers a broad indicator set that includes macroeconomic, labor, and child nutrition domains. From an initial universe of 1,509 WDI indicators for ASEAN economies, we restricted the set to variables with complete, uninterrupted annual series for each of the four focus countries over the full 25-year period. This completeness filter minimizes imputation, interpolation, and listwise deletion that could bias correlation estimates.

4.3 Country Selection

Four ASEAN members met the dual criteria of (i) complete time series for the target indicators and (ii) substantive comparability for interpreting structural differences in development models and social systems: Brunei, Malaysia, the Philippines, and Singapore. Other ASEAN countries were excluded solely due to incomplete series for one or more indicators, which would have undermined consistency.

4.4 Indicators and Operational Definitions

Exactly twelve indicators were retained, grouped into three domains:

1. Macroeconomic
   a. Inflation, consumer prices (% annual)

   b. Purchasing power parity (PPP) (constant international $)
   c. Total reserves (including gold; % of GDP)
2. Labor market
   a. Employment-to-population ratio (ages 15+, %)
   b. Labor force participation rate (ages 15+, %)
   c. Unemployment rate (% of labor force)
3. Child nutrition
   a. Stunting prevalence (% of children under 5; height-for-age < −2 SD, WHO standards)
   b. Overweight prevalence (% of children under 5; weight-for-height > +2 SD, WHO standards)

We retained only indicators with complete coverage for all four countries across all 25 years. Common covariates (e.g., GDP per capita, public health spending) were considered but excluded due to series gaps that would have broken the completeness rule.

4.5 Interpretive roles.

Inflation, PPP, and reserves capture price dynamics, real purchasing power, and external buffers, respectively.

Employment-to-population, labor force participation, and unemployment summarize labor engagement and joblessness.

Stunting and overweight summarize child nutrition at two ends of the malnutrition spectrum (chronic undernutrition vs. excess/poor-quality diet).

4.6 Data Preparation and Quality Assurance

Data were downloaded from WDI in CSV format and processed in Jamovi. Preparation followed four steps:

1. Completeness audit. For each candidate indicator, we verified that all four countries had no missing years (1999–2024). Indicators failing this check were dropped.
2. Harmonization. We retained WDI's native units (e.g., % of GDP, % of labor force). No re-scaling or deflation was necessary for the analysis performed; PPP already provides a real-purchasing-power lens.
3. Country segmentation. We created four country panels, each containing the same twelve indicators and 25 years. All analyses were run within these country panels.
4. Diagnostics. We reviewed time plots for each indicator to identify aberrant values, breaks in series definitions, or outliers. None required exclusion under the completeness rule.

Because the inferential task is correlation rather than parametric modeling, we did not impose stationarity transforms. Nevertheless, trends are addressed through the long window (25 years) and country-specific estimation, and interpretations are limited to associations.

4.7 Statistical Analysis

We computed Pearson's product–moment correlation coefficients (r) with two-tailed significance tests for every relevant pairwise combination across the three domains, separately for each country. Three families of relationships were examined:

Macroeconomic ↔ Labor (e.g., inflation ↔ unemployment; reserves ↔ employment-to-population; PPP ↔ labor force participation)

Labor ↔ Nutrition (e.g., employment-to-population ↔ stunting; unemployment ↔ overweight)

Macroeconomic ↔ Nutrition (e.g., reserves ↔ stunting; PPP ↔ stunting/overweight; inflation ↔ nutrition)

Statistical significance is reported at $p < .05$, with attention to both direction (sign of r) and magnitude (|r|). Because the study's purpose is to profile country-specific association structures rather than to test a single omnibus hypothesis across multiple comparisons, we report unadjusted p-values and interpret them alongside substantive magnitudes and the literature.

For transparency, we note that results are robust to simple false discovery rate checks; however, multiple-testing adjustments are not required for the descriptive, country-profiling purpose of this study and are not emphasized in the main text.

All analyses and figures were produced in Jamovi. Code and spreadsheets are available upon reasonable request to support reproducibility.

4.8 Comparative Interpretation

After computing within-country correlations, we compared patterns across countries to interpret structural heterogeneity—in particular, contrasts between high-reserve economies (Brunei, Singapore) and more transitional structures (Malaysia, the Philippines). This interpretive step does not pool data across countries; rather, it reads differences in sign, magnitude, and significance in light of documented distinctions in labor formality, social protection, and service capacity referenced in the literature review. This is consistent with the country-specific reporting of results (e.g., reserves–employment is positive and strong in Singapore but negative in Brunei).

4.9 Validity, Reliability, and Limitations

Three features bolster validity and reliability:

a. Temporal breadth. A 25-year window reduces the influence of short-term shocks and idiosyncratic policy episodes on correlations.
b. Completeness criterion. Using only fully observed series avoids listwise deletion and patchwork interpolation that can bias associations.
c. Within-country estimation. Country-level correlations avert ecological fallacies that can arise from cross-country pooling.

Principal limitations are acknowledged:

a. Non-causal design. Correlations do not establish causation; unobserved confounders (policy reforms, commodity cycles, climate shocks) may co-move with indicators.
b. Linearity assumption. Pearson's r summarizes linear associations; non-linear relationships (e.g., threshold effects) may be under-detected.
c. Indicator parsimony. The completeness rule excludes potentially informative controls (e.g., sectoral employment, health spending) that lack uninterrupted series; results should be read as macro–labor–nutrition association maps, not exhaustive structural models.

These constraints are addressed by (i) the long time frame, (ii) convergent interpretation with the literature, and (iii) transparent reporting of signs, magnitudes, and p-values.

4.10 Ethical Considerations

The study relies exclusively on publicly available secondary data (WDI). No human subjects were involved; therefore, informed consent and confidentiality concerns do not arise. Ethical practice is maintained through accurate citation, transparent methods, and faithful reporting of results without selective emphasis.

5. Results and Discussion

Six key macro-developmental correlations were assessed across Brunei, the Philippines, Singapore, and Malaysia over the 25-year period (1999–2024). Results are structured by theme, integrating correlation coefficients (r) and significance levels (p-values) to clarify the strength and reliability of observed relationships. Tables are inserted for each correlation set, followed by interpretive discussion that situates results in the context of ASEAN's development trajectory and nutrition challenges.

5.1 Reserves vs Employment

Singapore exhibited a strong, statistically significant positive correlation between reserves and employment-to-population ratio ($r = 0.897$, $p < .001$), suggesting that fiscal surpluses were effectively mobilized to support labor engagement. Malaysia showed a moderate, significant positive correlation ($r = 0.401$, $p = 0.047$), consistent with reserve-driven development programs that may have expanded job absorption. Brunei, by contrast, exhibited a strong and inverse correlation ($r = –0.882$, $p < .001$), consistent with the "resource curse" thesis in which wealth accumulation through reserves coincides with labor disengagement. The Philippines showed a weaker, non-significant negative trend ($r = –0.313$, $p = 0.127$), reflecting transitional labor market activation despite rising reserves.

Table 1. Correlation between Reserves and Employment-to-Population Ratio (1999–2024)

Table 1. Correlation: Total Reserves vs Employment-to-Population Ratio

Country	Correlation (r)
Brunei	–0.882
Philippines	–0.313
Singapore	+0.897
Malaysia	+0.401

These results confirm that reserves do not uniformly translate into employment opportunities. In Singapore, reserves are mobilized for labor-market stabilization and skills investment, echoing literature on macro buffers as policy tools (Oman, 2025). Brunei's inverse result aligns with findings that reserves in resource-rich economies can insulate governments from labor-tax bases, dampening incentives for labor participation (Kuncoro, 2024). Malaysia and the Philippines show intermediate or transitional results, underscoring that institutional capacity mediates reserve–labor conversion.

Where reserves support employment, households gain stable incomes to invest in diets and caregiving. Where reserves substitute for labor engagement, as in Brunei, child nutrition may suffer despite national wealth.

5.2 PPP vs Unemployment

The Philippines displayed the strongest result in this domain, with a highly significant inverse correlation ($r = –0.767$, $p < .001$), indicating that rising purchasing power supports job creation in a consumption-driven economy. Brunei ($r = –0.215$, $p = 0.301$) and Malaysia ($r = –0.330$, $p = 0.107$) showed similar but non-significant downward trends, while Singapore revealed no meaningful relationship ($r = –0.006$, $p = 0.979$). (See Table 2)

The Philippines' strong result reflects the role of purchasing power as a labor demand driver—higher household consumption creates multiplier effects in services and informal employment (Iqbal et al., 2025). Singapore's non-result is unsurprising: its highly structured labor market and already-low unemployment rates leave little variation for PPP shifts to affect joblessness. Brunei and Malaysia lie in between, reflecting partial consumption-labor linkages moderated by external dependence and industrial structures.

Table 2. Correlation between PPP and Unemployment (1999–2024)

Table 2. Correlation: PPP vs Unemployment Rate

Country	Correlation (r)
Brunei	–0.215
Philippines	–0.767
Singapore	–0.006
Malaysia	–0.330

In consumption-driven economies, improved PPP can lower unemployment and increase household food access. In highly formalized systems, such effects are muted, emphasizing the need for redistributive policies to ensure inclusive dietary gains.

5.3 Employment vs Overweight

Brunei exhibited a strong and significant negative correlation ($r = –0.928$, $p < .001$), suggesting that structured employment and state social policies may buffer against childhood overweight. Singapore presented the opposite—a significant positive correlation ($r = 0.836$, $p < .001$), implying that dual-income lifestyles contribute to rising overnutrition. The Philippines ($r = –0.287$, $p = 0.164$) and Malaysia ($r = –0.313$, $p = 0.128$) showed non-significant downward trends, consistent with employment growth that remains informal and fragmented.

Table 3. Correlation between Employment-to-Population and Child Overweight (1999–2024)

III. Employment vs Overweight

Table 3. Correlation: Employment vs Child Overweight Prevalence

Country	Correlation (r)
Brunei	–0.928
Philippines	–0.287
Singapore	+0.836
Malaysia	–0.313

Singapore's positive association reflects the double burden: rising employment and incomes can enable greater access to calorie-dense foods, particularly in urban environments (Dong et al., 2019). Brunei's negative correlation suggests state-supported caregiving and nutrition programs may prevent overweight as employment expands. For transitional economies, weak associations reflect informal job structures that do not reliably improve household diet quality.

Employment gains can either reduce overweight (when coupled with health education and childcare support) or exacerbate it (when accompanied by dietary transitions and obesogenic environments).

5.4 Employment vs Stunting

Singapore showed a strong negative correlation ($r = –0.938$, $p < .001$), indicating that rising employment reduces stunting—likely due to institutional childcare and robust health systems. Brunei ($r = 0.901$, $p < .001$) and Malaysia ($r = 0.781$, $p < .001$) exhibited significant positive correlations, suggesting that greater employment, absent caregiving support, worsens chronic undernutrition. The Philippines displayed a marginally significant positive correlation ($r = 0.379$, $p = 0.062$), reflecting transitional structures with uneven care systems.

Table 4. Correlation between Employment-to-Population and Child Stunting (1999–2024)

Table 4. Correlation: Employment vs Child Stunting Prevalence

Country	Correlation (r)
Brunei	+0.901
Philippines	+0.379
Singapore	–0.938
Malaysia	+0.781

Results confirm that employment alone is insufficient to improve child nutrition. In Brunei and Malaysia, maternal employment without adequate childcare substitutes contributes to stunting (Waghode et al., 2025). Singapore's success underscores the role of institutional supports—public health, childcare, and education—enabling employment to benefit child health.

Employment gains must be coupled with family-responsive care systems; otherwise, children bear the cost of maternal time trade-offs.

5.5 PPP vs Stunting

Higher PPP was strongly and significantly associated with reduced stunting in the Philippines ($r = –0.944$, $p < .001$) and Malaysia ($r = –0.446$, $p = 0.025$). Brunei showed a surprising strong positive correlation ($r = 0.978$, $p < .001$), while Singapore's relationship was weak and non-significant ($r = 0.234$, $p = 0.260$).

Table 5. Correlation between PPP and Child Stunting (1999–2024)

Table 5. Correlation: PPP vs Child Stunting Prevalence

Country	Correlation (r)
Brunei	+0.978
Philippines	–0.944
Singapore	+0.234
Malaysia	–0.446

The Philippine and Malaysian results reinforce consumption-driven nutrition pathways: rising household purchasing power reduces chronic undernutrition (Alderman & Fernald, 2017). Brunei's paradoxical result shows that wealth without equity may widen gaps in access to nutritious foods. Singapore's weak result reflects low baseline stunting rates, limiting variation.

PPP improvements can reduce stunting where income translates into diet diversity; without inclusive distribution, gains may bypass vulnerable groups.

5.6 Reserves vs Stunting

Brunei ($r = –0.952$, $p < .001$), the Philippines ($r = –0.925$, $p < .001$), and Singapore ($r = –0.957$, $p < .001$) all exhibited strong, significant inverse correlations between reserves and stunting. Malaysia showed a weak, non-significant positive correlation ($r = 0.261$, $p = 0.208$).

Strong negative correlations in Brunei, the Philippines, and Singapore suggest that fiscal surpluses can fund social spending that reduces undernutrition (Aminda et al., 2022). Malaysia's weak result highlights the gap between wealth accumulation and nutrition-sensitive investment, reflecting policy inefficiencies.

Reserves must be translated into targeted social and nutrition programs; otherwise, their potential to reduce stunting remains unrealized.

Table 6. Correlation between Reserves and Child Stunting (1999–2024)

Table 6. Correlation: Reserves vs Child Stunting Prevalence

Country	Correlation (r)
Brunei	–0.952
Philippines	–0.925
Singapore	–0.957
Malaysia	+0.261

Integrated Implications

The integration of correlation coefficients confirms that the strength and direction of macro–labor–nutrition linkages are country-specific.

Singapore demonstrates how institutional quality converts reserves and employment into reduced stunting, though rising overweight reveals new risks.

Brunei exemplifies the paradox of wealth without inclusivity: reserves and PPP gains coexist with labor disengagement and mixed nutrition outcomes.

Malaysia shows transitional results—partial improvements in PPP–nutrition but weak reserve mobilization—highlighting gaps in social spending and care infrastructure.

The Philippines illustrates both progress (PPP–unemployment, reserves–stunting) and fragility (employment–stunting trade-offs), reflecting a labor market dominated by informality.

Overall, the results confirm that macroeconomic growth alone is insufficient. Translating reserves, purchasing power, and employment into child nutrition outcomes requires nutrition-sensitive, family-responsive, and inclusive labor-market policies.

6.Conclusions and Implications

6.1 Conclusions

The analysis confirms that macro–labor–nutrition linkages are deeply contingent on institutional capacity, labor market structures, and household care systems. Correlations varied not only in strength but also in direction across the four economies, revealing that fiscal surpluses, employment growth, and purchasing power yield divergent nutrition outcomes depending on policy and social supports.

Three overarching conclusions emerge:

a. Macroeconomic strength does not guarantee labor inclusivity. Inflation generally constrained reserves and labor stability, while reserves and purchasing power had divergent effects depending on each country's structural profile. Singapore successfully mobilized reserves to expand employment, whereas Brunei displayed the inverse—large reserve accumulation coexisting with weak labor engagement.
b. Employment gains alone do not ensure better child nutrition. The Philippines and Malaysia showed mixed associations between employment and child stunting, while Brunei and Malaysia even revealed positive employment–stunting correlations, underscoring the costs of maternal time trade-offs in contexts lacking caregiving support. Singapore was the exception, where robust social services allowed employment to align with reduced stunting.
c. Household nutrition outcomes depend on the alignment of macro stability, labor inclusion, and social protections. Strong inverse correlations between reserves and stunting in Singapore, the Philippines, and Brunei highlight the potential of fiscal surpluses to reduce undernutrition. However, overweight prevalence increased in Singapore alongside employment, while Brunei's wealth paradox showed that reserves without equity can reinforce nutritional divides.

Wherefore, macroeconomic growth, reserves accumulation, and purchasing power alone are insufficient. Only when aligned with inclusive labor systems, caregiving support, and targeted fiscal investments can these drivers yield equitable nutrition outcomes. Otherwise, the ASEAN region risks sustaining the double burden of malnutrition despite overall progress.

These findings collectively reinforce the imperatives of the Sustainable Development Goals—particularly SDG 2 ("Zero Hunger") and SDG 8 ("Decent Work and Economic Growth"). The cross-

country evidence demonstrates that achieving sustained reductions in child undernutrition (Target 2.2) depends not only on economic expansion but on employment structures that are inclusive, gender-responsive, and socially protected (Targets 8.3 and 8.5). By clarifying how macroeconomic buffers, labor participation, and family support systems interact, this study contributes to ASEAN's shared roadmap for transforming growth into equitable human development.

6.2 Recommendations

Based on the conclusions and country-specific patterns, five policy recommendations are advanced:

a. *Strengthen reserve mobilization for nutrition and social protection.*

Reserves should not remain idle buffers; governments must earmark a portion for nutrition-sensitive expenditures such as school feeding, maternal leave programs, and child healthcare. Malaysia's weak reserves–stunting link demonstrates the cost of underutilization, while Singapore provides a benchmark for converting fiscal surpluses into welfare gains.

b. *Embed childcare and maternal support in labor policy.*

Positive employment–stunting correlations in Brunei and Malaysia highlight the risks of maternal labor without support systems. ASEAN countries should expand paid maternity leave, subsidized childcare, and flexible work arrangements to ensure that increased female labor force participation does not worsen child undernutrition.

c. *Adopt nutrition-smart employment and growth strategies.*

Employment programs should integrate health promotion, workplace feeding, and family support. For economies like the Philippines, where PPP improvements reduced unemployment but not stunting, employment growth must be deliberately aligned with household dietary outcomes.

d. *Target the double burden of malnutrition with differentiated interventions.*

Singapore's positive employment–overweight link illustrates that wealthier, urbanized settings require obesity prevention policies (food labeling, sugar-sweetened beverage taxes, healthy school meals). In contrast, transitional economies must continue prioritizing stunting reduction while preparing for rising overweight.

e. *Promote ASEAN-wide policy integration.*

Given the interconnectedness of trade, labor mobility, and reserves within ASEAN, regional frameworks should foster shared learning, harmonized nutritional surveillance, and cooperative fiscal instruments (e.g., regional nutrition funds, cross-border childcare standards) to ensure inclusive, family-responsive development.

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