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Structural change and industrial upgrading in the Philippines: Stylized facts and routes towards sophisticated economic diversification

by

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Abstract

Using time series data from 1945 to 2023, this paper develops stylized facts to trace the historical origins of the Philippines' narrow economic base. Econometric models are then estimated to analyze the drivers and benefits of economic diversification in the Philippines. The empirical results suggest that re-industrializing the domestic production base can significantly enhance economic diversification. Strategies that accelerate the growth of local industries, especially to catch up with the dominant services sector, are vital. Effective policies should focus on developing physical and human capital, improving connectivity, and fostering domestic innovation. This push for greater diversification is justified by its potential benefits on output and growth stability, and diversification and growth of exports. The paper also explores various routes towards economic diversification and industrial upgrading in the Philippines using the product space approach. The first route is directed towards leapfrogging to a more sophisticated economic structure in the product space. The second route points at climbing the value ladder within global value chains. The third route leads to the strengthening of the local industrial base that is heavily populated by small and medium-sized establishments.

Keywords: economic diversification, industrial upgrading, structural transformation, manufacturing, exports, product space, global value chains, SMEs, Philippines

JEL: L16, O14, O25, O33

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1. Introduction

The Philippines' economic trajectory has been characterized by erratic historical performance, despite being strategically located in a high-growth region.[2] In the 1950s, the Philippines boasted one of the highest per capita gross domestic products (GDP) in Asia, trailing only Japan, the former Malaya, Hong Kong, and Singapore. Despite an early lead in industrialization, the country was soon surpassed by its Asian neighbors—South Korea and Taiwan in the 1950s, followed by Thailand, Indonesia, and China from the 1970s through the 1990s [Balisacan and Hill 2003]. While the country showed stronger performance in the decade following the Great Recession, growth levels were insufficient for a robust catch-up.[3]

Numerous analyses have identified key factors impeding the Philippines' growth and development. A 2007 Asian Development Bank (ADB) study highlighted critical constraints to Philippine economic growth: tight fiscal situation; inadequate infrastructure, especially in electricity and transport; weak investor confidence, particularly due to corruption and political instability; and chronic market failures leading to a narrow industrial base. Specifically, a lack of economic diversification, the focus of this paper, resulted in a service-driven economy without a vibrant manufacturing sector. This failure in structural transformation stifled manufacturing and exports, with services emerging as the primary growth driver. By 2023, the services sector accounted for 62 percent of GDP and 59 percent of total employment.

The connections between growth, productivity, innovation, and diversification are intricate yet intuitive. Hidalgo and Hausmann [2009] previously noted that upgrading and diversification stem from accumulating complex domestic capabilities, essential for developing sophisticated industrial processes and expanding the knowledge base. Growth, as ADB [2017] suggested, is driven by the creation of innovative goods, alongside scaling existing production. Rodrik [2007] enumerated the following stylized facts about industrial development as an engine of growth: i) economic development requires diversification instead of specialization; ii) rapidly growing countries have large manufacturing sectors; iii) growth accelerations are associated with structural changes in the direction of manufacturing; iv) countries that promote exports of more "sophisticated" goods grow faster; and v) some specialization patterns are more conducive than others to promoting industrial upgrading. Usui [2012] also noted that the successful transformation of the Asian Tigers in the 1970s had the following specific dimensions: i) production shifted from low- to high-productivity manufacturing goods; ii) labor moved from the primary sector to modern industrial activities; and iii) the export basket diversified toward more sophisticated products. In contrast, Usui's [2012] diagnosis suggests that the Philippines' poor performance is tied to sluggish productivity due to slow industrial upgrading and diversification.

The empirical literature broadly supports the positive relationship between diversification and growth, particularly in the early stages of development. Imbs and Wacziarg [2003], documented a nonlinear relationship: developing countries diversify across more sectors, but this trend reverses as specialization becomes advantageous at higher income levels. Francis [2016] showed that diversification enhances economic and social welfare, impacting income distribution, innovation, and foreign direct investment (FDI). Theoretically, diversification is driven by two main factors: a general trend to expand production and consumption with increasing domestic income and capabilities [Imbs and Wacziarg 2003], and risk mitigation to reduce vulnerabilities to economic shocks [Acemoglu and Zilibotti 1997]. For commodity exporters, diversifying lessens the impact of shocks from price volatility and uncertainty in global markets. However, Imbs and Wacziarg [2003] rightly observed that entering into new products, sectors, or markets

[2] These historical swings are reflected in the evolving monikers given to the Philippines through the years, from being one of the "New Asian Tigers" to the "Sick Man of Asia" to the "Rising Star of Asia".
[3] As of end-2020, the Philippines had also been overtaken by Vietnam in terms of per capita GDP.

involves huge fixed costs, suggesting better diversification opportunities for countries with greater physical, technological, and knowledge resources.

This paper builds on the broad argument that economic diversification can drive industrial upgrading and growth in an emerging economy like the Philippines. Freire [2019] suggests that long-run growth may be propelled by diversification within the subset of complex economic activities and sophisticated products. This underscores the potential synergy between diversification, technology-driven industrial upgrading, and productivity growth. In light of these insights, this current study analyses the various dimensions of economic diversification in the Philippines through key research questions: 1) What are the historical origins of the Philippines' narrow economic base?; 2) What factors drive economic diversification in the country?; 3) What role does industrialization play in broader-based diversification?; and 4) What benefits does economic diversification bring to the Philippines? Based on the results of this analysis, the paper then explores feasible routes towards economic diversification and industrial upgrading in the Philippines using the product space approach.

The rest of the paper is organized as follows. The second section presents stylized facts about historical patterns of economic diversification in the Philippines. The third section discusses the econometric analysis of the drivers and benefits of economic diversification. The fourth section uses the product space to map several feasible routes for economic diversification and industrial upgrading. The final section concludes with policy insights.

2. Structural Change and Economic Diversification in the Philippines: Some Stylized Facts

This section examines the historical patterns and drivers of economic diversification in the Philippines, particularly in comparison with East and Southeast Asia. Brenton, Gillson, and Sauvé [2019, 142] define economic diversification as "the shift toward a more varied structure of domestic production and trade with a view to increasing productivity, creating jobs and providing the base for sustained poverty-reducing growth." Ideally, this structural transformation boosts productivity through efficient reallocation of resources. A narrower definition focuses only on exports diversification, involving the expansion of the trade basket, entry into new markets, and upgrading the quality of existing products [Brenton, Gillson, and Sauvé 2019].

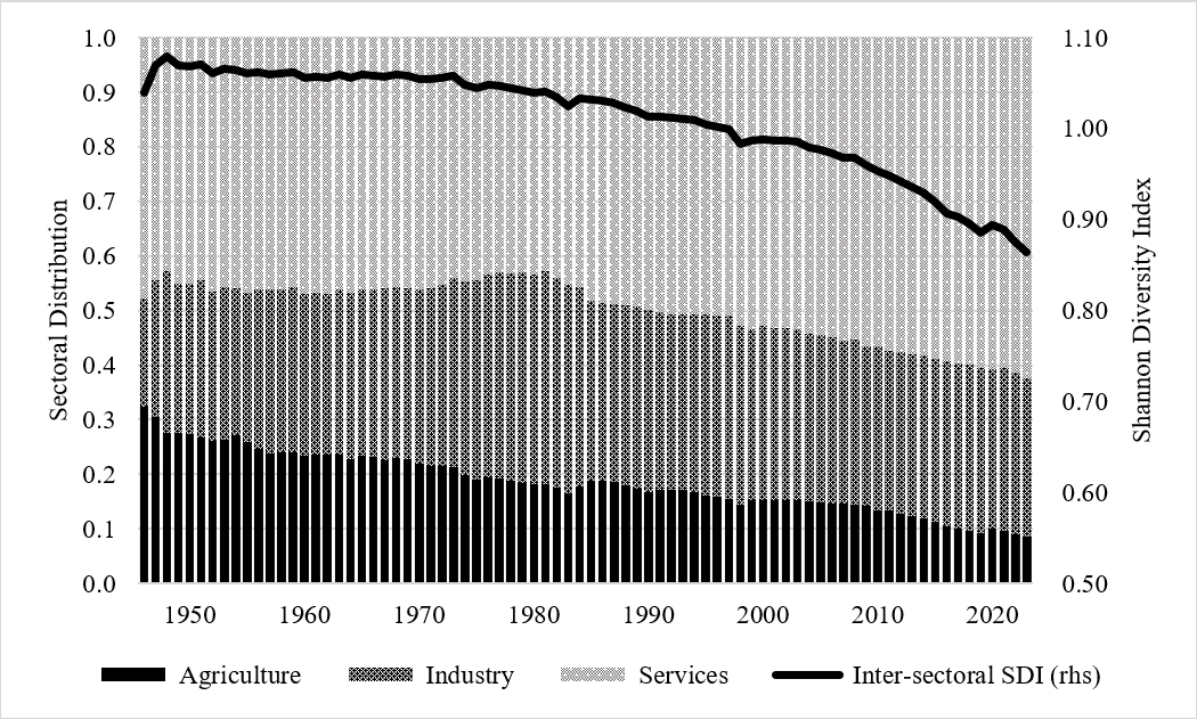
From a balanced and stable sectoral distribution in the 1950s to 1960s, the structure of the Philippine economy experienced rapid changes in the succeeding decades. The 1970s marked a decline in agriculture and the rise of manufacturing as the key driver of the domestic economy.[4] While emerging economies in East and Southeast Asia adopted export-led growth models, the Philippines continued with its import substitution strategy established in the 1950s [ADB 2007]. This policy involved foreign exchange controls and trade barriers (e.g., high tariff regimes and quantitative import restrictions) to protect priority sectors and infant industries [World Bank 2013]. However, this industrial surge was fleeting; by the late 1980s, services had overtaken manufacturing, as agricultural productivity continued to deteriorate. Employment data reveal that industrial expansion during the 1970s and early 1980s did not result in a proportional increase in the share of manufacturing in total employment. While there were brief periods of manufacturing resurgence in subsequent decades, these were often disrupted by economic crises, political turmoil, and natural disasters.

The services sector emerged as the main engine of economic growth due to the manufacturing sector's inability to sustain a robust recovery. According to Williamson and de Dios [2014], the Philippines' *deviant*

[4] However, it should be noted that the share of manufacturing (agriculture) in output has been gradually increasing (decreasing) even before the 1970s.

manufacturing behavior after the 1960s and its path towards premature deindustrialization was due to a "perfect storm" of protectionism, political instability, missed opportunities during the surge of FDIs in the 1980s, overreliance on foreign capital, and two financial crises. As Figure 1 illustrates, the inter-sectoral Shannon diversity index (SDI) for Philippine GDP has decreased overtime, reflecting the economy's increasing focus on services.[5] The data also indicate that the services sector has been contributing more than half of Philippine GDP growth since the 1990s.

Figure 1. Sectoral Distribution of Philippine Real GDP (% of total), 1946 - 2023



Source of data: Philippine Statistics Authority (PSA)

Understanding structural change in the Philippine economy can also be informed by analyzing the underlying dynamics in labor productivity growth. Following Usui [2012], labor productivity growth is decomposed using the following formula:

$$\frac{\Delta y_t}{y_{t-1}} = \frac{1}{y_{t-1}}\left(\sum_i \left[\underbrace{y_{i,t-1}(s_{i,t} - s_{i,t-1})}_{SSRE} + \underbrace{s_{i,t-1}(y_{i,t} - y_{i,t-1})}_{WSPGE} + \underbrace{(s_{i,t} - s_{i,t-1})(y_{i,t} - y_{i,t-1})}_{DSRE}\right]\right) \quad (1)$$

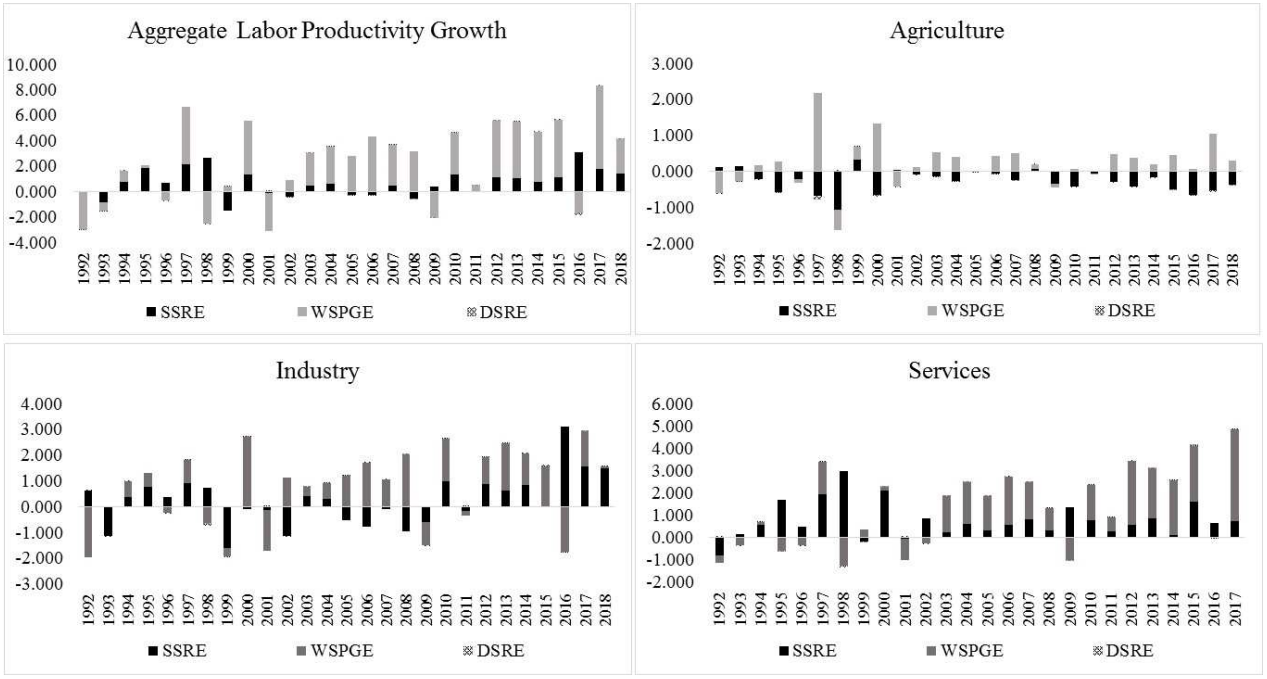
where y_t is aggregate labor productivity at time t, $y_{i,t}$ is labor productivity of sector i at time t, $i = \{A, I, S\}$, $s_{i,t}$ is share of sector i in total at time t. The first term is the static structural reallocation effect (SSRE) which measures the changes in productivity due to labor reallocation from low- to high-productivity sectors. The second term is the within-sector productivity growth effect (WSPGE) which captures the contribution of intra-sectoral changes to changes in aggregate productivity. The last term is the dynamic structural reallocation effect (DSRE) which is the residual in aggregate productivity growth when SSRE and WSPGE

[5] The SDI is computed using the following formula: $\sum_{i\in\{A,I,S\}} s_i \ln(1/s_i)$, where $s_i \in (0,1)$ is the share of component i in total GDP; $i \in \{A, I, S\}$, corresponding to agriculture, industry, and services, respectively. A higher index value is associated with greater diversity.

are excluded. The sign of DSRE depends on the direction of the changes in sectoral labor productivity and employment share.

Figure 2 illustrates the results of the decomposition exercise. The top left panel indicates that aggregate labor productivity growth is increasingly driven by WSPGE, reflecting productivity improvements within individual sectors, independent of the dynamics in other sectors. Sectoral decomposition shows that the aggregate WSPGE predominantly stems from services and industry, while agriculture has stagnated since the early 21st century.

Figure 2. Decomposition of Aggregate Labor Productivity Growth, 1992-2018



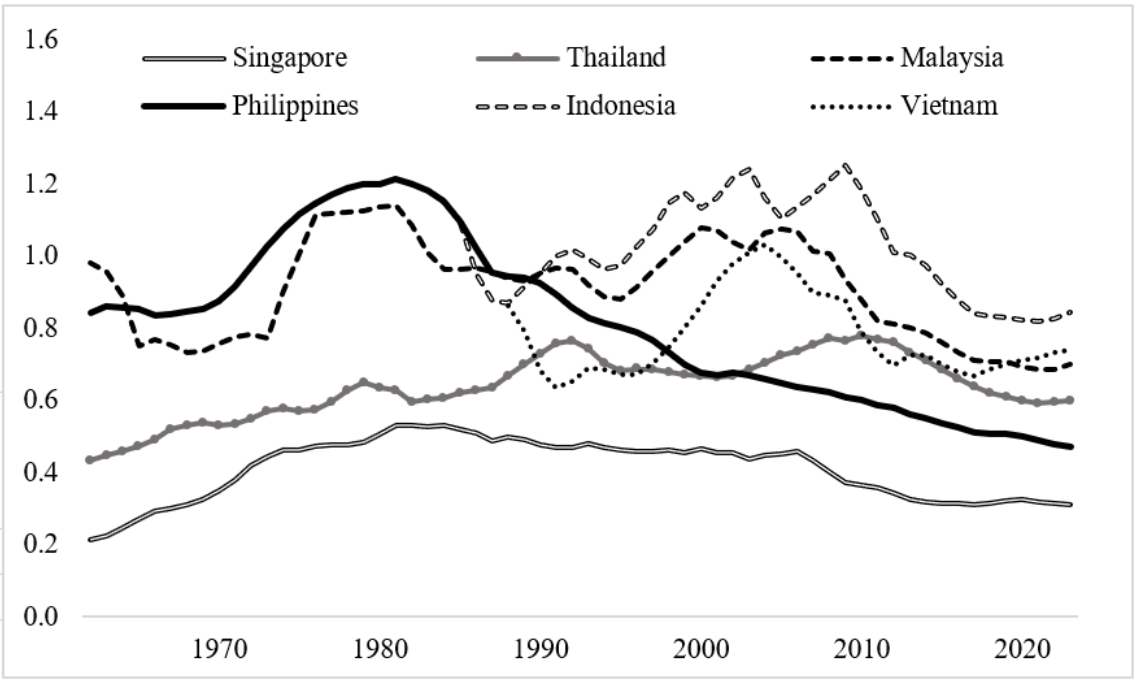
Source: Authors' computation using data from PSA.

Another significant trend is observed in sectoral shifts in resource allocation: SSRE is generally negative for agriculture, erratic for industry, and positive for services. This underscores that the industrial sector, particularly manufacturing in the 2000s, struggled to effectively absorb surplus labor from agriculture. But more importantly, stagnant industrial productivity also hindered manufacturing's ability to retain its own workforce, resulting in the services sector absorbing workers from both agriculture and industry. However, as noted in previous studies, although services became the catch basin of workers for the shrinking agriculture and manufacturing sectors, the majority of jobs in the services sector tend to be low-skilled and low-productivity, characterized by precarious employment conditions [World Bank 2013].

In the ideal path of industrialization, a developing country should progress with a balanced "two-legged" approach: industry-led growth supported by modern, high-skill services, along with enhanced agricultural productivity and export-driven manufacturing to be able to provide productive job opportunities and achieve inclusive growth [Usui 2012]. However, the Philippines deviates from this model. Since the late 1980s, its economy has increasingly leaned on services, as depicted in Figure 1, while manufacturing has stagnated. Figure 3 also illustrates how other ASEAN-6 economies have managed more balanced growth. Malaysia, for example, has successfully maintained a balance between industry and services for nearly five decades, contributing to its transition into a high-income economy in the 2010s. In contrast, the Philippines faced premature deindustrialization, with manufacturing's share of the economy shrinking to just half the

size of services in recent years. Figure 3 also shows that the Philippines is notably the only country among its regional peers to have not experienced an industrial resurgence during the 2000s. In fact, the country has since maintained the relatively weakest manufacturing leg among emerging ASEAN-6 economies (excluding Singapore which had a different set of initial endowment and constraints). Vietnam, with its recent industrial resurgence, has been growing a stronger manufacturing leg as a result of its emerging status as a regional manufacturing hub following trade wars and pandemic-driven reorganizations of Factory Asia.

Figure 3. Walking on Two Legs: Ratio of Industry to Services Shares in Real GDP (3yma)



Source: Authors' computation using data from World Bank.

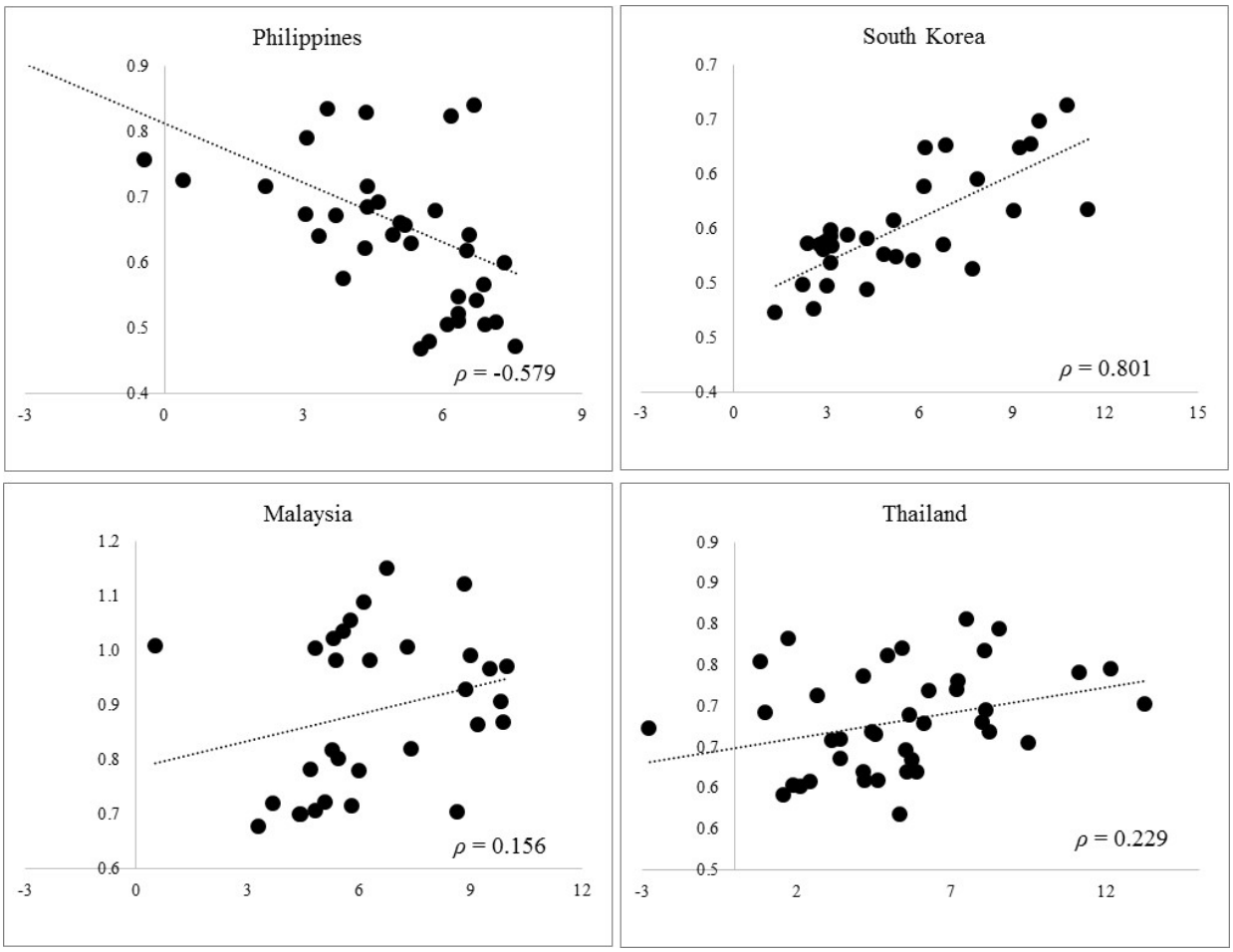
Figure 4 illustrates the Philippines' unique services-driven economy vis-à-vis some manufacturing-driven industrializers in the region. There is strong negative correlation (-0.73, excluding 1998, 2009, and 2020) between the industry/services ratio and GDP growth in the Philippines since the 1990s, indicating that the decline in manufacturing relative to services is linked to the country's moderate economic performance. This suggests that premature deindustrialization has weakened the growth momentum. In contrast, a higher industry/services ratio is associated with accelerated growth in South Korea, Malaysia, and Thailand. In South Korea, for instance, high-skilled, high-productivity services complement its globally-integrated high-tech manufacturing sector.

For South Korea, Malaysia, and Thailand, GDP growth and the industry/services ratio after 1960 and before reaching upper middle-income status exhibit positive correlations of 0.71, 0.81, and 0.31, respectively, implying a synergistic growth of the sectors during industrialization phases.[6] In the Philippine case, the correlation coefficient for the period 1960 to 2023 was -0.88, consistent with the country's early deindustrialization story. Unfortunately, the Philippines' services leg is a weak one since it is mainly

[6] According to official World Bank classification, South Korea, Malaysia, and Thailand reached upper middle-income status in 1981, 1991, and 2010, respectively.

supported by low-skilled jobs [World Bank 2013]. And while formal services like business process outsourcing and tourism have expanded, they remain disconnected from domestic manufacturing processes.

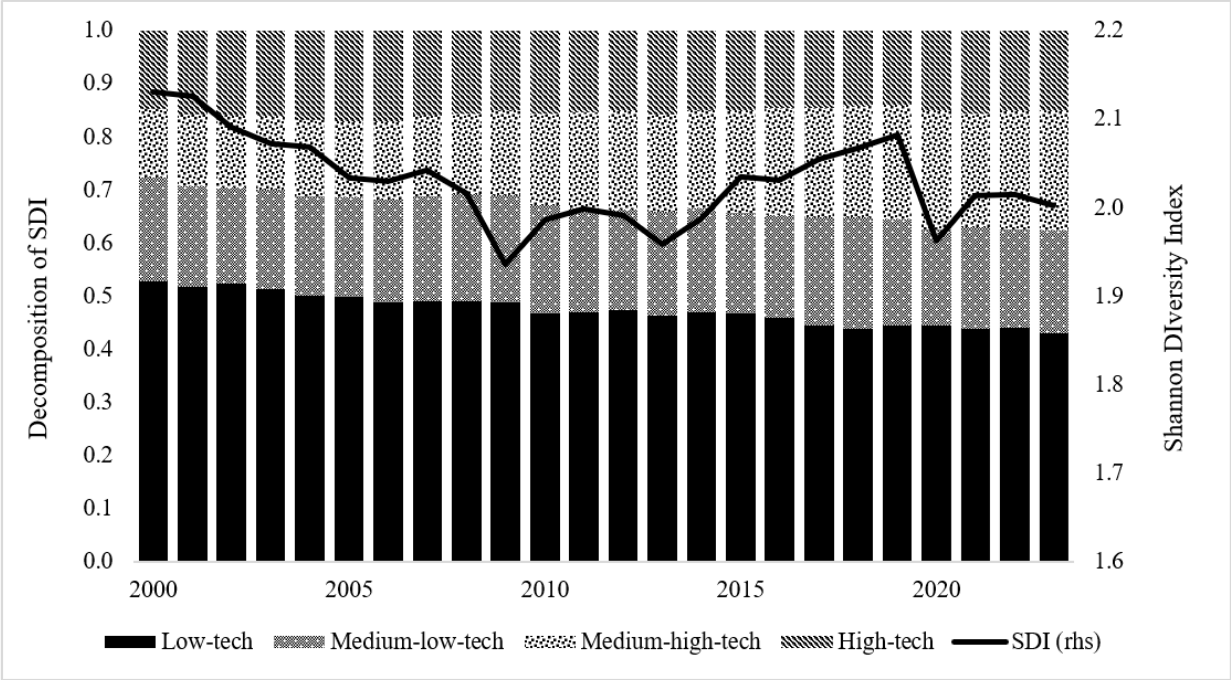
Figure 4. GDP Growth Rate vs. Industry/Services Ratio in Selected Countries, 1981-2023



Source: Authors' computation using data from World Bank.
Note: Data from 1998, 2009, and 2020 are excluded.

The stagnation of manufacturing in the Philippines, coupled with premature deindustrialization, highlights the domestic industrial base's failure to diversify and upgrade toward more sophisticated production. Figure 5's decomposition of the SDI for Philippine manufacturing reveals diversification patterns predominantly fueled by low-tech sectors such as food, beverages, tobacco, textile, wearing apparels, leather, footwear, wood and related products, paper and paper products, printing and reproduction of recorded media, and furniture. The decline of diversification in manufacturing during the 2000s was primarily driven by the sustained contraction of the low-tech production base, with no significant offsetting increase in other sectors. Most notably, high-tech sectors such as pharmaceuticals, computers, and electronics failed to expand output share or innovate with new, sophisticated products. The 2010s saw a rise in diversification driven by medium-high-tech sectors, including chemical and chemical products, electrical equipment, machinery and equipment, and transport equipment, albeit at a moderate pace. This trend indicates some upgrading from low-tech, labor-intensive sectors to more sophisticated industries. The preceding observations suggest deterioration in low-tech sectors, and a missed opportunity for the Philippines to effectively restructure its manufacturing industry towards medium and high-tech sectors.

Figure 5. Diversification in Philippine Manufacturing Value Added, 2000-2023



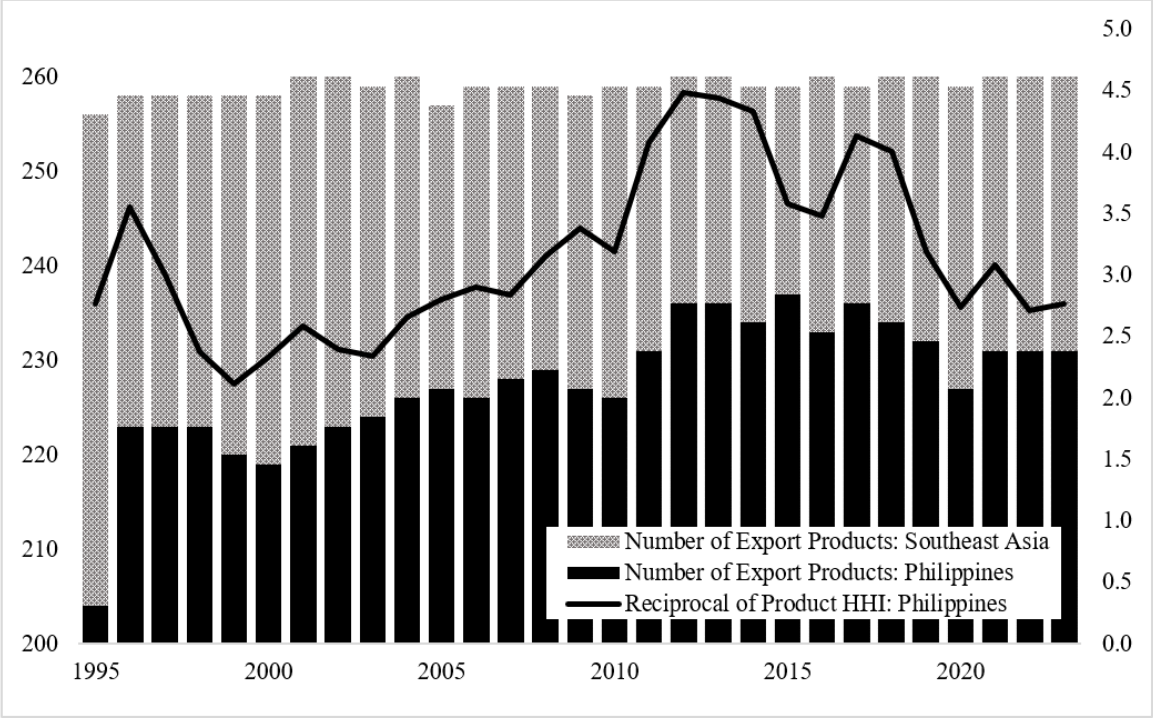
Source: Authors' computation using data from PSA.

The limited diversification of Philippine industries is evident in the small composition of its export basket. Figure 6 illustrates that Philippine exports lack differentiation, especially compared to the rest of the region. From 1995 to 2023, the average Herfindahl-Hirschmann Index (HHI) of Philippine export products at the three-digit SITC Rev. 3 level is 0.33 according to UNCTAD data[7], which is more than double the Southeast Asian average of 0.14. This higher HHI indicates pronounced export concentration, with the Philippines exporting a narrower range of 228 products on average, compared to the regional average of 259 products. While electronics-related exports have historically dominated the Philippines' trade transactions in global value chains (GVCs), the focus has mostly been on lower-value-added activities such as assembly, testing, and processing trade, leading to a perception of high-tech export capabilities that may not reflect the reality of limited value addition [Abrenica and Tecson 2003]. Beyond electronics, the other important contributors to Philippine exports are still in traditional manufactures and agro-based products such as wearing apparel, coconut products, seafood, metal products, and bananas. Moreover, the static nature of products with revealed comparative advantage underscores challenges in enhancing export quality.

GVCs can offer a critical avenue for economic diversification, especially relevant to the Philippine context. By connecting economies into international production networks, GVCs enable countries to specialize in distinct value chain segments where they hold a competitive advantage. This model supports developing economies aiming to expand beyond primary goods, offering opportunities to engage in specific tasks—such as component manufacturing, assembly, or service provision—that can catalyze technology transfer, skills development, and market access, thus driving movement into higher-value-added activities over time [World Bank 2020].

[7] The HHI is computed using the following formula: $\sum_{i=1}^{h} s_i^2$ where $s_i \in (0,1)$ is the share of component i, $i = 1, \ldots, h$. A higher index implies more concentration.

Figure 6. Exports Diversification in the Philippines vs. Southeast Asia, 1995-2023



Source of data: UNCTAD
Note: The HHI and number of products are calculated based on the three-digit SITC, Rev. 3 level.

However, the Philippines' GVC participation remains concentrated within electronics and electrical equipment, with minimal activities in sectors closer to the core of the product space. This narrow participation can be attributed to the country's specialization in low-value adding segments, where captive-type of relationships often limit functional and intersectoral upgrading. Mendoza [2024] notes that the Philippines' GVC experience reflects only a subset of the broader learning and upgrading possibilities within production networks. While some GVCs do not inherently foster innovation, studies show that participating in knowledge-intensive GVC segments can accelerate learning and productivity growth. The primary challenge for Philippine suppliers, therefore, is how to cultivate the technological capabilities necessary to explore various GVC upgrading trajectories that enable radical innovations, dynamic learning, and substantial productivity growth.

The lack of diversification in manufacturing and exports is a manifestation of the progressive shrinking of the mass of Philippine exporters. Balaoing-Pelkmans [2017] attributes this to a declining entry rate alongside an increasing permanent exit rate of firms in the export market, resulting in decreasing survival rates of manufacturing exporters since 2001. The share of new export entrants in total entrants has been diminished significantly, from as high as 88 percent in 1999 to 24 percent in 2012.[8] This may be indicative of an eroding domestic production base or a deteriorating ability of local firms to successfully enter foreign markets.

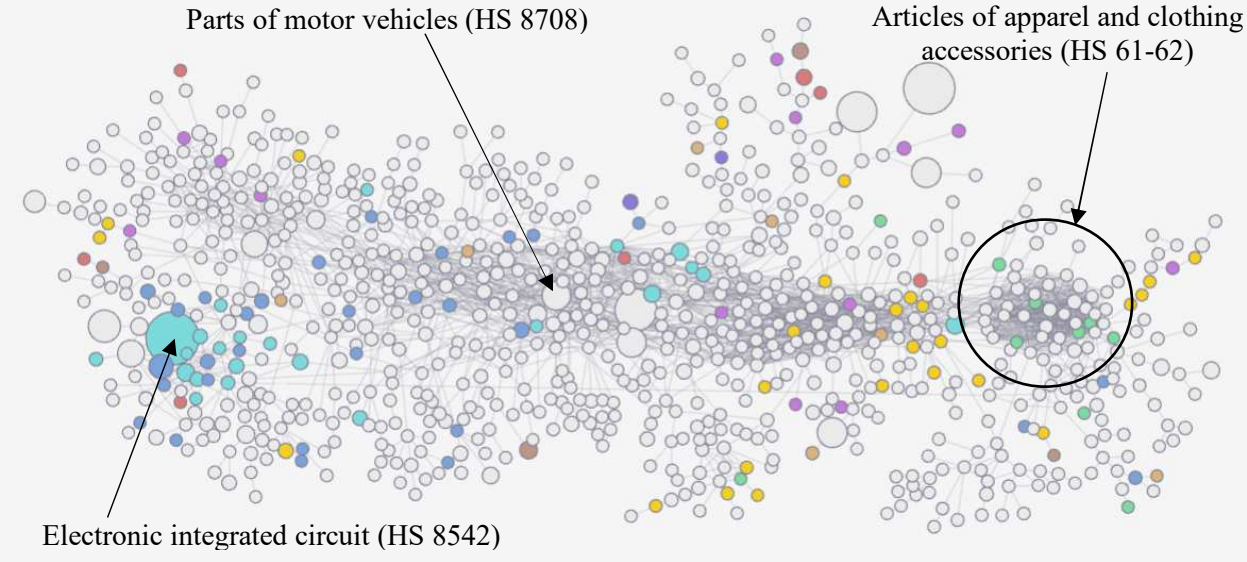
From a product space perspective, Figure 7 illustrates how small the Philippines' export basket is with respect to the entire universe of goods produced globally in 2021. Its product space is notably sparse (i.e., very few shaded nodes), especially when compared to more diversified neighbors such as Malaysia,

[8] Total entrants include other types such as re-entrants and one-time entrants.

Singapore, and South Korea. In fact, Hidalgo and Hausmann [2009] classified the Philippines among "non-diversified countries producing standard products". Comparison across time also suggests declining diversification in the Philippine product space, with the near-extinction of traditional export products such as garments during the 1990s. Major Philippine exports such as electronics are mostly in the periphery of the product space, while exports near the core (i.e., the area surrounding cars and auto parts) are either trivial or non-existent (i.e., unshaded nodes).[9] Unfortunately, the opportunities for upgrading are highest near the core since the production capabilities here are densely connected. In other words, the tendency to produce "neighboring" goods is high given their very similar technology and skills requirements. Despite its high-tech nature, electronics is like a cluster of islands far from the core which makes the highly-specialized capabilities associated with it difficult to apply outside the industry. This may partly explain why the Philippines failed to replicate the success of electronics in other sectors.

The limited diversification of output and employment towards greater sophistication may be explained by the small stock of productive knowledge and skills necessary to perform more complex economic activities [Hidalgo and Hausmann 2009]. Accumulating a diverse set of productive know-how is crucial for building the capacity to manufacture a wide range of goods, including complex and sophisticated products that only a few other countries can produce. However, accumulating useful knowledge and skills need purposeful efforts to learn and innovate. In addition to software and hardware acquisitions, investments in human capital are also critical to improve the absorptive capacity of domestic industries. Upgrading often requires strategic spending on a package of complementary investments (i.e., human, technological, and institutional capital) that will not work with missing elements.

Figure 7. Philippine Product Space in 2021



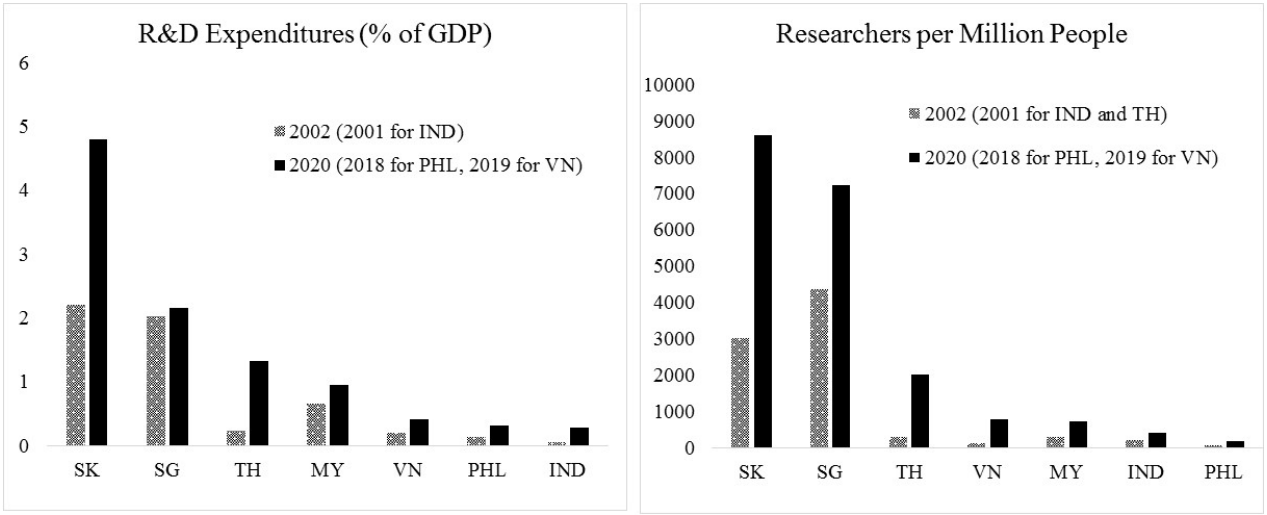
Source: Atlas of Economic Complexity using HS92 (https://atlas.cid.harvard.edu/)

Unfortunately, research and development (R&D) and technology buildup in the Philippines have suffered many years of underinvestment due to a lack of public and private interest in innovation [Patalinghug 2003]. Accordingly, innovation in Philippine manufacturing is characterized by a heavy reliance on imported technologies, a strong focus on process improvements, but relatively fewer endeavors for introducing new

[9]Hidalgo et al. [2007] noted that the core is usually occupied in industrialized countries that specialize in closely-related products such as machinery, metal products and chemicals.

products [Mendoza 2024]. In fact, various innovativeness indicators show that the country lags behind its regional neighbors in multiple aspects. Figure 8 shows that the country has one of the lowest intensities of R&D expenditures and researchers in ASEAN-6, which translates to relatively low innovation outputs (e.g., patent applications). Unless reversed, these trends will continue to strain the ability of domestic manufacturing to create new knowledge needed in the production of more complex goods in sophisticated sectors.

Figure 8. Innovation Inputs in Some East and Southeast Asian Countries



Sources of data: UNESCO and World Bank

3. Econometric Analysis of the Drivers and Effects of Economic Diversification in the Philippines

The pursuit of long run diversification is a complex process. It requires countries to build capabilities in new and preferably more sophisticated economic activities [Hidalgo and Hausmann 2009]. This aligns with the concept of structural transformation, which involves reallocating resources from low- to higher productivity sectors alongside investments in critical skills, capital, and technology [Brenton, Gillson, and Sauvé 2019]. Such transformation requires innovation to unlock new capabilities to produce new goods and services across a broader range of sectors.

Using cross-country data from Sub-Saharan Africa, an IMF [2017] study found that macroeconomic stability (e.g., stable inflation and manageable external debt), access to credit, infrastructure (e.g., access to electricity), ease of doing business, and human capital development are positively associated with economic diversification. This is broadly consistent with Haraguchi's [2019] findings that the principal constraints to economic diversification are as follows: limited manufacturing capacity, limited access to trade finance, transport infrastructure, limited agricultural productivity, and poor international competitiveness. Industrialization in turn, is highly dependent on technological innovation and capacity buildup.

Empirical studies often focus on export diversification, which is closely linked to domestic economic diversification. IMF [2017] highlighted that countries with limited manufacturing and export diversity experience lower trade flows, suggesting common drivers for domestic production and export diversification. Using data for 79 countries from 1962 to 2000, Agosin, Alvarez, and Bravo-Ortega [2011] tested three sets of determinants of export diversification: economic reforms (e.g., trade openness and financial development), structural factors (e.g., endowments), and macroeconomic variables (e.g., exchange rate volatility). Their regressions showed mixed results, with some evidence for the positive effect of human capital accumulation on export diversification. On the other hand, trade openness tends to favor

specialization, while access to credit and exchange rate volatility are statistically insignificant. The result for trade openness is consistent with Osakwe, Santos-Paulino, and Dogan's [2018] finding that Sub-Saharan African countries more open to trade have less diversified exports. However, they also showed that trade liberalization (i.e., lower tariff) contributes to long-run export diversification in developing countries.

Effective policy is crucial for diversification. Kurul [2023] found that border efficiency and quality infrastructure significantly enhance product and market diversification and that ICT access boosts export diversification, especially in least developed countries. These results are consistent with Agosin and Rematal's [2021] theoretical simulations which showed that subsidizing investments that facilitate knowledge spillovers and easy access to information about useful production technologies may lead to the establishment of new sectors. They argued that the best strategy for infrastructure selection is choosing projects that cater to the growth of skill-intensive sectors, which can generate positive spillovers to the rest of the economy. Agosin and Rematal [2021] model the provision of those investments as being hindered by a coordination problem, which makes a case for an industrial policy that harmonizes the strategies and activities of government and the business sector.

Based on the foregoing discussion, we empirically analyze the drivers of economic diversification in the Philippines using the following regression model:

$$D_t = \beta_0 + \boldsymbol{W}'_{t-1}\boldsymbol{\beta_W} + \boldsymbol{X}'_{\boldsymbol{t-1}}\boldsymbol{\beta_X} + \boldsymbol{Z}'_{\boldsymbol{t-1}}\boldsymbol{\beta_Z} + \varepsilon_t \quad (2)$$

where D_t is a measure of economic diversification at time t, $\boldsymbol{W}_t$ is a vector of structural factors (e.g., sectoral shares, productivity growth), $\boldsymbol{X}_t$ is a vector of enabling factors (human capital development, infrastructure, capital accumulation, innovation), $\boldsymbol{Z}_t$ is a vector of policy-related variables (e.g., macroeconomic, trade, and industrial policies), the β's are model coefficients, and $\varepsilon_t \sim WN(0, \sigma_\varepsilon^2)$ is the white noise error. The variables used to estimate Equation 2 are summarized in Table 1.

Table 1. Variable Descriptions and Summary Statistics

Variable description	N	Mean	SD	Min	Max	d
Shannon diversity index for GDP	42	0.979	0.046	0.886	1.041	0
SD of sectoral contributions to GDP growth	63	1.311	0.642	0.082	2.951	0
• 1980 to 2021 only	42	1.444	0.614	0.345	2.951	0
• 1980 to 2023 only	44	1.493	0.645	0.345	2.951	0
Industry value added (% of GDP)	42	34.996	4.040	28.400	43.113	0
Industry/services value added	42	0.744	0.216	0.478	1.229	0
Growth of GDP per capita	42	1.537	3.835	-10.978	5.418	0
Trade openness (% of GDP)	42	53.785	19.221	28.792	90.542	1
Growth of gross capital formation per capita	42	2.187	14.853	-37.918	28.130	0
Growth of telephone subscriptions/100 people	42	4.303	9.460	-20.101	27.119	0
Life expectancy (years)	42	68.316	3.048	62.499	72.119	2
Patent applications per capita (ln)	42	-10.328	0.241	-11.464	-9.923	0
Inflation	42	7.721	7.990	-0.325	46.673	0
Growth of real effective exchange rates	42	0.321	7.544	-20.728	10.758	0
Growth of domestic credit to private sector	42	6.162	14.470	-38.408	38.095	0
Two-year SD of ln(GDP)	63	0.035	0.013	0.003	0.071	0
• 1980 to 2023 only	44	0.034	0.015	0.003	0.071	0
Annual growth of merchandise exports	63	8.943	15.914	-24.328	71.364	0
• 1980 to 2023 only	44	7.240	12.624	-21.684	33.984	0
Export concentration index	29	0.331	0.068	0.223	0.472	1

Sources of data: Bruegel, IMF, PSA, UNCTAD, World Bank
Note: d = number of differencing to achieve stationarity

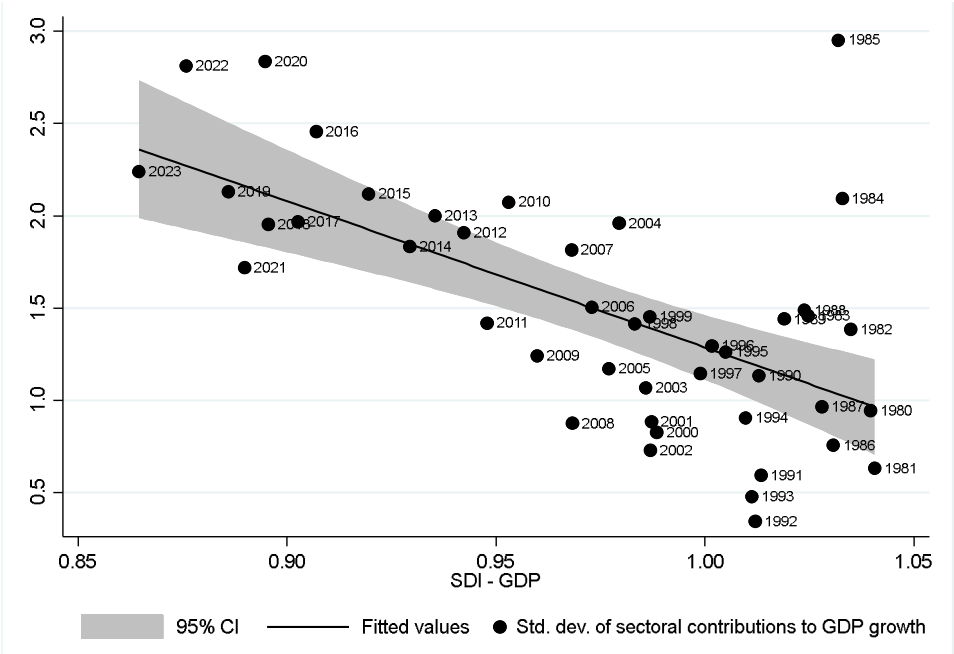
To estimate Equation 2, we applied ordinary least squares (OLS) regression with autoregressive errors using variables from 1980 to 2021 only due to data availability. All variables entered the regression equation in their stationary forms. To analyze the benefits of economic diversification, we estimated additional regressions for these outcome variables: two-year standard deviation (SD) of ln(GDP) as proxy for output volatility, the two-year SD of real GDP growth to measure growth volatility over time, annual growth of merchandise exports, and the Herfindahl-Hirschmann Index (HHI) for export concentration. Data for these outcome variables (except HHI-Exports) are available from 1961 onwards.

Initial analysis suggests that the SDI for GDP (SDI-GDP) exhibits near random walk behavior despite being stationary.[10] To avoid potentially spurious results, we proxy economic diversification by the SD of sectoral contributions to overall GDP growth ("SD-within"). For each sector i, the contribution to GDP growth is calculated as follows:

$$\frac{Y_{it} - Y_{i,t-1}}{\sum_{i\in\{A,I,S\}}\left(Y_{it} - Y_{i,t-1}\right)} \times \left(\frac{\sum_{i\in\{A,I,S\}} Y_{it}}{\sum_{i\in\{A,I,S\}} Y_{i,t-1}} - 1\right) \times 100 \qquad (3)$$

where Y_{it} is output of sector i at time t. Figure 9 indicates a strong negative linear relationship between SDI-GDP and SD-within ($\hat{\rho} = -0.623$), suggesting that a diversified economy derives growth from a wide range of sectors rather than relying on a few dominant ones. This aligns with the notion that diversification helps reduce economic volatility and build a stable path towards equitable growth [Brenton, Gillson, and Sauvé 2019]. Moreover, Francis [2016] also noted that sectoral concentration leads to a higher variance of GDP.

Figure 9. Economic diversification vs. sectoral concentration of GDP growth



Source: Authors' calculation based on PSA data.

Table 2 summarizes the baseline regression results using SD-within as the dependent variable. Given the relationship observed in Figure 9, factors increasing (decreasing) economic diversification should have

[10] SDI-GDP follows a first-order autoregressive (AR(1)) process with $\hat{\phi} = 0.99$. This is almost like a random walk process which is the limiting form of an AR(1) process when $\phi = 1$.

negative (positive) coefficients in our regression model. Models 1 and 3 estimate the initial OLS regressions using several proxies for industrialization (i.e., share of industry value added to GDP and ratio of industry and services value added). While the OLS models satisfy most regression assumptions (e.g., no specification bias, no multicollinearity, and homoskedastic and normal errors), both models exhibit errors that are serially correlated and not yet white noise. This makes the OLS results potentially biased and spurious. To address this, we estimated regression models with exogenous variables and autoregressive errors (ARX) in Models 2 and 4, obtaining errors that are white noise and normally distributed.

Table 2. Baseline Regression Results

	1	2	3	4
Industry value added (% of GDP)	-0.088**	-0.085**		
	(0.035)	(0.039)		
Industry/services value added			-1.356**	-1.455*
			(0.645)	(0.774)
Growth of GDP per capita	0.065*	0.071***	0.061*	0.067***
	(0.032)	(0.025)	(0.035)	(0.025)
Trade openness (% of GDP)	-0.028**	-0.022**	-0.030**	-0.023**
	(0.014)	(0.011)	(0.014)	(0.011)
Growth of gross capital formation per capita	-0.021**	-0.017***	-0.022**	-0.017***
	(0.010)	(0.006)	(0.010)	(0.006)
Growth of telephone subscriptions/100 people	-0.019**	-0.016**	-0.020**	-0.015**
	(0.009)	(0.007)	(0.009)	(0.007)
Life expectancy (second difference)	-0.413***	-0.336***	-0.471***	-0.361***
	(0.079)	(0.087)	(0.076)	(0.086)
Patent applications per capita (ln)	-0.076	-0.248	-0.026	-0.264
	(0.216)	(0.166)	(0.227)	(0.176)
Inflation	0.040	0.040***	0.035	0.039**
	(0.027)	(0.015)	(0.029)	(0.016)
Growth of real effective exchange rates	-0.042**	-0.032***	-0.039**	-0.030**
	(0.015)	(0.012)	(0.016)	(0.012)
Growth of domestic credit to private sector	0.018**	0.013*	0.019**	0.013*
	(0.009)	(0.007)	(0.008)	(0.007)
Constant	3.365	1.473	1.874	-0.564
	(2.054)	(1.975)	(2.332)	(1.885)
AR(1) coefficient		0.487***		0.534***
		(0.153)		(0.144)
No. of observations	42	42	42	42
R-squared	0.450***		0.408***	
Power test on R-squared	0.963		0.922	
AIC	78.098	72.368	81.217	73.128
Average VIF	2.32		2.32	
RESET F-stat	1.16		0.77	
White's test χ^2-stat	42.00		42.00	
Breusch-Godfrey test χ^2-stat	8.116***		9.518***	
Shapiro-Wilk test z-stat	0.154	0.039	-0.129	-0.132
White noise test Q-stat	7.420***	0.139	8.921***	0.094

Source: Authors' calculations

*** p < 0.01, ** p < 0.05, * p < 0.10

Dependent variable: standard deviation of sectoral contributions to GDP growth

Note: Models 1 and 3 are estimated using OLS regression. Models 2 and 4 are estimated using ARX regressions. Numbers in parentheses are robust standard errors. All explanatory variables are lagged to reduce reverse causality.

Model 2 confirms that a greater contribution of the industrial sector to aggregate output enhances economic diversification and improves the distribution of the sectoral sources of growth in the Philippines. This makes a case for "re-industrialization" as a potential strategy to achieve a balanced and stable growth path. Francis [2016] argued that while concentration might spur growth initially, industrial diversification can reduce the welfare and productivity losses from sector-specific shocks. Meanwhile, Model 4 suggests that achieving a broader domestic production base is possible if the industrial sector grows faster to catch up with the dominant services sector. This supports "walking on two legs", advocating a sophisticated manufacturing industry backed by a modern services sector. Transforming the economy into a complex structure requires robust supply chain linkages and the complementarity of technology and skills across interconnected manufacturing and services sectors.

In terms of the domestic drivers of diversification, Models 2 and 4 consistently show that rapid capital accumulation, especially of the kind that supports industrial growth, significantly broadens the domestic production base. Francis [2016] noted that increased capital supply boosts diversification and reduces economic volatility through several channels: providing infrastructure required to enter new sectors, supporting education and research and development (R&D) for more sophisticated activities, and shifting the economy away from primary sectors that rely heavily on natural resource endowments. Our proxies for human capital development (i.e., life expectancy) and connectivity (i.e., growth of telephone subscriptions per 100 people) also have significant effects on improving economic diversification in the Philippines. Intuitively, developing the domestic production base requires a highly skilled workforce for handling complex tasks; while physical and digital connectivity facilitates efficient flow of resources in the economy, strengthens sectoral linkages, and opens new economic opportunities. These are broadly consistent with the literature showing positive effects of human capital and infrastructure development on diversification (IMF [2017]; Haraguchi [2019]; Agosin, Alvarez, and Bravo-Ortega [2011]). Interestingly, our proxy for innovation (i.e., ln of patent applications per capita) has insignificant direct effects on diversification, possibly due to limited domestic innovation activities and the inadequate capture of incremental and non-R&D innovations by patent measures in a developing country like the Philippines.

Supply-side competitiveness is essential for diversification. Education enhances workforce skills, enabling sectors to upgrade and diversify into more complex industries. Efficient logistics reduce costs and boost competitiveness across diverse industries by facilitating supply chains. Trade policy reform can enhance market access and competitiveness by reducing barriers. Remittances increase household income, providing capital for diverse entrepreneurial investments. Finance, when properly allocated beyond traditional sectors, fosters growth in underrepresented industries.

In terms of macroeconomic policies, the regressions suggest that faster inflation results in less diversification, as high and fluctuating prices increase uncertainties and cause distortions in the allocation of resources across sectors. In contrast, real exchange rate appreciation and the growth of domestic credit to the private sector yield counterintuitive results. The positive coefficient for domestic credit indicates a concentration of loans in the services sector, suggesting limited credit access for agricultural and industrial enterprises.[11]

The negative sign for REER might be explained by importing, which facilitates diversity-enhancing learning through knowledge spillovers, technology, and inputs. This is consistent with the negative coefficient for total trade openness, which suggests that wider international exposure through exports and

[11] For instance, data from the Bangko Sentral ng Pilipinas show that as of March 2014, services account for 63 percent of the Philippine banking system's loans outstanding to production activities by residents. Manufacturing only got 16 percent.

imports provides access to products, inputs, technologies, and knowledge that can boost domestic production capacities.

Given the insignificance of the patent variable, we re-ran the ARX models with an additional interaction between our proxies for industrialization and innovation (Models 2a and 4a). As summarized in Table 3, at the mean of industry value added (% of GDP), the effect of patent applications per capita (in ln) on SD-within is calculated as 22.846 - 0.661 × 34.996 = -0.286. At the mean of the industry to services ratio, the effect of patent applications per capita (in ln) on SD-within is calculated as 8.354 - 12.496 × 0.744 = -0.943. Both average interaction effects are negative and statistically significant, implying that innovation can support more diversification when the innovative activities directly support the growth and upgrading of domestic manufacturing sectors, especially to catch up with services. This is consistent with previous findings that reducing barriers to innovation and technology adoption promote diversification and higher growth [IMF 2017].

Table 3. Interaction of Industrialization and Innovation

	2a	4a
Industry value added (% of GDP)	-6.898***	
	(0.052)	
Industry/services value added		-130.334***
		(48.060)
Patent applications per capita (ln)	22.846***	8.354***
	(0.095)	(3.192)
Industry value added (% of GDP) × Patent applications per capita (ln)	-0.661***	
	(0.005)	
Industry/services value added × Patent applications per capita (ln)		-12.496***
		(4.659)
No. of observations	42	42
AIC	65.323	66.623
Shapiro-Wilk test z-stat	0.462	0.121
White noise test Q-stat	0.030	0.0978

Source: Authors' calculations
*** p < 0.01, ** p < 0.05, * p < 0.10
Dependent variable: standard deviation of sectoral contributions to GDP growth.
Note: The coefficients for other variables are suppressed but are broadly consistent with the baseline results.
Numbers in parentheses are robust standard errors. All explanatory variables are lagged to reduce reverse causality.

Delechat et al. [2024] identified at least four major benefits of economic diversification. First, a more diversified domestic production base, exports, and imports improves a country's resilience to external shocks. Second, diversification has been empirically shown to accelerate economic growth, particularly during the early stages of development. Third, diversification leads to the creation of new industries and jobs, which can boost income and reduce poverty and inequality in the long run. Lastly, diversifying into sustainable industries can reduce a country's vulnerability to emerging risks such as climate change. In terms of growth effects, there is a large body of empirical literature that supports the positive impact of economic and export diversification on short-run growth and long-run development outcomes. See for instance, the recent survey of Sarin, Mahapatra, Sood [2020] which concludes based on 88 studies that export diversification has a generally positive effect on economic growth. However, the nature and composition of diversification also matters [Greenaway, Morgan, and Wright 2006]. For instance, Saviotti and Frenken [2008], using data from OECD countries from 1964 to 2003, showed that a diversification of exports into related varieties or sectors is associated with instantaneous economic growth, while growth from a diversification of exports into unrelated sectors has a considerable lag.

In the next set of estimations, we analyze the effects of economic diversification using the following simple regression model:

$$B_t = \gamma_0 + \gamma_1 D_{t-k} + \eta_t \quad (4)$$

where B_t is a measure of the potential benefits of diversification on domestic production and exports, D_{t-k} is SD-within at lag $t-k$, γ_0 and γ_1 are coefficients, and $\eta_t \sim WN(0, \sigma_\eta^2)$ is the white noise error term. Due to data constraints, we only estimated regression models using the following dependent variables: two-year SD of ln(GDP) for Models 5 and 5a, annual growth of merchandise exports for Models 6 and 6a, and first difference of HHI-Exports for Model 7. The two-year SD of real GDP growth rate was also considered as a dependent variable but the results were not used due to some diagnostic issues. The regressions explored different lag k of SD-within to account for the possible medium- to long-term benefits of diversification.

Table 4. Benefits of Economic Diversification

	5	5a	6	6a	7
lag 0					0.024**
					(0.011)
lag 1	0.007***	0.010***			
	(0.003)	(0.003)			
lag 2			-5.692*	-5.402*	
			(2.858)	(3.200)	
No. of observations	63	44	63	44	28
R-squared	0.102**	0.197***	0.299**	0.067*	0.101**
AIC	-369.109	-253.752	508.106	347.923	-97.238
RESET F-stat	1.80	2.57*	2.75*	2.39	0.27
White's test χ^2-stat	0.02	0.26	0.79	0.07	2.38
Breusch-Godfrey test χ^2-stat	1.110	0.030	0.412	0.017	0.531
Shapiro-Wilk test z-stat	1.715	0.637	-2.526	-0.688	-0.630
White noise test Q-stat	0.972	0.019	0.422	0.018	0.584
Power of slope test	0.747	0.894	0.410	0.414	0.401

Source: Authors' calculations

*** p < 0.01, ** p < 0.05, * p < 0.1

Note: For all regressions, various lags of the SD of sectoral contributions to GDP growth were used as the sole explanatory variable to proxy for domestic economic diversification. Model 6 adds a year dummy for 1973. Models 5 and 6 used available data from 1961 to 2023, while Models 5a and 6a used data from 1980 onwards. For Model 7, data are available for 1996 to 2023 only. Numbers in parentheses are robust standard errors.

The regression results for Equation 4 are summarized in Table 4. Consistent with the literature, output stability seems to be the most apparent benefit of a broader domestic production base. This is suggested by the results for Models 5 and 5a, which show a positive and significant effect of SD-within on the volatility of output across time. In other words, more sectoral concentration tends to be followed by a higher volatility of production over time. Alternatively, increased sectoral diversification leads to more stable production.[12] Models 6 and 6a also lend some support, albeit weakly significant, that diversification of the domestic economy has a positive medium-term effect on the growth of merchandise exports. Finally, Model 7 shows that SD-within has a positive and significant contemporaneous relationship with the change in HHI-Exports. This means that a narrower domestic production base is associated with faster increase in export

[12] The initial estimates using the two-year SD of real GDP growth rate as dependent variable provide some evidence that sectoral diversification also reduces the volatility of growth over time.

concentration. Put differently, a more diversified economy contributes to export diversification. This is intuitive given that the margins of trade are partly dictated by the production capabilities of the domestic economy. However, due to the low statistical power of the slope the test for exports, further study with larger datasets is recommended.

Even with GDP growth rates of 5-6%, diversification is still crucial for the Philippines because it enhances the sustainability and robustness of economic growth. While current growth is decent, a narrow economic base increases vulnerability to sector-specific shocks, which can destabilize overall growth. Diversification reduces output volatility, as demonstrated in Model 5 of our study, by mitigating the adverse effects of relying too heavily on the service sector. In the context of recent global uncertainties, such as trade wars, economic sanctions, supply chain disruptions, and pandemics, diversification becomes even more important. A diversified economy can better absorb and adapt to external shocks, minimizing negative impacts. Moreover, diversification may promote export growth (Model 6) and reduce export concentration (Model 7), which can enhance international competitiveness and increase resilience to global market fluctuations. Overall, diversification not only sustains growth but also contributes to a more stable economic environment, supporting long-term development goals and improving welfare and productivity across sectors.

4. Routes towards economic diversification and industrial upgrading

The preceding section made a case for re-industrialization and the active use of policy to build a broader domestic production base. This section builds on that analysis by exploring three potential routes for economic diversification and industrial upgrading, supported by industrial policy (IP). Balaoing-Pelkmans and Mendoza [2021] outline these routes given that purely market-led diversification and upgrading are often insufficient to generate the kind of growth needed by a developing country to catch up. Table 5 summarizes the three routes, which though distinct, often overlap due to shared challenges across domestic industries. The framework and methodology underpinning these routes use the Product Complexity Index (PCI) and the concept of "proximity" (relatedness) in the product space developed by Hidalgo et al. [2007], as well as the analysis of Revealed Comparative Advantage (RCA) indices.

Route 1, the leapfrogging strategy, aims to directly upgrade to more sophisticated production activities, bypassing intermediate steps. This ambitious approach requires significant government intervention to support technological advancements and necessary skills development, overcoming the "quiescence trap" where low growth and limited diversification reinforce each other. The strategy's success hinges on breaking this path dependency through targeted government support for technology and skills accumulation—a "juggernaut" activating self-sustaining growth dynamics. Although costly and prone to errors, inaction is costlier due to resulting technological stagnation.

The empirical evidence shows that developing comparative advantage in complex products without prior experience in similar products is difficult [Mehta and Felipe 2014], highlighting the need for proactive capacity building. Successful leapfrogging, as demonstrated by newly industrialized Asian countries, requires a coherent long-term vision, massive upskilling investments, effective technology acquisition strategies, strong coordinating government agencies, continuous policy learning and adaptation, a high-quality bureaucracy, close monitoring of firms, and robust collaboration with the private sector. To identify the targets in Route 1, our approach prioritizes products with comparative advantage, potential market size, and high opportunity gains, even if distant from the country's current capabilities. This necessitates a "big push" towards high-quality skills and aggressive technology acquisition. The challenge lies in incentivizing skill development ahead of high market demand.

Table 5. Three routes towards diversification and industrial upgrading

	Route 1	Route 2	Route 3
Approaches to diversification	*Leapfrogging*: upgrading towards high-productivity, more sophisticated goods	*Climbing the value ladder*: upgrading in global value chains (GVCs)	*Sustaining the local industrial base*: ensure survival and expansion of local firms (especially SMEs)
Industrial policy (IP)	Active, cohesive, and targeted IP	Open-economy IP; direct engagement with GVC lead firms	Local firms-centric IP
Target sectors	High-technology, achievable in medium to long term	Top exports in GVCs	Top traditional exports; firm- and labor-populous sectors
Policy guide questions	What is the structure and density of the product space? How to jump to nearby, more complex products?	Which sectors are in GVCs? Which lead firms in key GVC sectors should be targeted?	What are the major constraints in the competitiveness of local firms?
Broad policy goals	Target productivity- and complexity-enhancing sectors	Make the country an attractive host for GVC lead firms; stimulate GVC linkages with local suppliers; upgrading of local firms	Increase competitiveness of local firms in domestic and foreign markets
Timeframe	Long run (10-15 years)	Short run to medium run	Continuous

Source: Balaoing-Pelkmans and Mendoza [2021]

Another important consideration for leapfrogging is the pragmatic reckoning of what could be achieved in the medium to long run given the country's comparative advantage, as well as a strategic long-term vision that looks beyond the natural limits of current capabilities.[13] As in the experiences of Asian industrializers in the 1970s and 1980s, it typically takes 10 to 15 years before leapfrogging projects produce visible results. While the detailed contour of industrial strategies is designed in a step-by-step learning-by-doing policy-making approach, the identification of target sectors can help kick-start the process. Having target sectors creates the imperative to reach a broad-based consensus on what kind of competencies would be needed, as well as how priorities could be ranked in terms of urgency and feasibility. The targeted sectors may evolve over time, depending on how agile policymakers are in evaluating firm performance and correcting policy errors.

The second route looks at climbing the value ladder within GVCs. A GVC-driven open-economy IP is considered a pragmatic and less interventionist approach since the value ladder provides a natural trajectory for functional and intersectoral upgrading. However, GVC participation per se does not provide a straightforward path towards upgrading and export diversification [Mendoza 2023]. While some local firms are able to shift to more complex functions within the value chain, other suppliers are trapped in low value-added segments of production where the resources and incentives for upgrading are scarce. It would normally appear that GVCs can serve as a catalyst for leapfrogging, especially when they facilitate the production of sophisticated goods using international frontier technology. But the sourcing strategies of GVC lead firms are based on exploiting the comparative advantage of their hosts to attain greater efficiency

[13] In targeting a sector for industrial policy, Singapore set its sight on producing products that would otherwise not have been produced in the country on the basis of comparative advantage alone.

and scale. Therefore, developing countries that attract GVC firms based on low-cost labor or natural resource endowments will naturally be assigned labor- or resource-intensive tasks. Hence, while GVCs bring productive employment and provide potential stepping stones for economic upgrading, they give no guarantee of meaningful industrial diversification if local firms participate on the basis of undynamic comparative advantage (e.g., cheap labor or natural endowments). In this case, governments may intervene through regulations or incentives to induce GVC lead firms to invest on upgrading, and to improve the global competitiveness of local suppliers.

Route 2 explores PCI and the product space structure, targeting products within the GVC core, characterized by high complexity, strong comparative advantage, and extensive linkages with other complex products. The approach recognizes that while GVCs can serve as catalysts for leapfrogging, particularly when employing frontier technologies, their inherent sourcing strategies often exploit host countries' comparative advantages, potentially leading to stagnation in low-value-added activities.

The third route makes a case for sustaining the local industrial base that is populated by small and medium-sized establishments (SMEs). In 2022, SMEs accounted for 99.6 percent of all firms in the Philippines. This means that the seeds of the country's industrial champions can be sown in this vast field of promising firms that potentially include innovative start-ups, new export entrants, and new GVC participants. Broad-based industrialization entails not only the birth of new firms and new products but also the survival and expansion of existing sectors with strong comparative advantage. Yet, the intensely competitive global environment threatens to drive small and newly emerging producers out of the market which can further shrink the narrow industrial base in developing economies. In the Philippines, nine sectors with more than twenty years of comparative advantage have disappeared from the roster of strong traditional export sectors; while those that remained have stagnant or falling RCA indices [Balaoing-Pelkmans and Mendoza 2021]. The global competition has been particularly felt in the textiles and garments sectors, where RCA indices have been consistently falling since 1995, resulting in the disappearance of 33 out of 44 product lines with comparative advantage. The struggle to compete with countries or GVCs with enormous scale advantages is also driving local firms to downgrade into lower cost but also lower quality product niches, use cheaper but environmentally-harmful technologies, and/or further push down labor costs in order to survive.

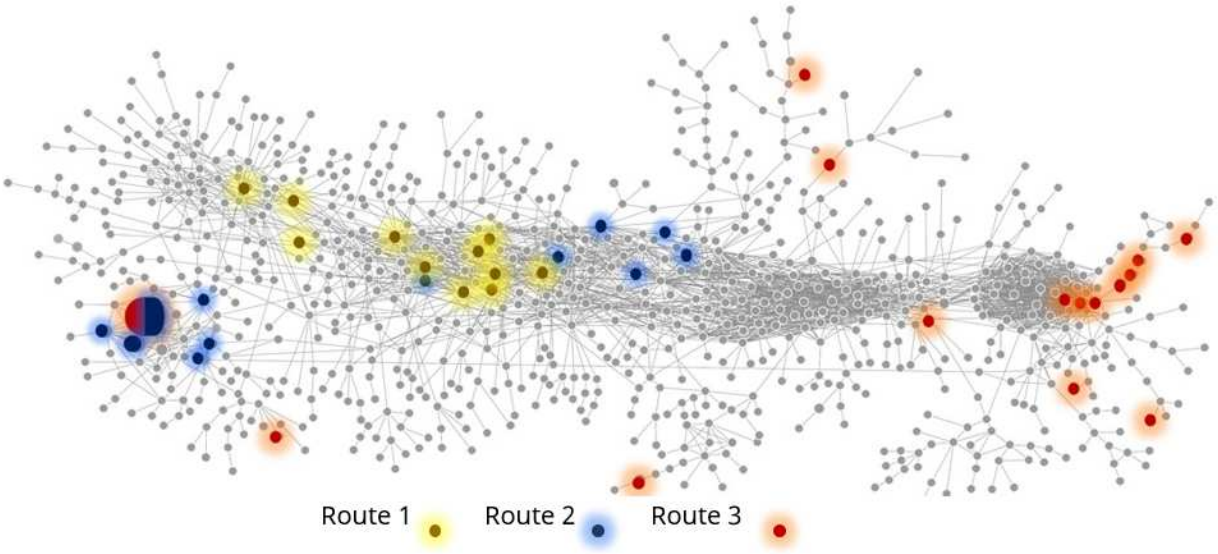
Fast-growing SMEs are crucial for inclusive development and employment, yet their sheer number cause poorly-targeted government resources to be spread thinly across thousands of firms. Middle-sized firms, in particular, are considered big enough to survive on their own; yet these firms are precisely the most vulnerable to competition and other supply shocks as they begin to traverse the more perilous open seas of domestic and foreign markets. Middle-sized firms play a critical role—they are strongly linked to local supply chains populated by micro and small-sized firms and they are also suppliers to large local and foreign firms. Populating this "missing middle" is key to a robust, inclusive industrial base, but requires clear targeting guidelines, enforceable timelines, and a cohesive strategy involving local government units. Analysis of falling RCA indices and revenues can pinpoint sectors facing pressure and prioritize support for large employers with strong local value chain linkages. The approach acknowledges that even established exporters like bananas and electronics—facing competition from Ecuador and Vietnam, respectively—require support to weather intensified global competition.

The rest of the section explores the product space developed by Hidalgo et al. [2007] to identify target HS4 products for each route.[14] Figure 10 provides an overview of the targets' location in the product space.

[14] The Harmonized System (HS) is a standardized system of nomenclature and number codes to classify traded products. At the four-digit level of the codes (HS4), specific product descriptions can already be identified (e.g., "T-shirts, knit" (HS6109 in the 1992 classification) which falls under "Articles of apparel and clothing accessories, knitted or crocheted" (HS61)). However, we note that at a high degree of aggregation (e.g., HS4), the heterogeneity

Hidalgo et al. [2007] developed the PCI which measures the level of complexity required to produce a certain product. They also defined the concept of proximity in the product space based on the principle of relatedness; i.e., the probability of producing a new product increases with the number of related items that a country already manufactures. Nearby goods in the product space often have similar capability requirements which means that skills and technologies used in a particular product can be easily repurposed for the manufacturing of neighboring products. The strength of the connection between two products (i.e., their degree of proximity) will influence the speed with which a country's product space grows. Products that are well connected (i.e., those near the core) provide greater opportunities for sophisticated diversification and growth. Using the concept of proximity, one may also quantify the relatedness between a country c and particular product p; i.e., how compatible is country c's current export structure and complexity with what is required to export a new product p. The opposite of relatedness is called distance. Information on proximity and product-level complexity may also be combined to calculate OG_{cp} or the opportunity gain of developing a particular product; i.e., the potential contribution of producing a new product p to country c's overall complexity.[15]

Figure 10. Product Space Visualization of Target Products for Routes 1 – 3



Source: Authors' illustration using https://atlas.cid.harvard.edu/.

It should be noted that relatedness and opportunity gain are strongly negatively correlated; that is, products with high opportunity gain tend to have very low relatedness to the country's current export structure. In fact, goods with the highest relatedness values are associated with negative opportunity gains. This implies that developing these products will not significantly contribute to the complexity of the Philippine product space. The danger of diversifying based only on relatedness is that the Philippine product space is sparse and still concentrated in relatively simple products. In this context, path dependence dictates that the direction of diversification, at least in a short-run scenario without a conscious effort to leapfrog, would be

of the subcategories in terms of complexity and value creation is not fully observable. Policymakers may access more granular product level data to fully disaggregate the existing exports under these broad categories.

[15] Bayudan-Dacuycuy and Serafica [2019] previously analyzed the Philippine export basket in 2014 and identified 26 targets for a short-run diversification strategy that used proximity, relative sophistication, import intensity, and RCA as screening criteria. The products identified for short-run diversification "have RCA, are relatively sophisticated, and are close to the current products in the country's export basket." In the current study, some of the products identified by Bayudan-Dacuycuy and Serafica [2019] fall under Routes 2 and 3 targets.

towards similarly unsophisticated sectors. Moreover, the diversification will be most likely slow and limited to the periphery where Philippine exports are concentrated. On the other hand, upgrading based on potential gains in complexity may require massive and fast-tracked investments in technology and skills. The challenge for policy is how to strike a balance between the two such that exploring new products is both feasible and complexity-enhancing.

For a leapfrogging industrial policy with a time horizon of at least a decade (Route 1), the top ten promising products are identified based on the opportunity gains of triggering diversification towards complex products, the potential size of these opportunities as indicated by the size of world trade, and tempered by distance and comparative advantage considerations (see Table 6). These products are actually outliers in the sense that they are highly complex and far from the cluster of the country's current major exports; yet, display huge potential for comparative advantage (they are all in the top 30 percent of Philippine exports in terms of RCA). This shows that firms active in this sector are already developing a set of sophisticated skills very much different from what most Philippine exporters possess. Route 1 is partly supported by our earlier econometric results which imply that industrialization backed by innovation targeted towards key sectors can boost economic diversification and its potential benefits in terms of reducing output volatility and boosting export growth.

Table 6. Profile of Route 1 products, 2021

Product description	1992 HS4 Code	PHL Exports (million US$)	World Trade (billion US$)	RCA	Distance	PCI	OG
1) Machines n.e.c.	8479	69.45	145	0.242	0.869	2.04	1.22
2) Screws & similar articles (iron/steel)	7318	142.69	46.1	0.67	0.879	1.62	1.22
3) Transmission shafts	8483	132.31	63.3	0.39	0.878	1.31	1.06
4) Appliances for thermostatically controlled valves	8481	142.83	100	0.306	0.864	1.72	1.16
5) Instruments for physical or chemical analysis	9027	11.59	54.6	0.132	0.87	1.77	1.15
6) Equipment for temperature change of materials	8419	67.55	44.8	0.608	0.867	1.32	1.04
7) Instruments for measuring properties of liquids or gases	9026	32.85	21.3	0.798	0.872	1.44	1.08
8) Parts and accessories for metal working machines	8466	68.20	19.5	0.58	0.874	1.51	1.15
9) Ball or roller bearings	8482	25.41	35.1	0.24	0.867	1.41	1.05
10) Electrical lighting equipment used for motor vehicles	8512	102.34	34.8	0.997	0.856	0.962	0.781

Sources of data: UN Comtrade and Atlas of Economic Complexity (https://atlas.cid.harvard.edu)
RCA = revealed comparative advantage; PCI = product complexity index; OG = opportunity gain
Data for HS 9026 are for 2020.

The main challenge for a leapfrogging IP is how to incentivize the buildup of skills that might not yet have a critical demand. In this sense, leapfrogging IP is primarily a big push towards the overall quality skills needed to accumulate productive knowledge, as well a push towards more aggressive technology acquisition strategies. The fact that most countries failed to leapfrog shows how exceptionally difficult it is to assemble a critical package of interventions [Mehta and Felipe 2014]. Overcoming this challenge is not impossible, but the experience of successful late industrializers suggests that this requires strong leadership

and a long-termist bureaucracy, resources, and the establishment of long-term partnerships and collaboration with key stakeholders. The industrial policies of Singapore, Taiwan, and South Korea in the 1970s to the 1980s were based on the premise that rapid industrialization will not take place without a deliberate leapfrogging policy. For instance, Singapore pursued well-calculated strategies to transition away from labour-intensive products to products with higher technology content to generate higher-paying jobs. This was implemented through a long-range economic development strategy which includes, among others, fiscal, infrastructure, and institutional support.

Given the difficulties of leapfrogging, integration in GVCs has been seen as a relatively easier way towards industrialization as developing countries can participate in the large-scale global production architecture of high-technology products by specializing in the labor-intensive segments of production. The idea is that the tighter relationships that bind foreign and local firms within GVCs will eventually facilitate the transfer of technology and skills. However, this is usually not an automatic process. Similar to Route 1, local firms still need to build absorptive capacities and improve technical capabilities for further technological, skills, and functional upgrading in GVCs [Mendoza 2023]. In Table 7, the Philippines' top GVC sectors are items 1-4, 6-8, and 10. Note that almost all of these major exports are clustered together in the periphery of the product space. The specificity of the skills required in manufacturing these products partly explains why forward and backward linkages with other local firms are difficult to establish. For these sectors, the most practical aim for industrial policy is to stimulate process upgrading with an emphasis on skills training for the workforce.

The products of interest for Route 2 diversification are those situated in the core (i.e., items 5, 9, and 11-14 in Table 7) because of the higher opportunities for expansion to sectors that require similar skill sets. Products such as *Electrical apparatus for < 1k volts, Electric motors and generators, Automatic regulating instruments, Vulcanized rubber plates,* and *Parts for use with electric generators*, have the good properties of extensive linkages with other complex products, high complexity indices, and strong comparative advantage. Consistent with our econometric results, innovation-driven diversification along Route 2 will help broaden the domestic economic base through its direct expansionary effect on local production as well as through the possible learning effects of GVC transactions. The ongoing reorganization of Factory Asia, driven in part by the outmigration of GVC firms from China due to rising costs, geopolitical tensions, and trade conflicts, presents a significant opportunity for the Philippines. Diversification along Route 2 can enhance the country's resilience and overall trade performance in this evolving landscape. By strategically targeting products within the GVC core, the Philippines can attract lead firms seeking more stable alternative locations for their vulnerable GVC segments. This targeted approach, coupled with proactive government engagement to improve the country's locational advantages and foster direct engagement with GVC lead firms, will be critical to capitalizing on emerging GVC opportunities.

What does it entail to pursue a diversification strategy with GVCs as a linchpin? There are two approaches that can be deduced from Table 7. The first addresses the problem of weak capabilities which traps local firms in "captive" value chains where lead firms wield more power and control over their suppliers. Understandably, foreign lead firms need to exercise this control to ensure that strict quality parameters and technical specifications are met by suppliers. Lead firms must also ensure that their knowledge assets are protected. In this captive environment, suppliers themselves must exert purposeful efforts to demonstrate that they are capable of performing more complex GVC functions. However, suppliers in this captive relationship usually have weak capabilities. Horizontal industrial policies that enhance the country's locational advantages (e.g., infrastructure, ease of doing business, upskilling) will also improve the bargaining position of local firms. Some elements of these policies are already in place in export processing zones (EPZs) since the 1990s. The challenge is how to replicate this ideal climate for GVC production in the rest of the domestic supply chain.

Table 7. Profile of Route 2 products, 2021

Product description	1992 HS4 Code	PHL Exports (billion US$)	RCA	PCI
1) Electronic integrated circuits	8542	27.4	8.29	1.133
2) Parts and accessories for office machines	8473	11.0	9.22	1.256
3) Computers	8471	3.74	0.07	1.050
4) Semiconductor devices	8541	2.75	4.72	0.993
5) Electrical transformers	8504	2.43	4.49	0.912
6) Electrical machines with individual functions n.e.c.	8543	0.06	0.58	1.404
7) Electrical capacitors	8532	1.69	10.2	1.209
8) Sound storage media	8523	1.04	4.42	1.604
9) Electrical apparatus for < 1k volts	8536	1.08	2.07	0.696
10) Parts of radios, telephones, and TVs	8529	0.51	1.66	0.591
11) Electric motors and generators	8501	0.84	2.81	0.882
12) Automatic regulating instruments	9032	0.19	1.15	1.137
13) Vulcanized rubber plates	4008	0.02	0.92	0.856
14) Parts for use with electric generators	8503	0.11	1.08	0.866

Sources of data: UN Comtrade and Atlas of Economic Complexity (https://atlas.cid.harvard.edu)

What differentiates a GVC-driven industrial strategy is the second approach that is characterized by more direct engagements with GVC lead firms. The government can make a difference by lending its various powers to strengthen the bargaining position of local firms vis-à-vis the foreign multinationals that organize the largest GVCs. In this case, the government not only regulates but also proactively negotiates with lead firms in order to obtain the conditions that can ensure progressive upgrading of local production and employment and more opportunities for linking with the domestic economy. However, promoting domestic linkages through legal requirements may raise production costs or expose GVC firms to supply risks that could induce them go around the rules or move to alternative locations. Hence, effective use of bargaining power also entails a realistic assessment of the cost implications of local industrial policies on GVC lead firms.

Broad-based industrial diversification entails not only the creation of new sophisticated exports (Route 1) and upgrading in GVCs (Route 2) but also the survival and expansion of existing sectors with strong comparative advantage. Unfortunately, the Philippines has been unable to preserve its international presence in many traditional sectors despite having accumulated competitive production capabilities in the 1990s. The openness of the Philippines to global markets means that local firms, regardless of size and market orientation, must compete with foreign firms that can deliver quality products at a competitive price. While the domestic market is being flooded by cheaper and higher-quality goods, many local manufacturing firms are challenged by deteriorating quality and eroding competitiveness. Route 3 emphasizes that the survival and eventual expansion of SMEs in traditional export sectors will create a more organic path to industrialization. The growth of domestic demand for locally-manufactured goods relies on the steady flow of incomes for workers employed in these sectors. Rising income may also generate a demand for innovation due to the increasing sophistication of domestic preference for new and higher-quality products. Likewise, a stronger earning power of these traditional export sectors will help support a healthy current account position that can finance the country's import requirements.

To sustain the country's domestic industrial base, Route 3 targets the biggest export earners that have experienced increasing competitive pressures as reflected by their falling RCA indices and /or gross revenues over time (see Table 8). While these sectors are very low on the product complexity scale, our econometric results suggest that diversification along this route is still beneficial since it targets the export sectors that are emptied out by extreme competitive pressures. These sectors are traditionally large

employers and have strong linkages to local value chains, especially upstream agricultural industries. There is a tendency to regard established exporters of traditional products (e.g., bananas, coconut oil) as already big enough to be receiving policy support. However, the heightened global competition has exposed local exporters to substantial market share pressures. Banana exports, for instance, have been experiencing market share challenges from countries like Ecuador, which has been aggressively expanding their reach through active government policies. Electronics exporters have likewise been facing growing competition from countries such as Vietnam, which registered a 39 percent growth in that sector in the last decade. Garment exports such as *men's and babies' garments* saw more than a 50 percent drop in earnings between 2013 and 2018, as RCAs fell below one, turning them into products of comparative disadvantage.

Table 8. Profile of Route 3 products with falling competitiveness

Product description	1992 HS4 Code	RCA 1995	RCA 2013	RCA 2021	PHL Exports in 2021 (million US$)	PCI 2021
1) Bananas and plantains	0803	22.7	27.8	19.9	1,320	-1.921
2) Coconut & palm kernel oil	1513	130	48.1	42	1,580	-2.059
3) Electronic integrated circuits	8542	6.51	12.2	8.29	27,400	1.133
4) Cashew nuts & coconuts	0801	16.2	10.6	8.1	388	-2.395
5) Seaweeds & edible vegetable prod.	1212	12.5	6.23	0.08	14.7	-1.719
6) Fruits and nuts, otherwise prepared	2008	13	6.47	5.93	534	-1.197
7) Solid vegetable oil and fat residues	2306	14.7	5.55	1.63	74.9	-1.082
8) Wood marquetry, ornaments, etc.	4420	12.9	2.34	1.13	13.4	-0.861
9) Basketwork	4602	34.9	6.7	4.52	58.8	-1.505
10) Men's shirts, knit	6105	10.5	1.88	1.01	33.6	-1.534
11) Babies' garments, knit	6111	15.9	1.15	0.27	5.8	-1.591
12) Babies' garments	6209	31.2	2.31	0.82	8.1	-1.521
13) Hats, knit	6505	13	0.676	1.12	34.4	-1.021
14) Unrefined copper	7402	17.2	0.0009	1.81	131	-2.515
15) Cigarette lighters	9613	10.4	4.49	2.55	24.8	0.328

Sources of data: UN Comtrade and Atlas of Economic Complexity (https://atlas.cid.harvard.edu)

5. Concluding Remarks

Philippine policymakers have long recognized the need to move away from a one-size-fits-all strategy for industrial development. In some sectors, a liberal foreign sourcing approach is warranted; while in others, policymakers might need to exercise more proactive interventions to support growth. Active accumulation of skills and productive knowledge are crucial for leapfrogging policies; building long-run collaborative relationships with local and foreign lead firms is key in exploring feasible trajectories for GVC upgrading; and context-dependent strategies must be developed in an environment of constant policy learning and experimentation with various stakeholders. Table 9 lists the most urgent vertical policies identified by Balaoing-Pelkmans and Mendoza [2021] for each diversification route. Given the complexity of issues in domestic industries, a cohesive overarching policy strategy is necessary to avoid fragmented, duplicating, and potentially conflicting interventions, programs, and projects. Vertical policies focus on targeted interventions within specific sectors. For leapfrogging, this includes technology development, skilled labor attraction, and strategic collaborations; for GVC integration, it involves direct engagement with lead firms and enhancing local suppliers' bargaining power; and for sustaining the local industrial base, vertical support includes promoting SMEs, shared services, and innovation.

Table 9. Possible Policy Interventions for Each Route

	Route 1	Route 2	Route 3
Vertical Policies	• Technology access and buildup (reverse engineering; patents; R&D) • Need for a strong coordinating agency (with mandate to ensure implementation) • Active labor policies to attract well-educated engineers & technicians • Proactive collaboration with engineering & technical knowledge institutions for patent development & commercialization • Explore policy space for (time-bound) use of local content & trade policy instruments	• Identify GVC and local lead firms for direct and strategic engagement; customize incentives to attract GVC lead firms with large impact for upgrading and generation of productive employment • Proactive measures to help local suppliers increase bargaining position with GVC lead firms • Establish Linkage (and supplier search) Program • Facilitate setting of concrete (social, process) upgrading in collaboration with stakeholders, esp. workers and employers' groups	• Profiling of key Filipino-owned SMEs; target strategic firms for close collaboration • Strengthen and customize shared services facilities • Incentivize frugal innovation in green tech /products • Use EPZ benchmarks in strategies to lower production costs for local firms • Surveillance mechanism to monitor survival, exit, new entry rates of local SMEs (especially in export markets); assistance for distressed local firms
Horizontal policies	• Identify strategic firms & societal partners (e.g., workers and employers' associations, knowledge associations) for collaborative action; regularly review sector & firm selection • Big-push in R&D spending (towards tripling of current expenditures) and investments in skilling and re-skilling (target technical professions) • Facilitate workers' access to labor market, as unemployed and new labor market entrants will need to be effectively (re)integrated • Targeted financing strategies in collaboration with selected public & private financing institutions • Review tariff structure (bound vs. applied) for possible temporary adjustments • Set concrete 'ease of doing business' targets that can be evaluated and monitored by stakeholders • Facilitate integration of green technology/products strategies in firm business models • Fast-track establishment of standard certification bodies & implement plans to enable compliance of local SMEs		

Source: Balaoing-Pelkmans and Mendoza [2021]

Horizontal policies, on the other hand, are important in addressing economy-wide challenges and laying down the pillars of broad-based industrialization. Horizontal policies create a supportive environment across the economy. These policies include enhancing the country's locational advantages (infrastructure, ease of doing business, upskilling) to improve the bargaining position of local firms, establishing a cohesive overarching policy strategy, and fostering collaboration among various stakeholders to avoid conflicting interventions. The most critical of which is a robust educational system and skills buildup that are indispensable prerequisites for industrial catch-up. This is perhaps the most challenging area of industrial policy because of the quiescence trap where the paucity of high-skilled jobs discourages households, workers, and firms to invest on skills. The lack of diversification and upgrading therefore creates the kind

of conditions that perpetuate low-trajectory growth. Escaping this trap would require a clear long-term vision that aligns public and private investment incentives. The chicken-and-the-egg problem of higher wages and higher skills and productivity cannot be solved simply by increased investments in upskilling. The large gap between foreign and local wages will continue to draw trained Filipino workers towards overseas job opportunities, so that the rise in expenditures for training and education will translate into de facto subsidies for firms abroad. This is the same reason why employers are reluctant to make additional investments on the skills upgrading of their workforce if the incidence of job poaching is high. This highlights the need for increased prospects for higher paying local jobs on one hand, and simultaneously, a credible commitment to build up the quality of the local workforce in order to attract investments in higher-skilled industries. ■

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