On the Development Path of Hong Kong and Singapore Economy: Is the Industrial Policy Important?

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Abstract

Singapore and Hong Kong exhibit numerous parallels, including their size, historical narratives, status as free trade ports, and economic take-off post the 1960s. However, they significantly differ in the government's role in industrial policies. While the Hong Kong government adheres to a laissez-faire approach, the Singaporean government actively promotes and nurtures specific industries and upgrades manufacturing sectors. This case study investigates the consequence of these policy differences and the dynamics between industrial and development divergence. The results from a structural vector autoregressive (VAR) framework with exogenous policy shocks show that manufacturing serves as a linchpin in the mechanism of how industrial policies lead to development divergence.

1 Introduction

Singapore and Hong Kong are frequently treated as paired twins by scholars of growth theory (Krause, 1988; Lam, 2000; Young, 1992), primarily because their similar regional profiles fostered comparable economic development conditions.

Starting with their similarities, Singapore and Hong Kong are geographically proximate and both serve as free trade ports for China and Southeast Asia. They possess similar demographic features, including population density (8019 per km^2 for Singapore and 7126 per km^2 for Hong Kong in 2020) and immigrant composition. Both exemplify natural resource poverty (Krause, 1988). From a historical and institutional perspective, both economies were under the British colonial system.

Between 1965 and 1980, both Singapore and Hong Kong achieved rapid economic progress. The economic miracles qualified them, along with Korea and Taiwan, to earn the collective title of "The Four Asian Tigers" (Mascelluti, 2015). However, their development paths began to diverge post the 1980s, with the discrepancy becoming increasingly significant in the 21st century.

Among factors affecting growth and development, this project focuses on the differing government roles in industrial policies and delves into the interplay between industrial and development divergence. The content will proceed as follows. Section 2 outlines the development paths of the two economies, provides policy backgrounds, and conducts preliminary data analysis. Section 3 details the data and methodology. Section 4 presents the primary empirical results and conducts robustness and diagnostic checks. Section 5 concludes and discusses policy implications.

2 The Development Path of Singapore and Hong Kong

2.1 Economic Growth and Development Divergence: 1965-2020

The economic growth patterns of Singapore and Hong Kong exhibit notable similarities. Both experienced their most significant periods of positive growth between 1965 and 1980 and faced instability during the mid-1980s, the Asian financial crisis in 1998, and the COVID-19 pandemic in 2020. Their GDP and GDP per capita growth rates have seen similar fluctuations, largely due to their comparable geographic, political, and international contexts.

When considering the total annual nominal GDP (as depicted in Figure 1), Hong Kong was initially ahead of Singapore. However, Singapore gradually closed this gap with a more rapid growth rate. Post-2010, Singapore's annual GDP surpassed that of Hong Kong, and it continues to maintain this lead. The difference, though, remains relatively minimal. But in terms of GDP per capita, Singapore not only gained an economic advantage much earlier starting in 2004, but the disparity has also been more pronounced.

Despite having a smaller land size and population than Hong Kong, Singapore has surprisingly managed to exceed Hong Kong in both GDP per capita and total GDP. This is a testament to its robust economic growth since the 1980s. Furthermore, it is worth noting that Singapore's impressive GDP per capita growth did not take advantage of or rely on a slow population growth rate. Instead, the relative population increase of Singapore to Hong Kong since 1980 underscores the substantial economic advancement of Singapore.

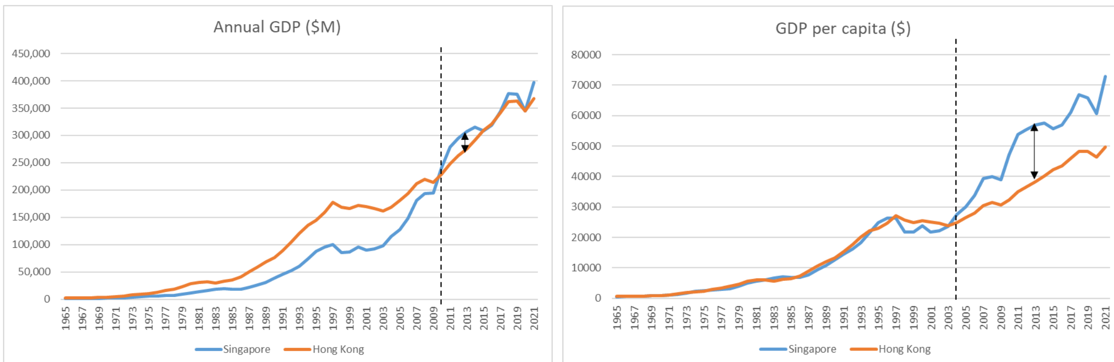

Figure 1: The economic growth of Singapore and Hong Kong

2.2 Industrial Policy and Structural Divergence

The industrial structure is a remarkable indication of Singapore and Hong Kong's later economic divergence. In the early 1970s, Hong Kong was endowed with a highly developed industry superior to Singapore, but it then experienced a decline, characterized by the hollowing out of the manufacturing sector and an over-reliance on the service sector. In contrast, Singapore began to incubate its industries early on and has achieved a relatively balanced industrial structure.

The government plays a crucial role in driving industrial evolution. According to Tsui-Auch (1998), Singapore has implemented selective industrial policies ("top-down" approaches) guided by an interventionist state, while Hong Kong has practiced functional industrial policies ("bottom-up" approaches), which are market-oriented and adhere to "positive non-interventionism." Hong Kong's industrial evolution lacked industrial optimization and upgrading. Its industrial development can be seen as a process of de-industrialization. In this section, we specify these exogenous policy differences and link them to industrial structural divergence between Singapore and Hong Kong. These policies are considered to aggravate the industrial divergence between Singapore and Hong Kong.

2.2.1 Laissez-faire in Hong Kong

After the fall of the KMT in mainland China, a significant influx of capital and refugee labor transformed Hong Kong from an entrepot trade economy into a manufacturing-based economy.

By the mid-1970s, manufacturing in Hong Kong began to face structural problems such as rising wage and land costs, low levels of technology, and over-reliance on external supply. However, the government did not support strategic industries and prioritized market demand for capital investment, human resource training, and technological advancement. Fiscal conservatism failed to provide small and medium-sized manufacturing with sufficient start-up financial funds or subsidies for transformation and restructuring, forcing them to relocate (Tsui-Auch, 1998). Additionally, it did not sustain price stability as the Singapore government did. High land prices had significant negative impacts on manufacturing upgrading by increasing costs. Throughout its entire industrial development, Hong Kong's manufacturing was narrowly based on two sectors: textiles and clothing, and electronics. With the hollowing out of manufacturing after the late 1980s, service sectors had almost complete leverage on Hong Kong's economic growth.

2.2.2 Strong Interventionism in Singapore

After Singapore's independence in 1965, the government shifted its industrial strategy from import substitution towards export-oriented. The Economic Development Board (EDB) seized the opportunity to leverage the local cheap labor force, expand publicity and investment, and implement preferential tax policies to attract labor-intensive multinational enterprises to invest in Singapore. In the 1970s, it promoted foreign direct investment (FDI) to compensate for the domestic industrial shortage and imported foreign workers to alleviate the labor shortage. The manufacturing growth was slowed by the first oil shock in 1973 but recovered steadily.

The industrial start-up from 1965 to 1980 in Singapore mainly focused on processing industries related to the entrepot trade (e.g., food, beverages, tobacco, basic chemicals, petroleum refining, leather, wood, paper, plastic, rubber, metal products) and labor-intensive industries (e.g., textiles and clothing, furniture, toys, electronic assembly).

From 1980 to 2000, Singapore focused on cultivating high-tech manufacturing. Singapore's periodical industrial focus switched from labor-intensive to technological and capital-intensive. Since 1979, Singapore has launched several restructuring policies, including a three-year wage correction policy, to increase the cost of high-polluting enterprises through higher tax rates, force them to improve manufacturing techniques, and encourage them to automate, mechanize, and computerize operations. The Skill Development Fund was established to enhance human capital through education and training. These measures jointly worked to phase out or reconstruct processing and labor-intensive industries (e.g., petroleum refining, wood, leather, textiles, machinery, and transport equipment), and develop technology-intensive industries (e.g., integrated circuits, electrical equipment, computers, optical products, refined chemicals, petrochemicals, medical equipment). In 1980, the Singapore government revised the Economic Expansion Incentives Act in 1967, aiming to attract foreign investments and boost manufacturing sectors. The act provided significant income tax breaks or exemptions and reinvestment allowances, incentivizing companies to contribute to Singapore's economic expansion.

In 1985, Singapore encountered a recession with negative GDP growth of 5.06%. The government realized the boom brought by rapid industrialization had faded away. To maintain sustainable development, Singapore needed to timely adjust its industrial strategy and cultivate higher tech and value-added industries. The 1986 Economic Committee Report (ECR) explored short-term counter-recessionary measures and long-term industrial upgrading strategies toward a new niche.

The 1991 Strategic Economic Plan (SEP) put forward manufacturing and services as two engines of growth, which lays the policy groundwork for the next 30 years' development. In SEP, the Manufacturing 2000 program guaranteed the indispensable role of manufacturing in promoting economic growth and set the goal to sustain its share around 25%. Besides, industry clusters became a strategic target, surging in capital-intensive industries (e.g., chemicals, petrochemical engineering, fabricated metal products, electronics, media services, and biomedical sciences). The International Business Hub 2000 program aimed to build Singapore into a business center and service hub, as an international service exporter specializing in insurance and financial services, logistics and transport, communications and information, instead of just tourism and banking.

Under the onset of the Asian financial crisis, the 1998 Committee on Singapore's Competitiveness Report continued to treat manufacturing and services as two complementary engines and proposed to nurture domestic enterprises, introduce foreign talents, and strengthen science R&D, technology, and innovation. In the 21st century, Singapore has implemented a series of industrial strategies such as the Industry 21 Plan (I21) to support high-tech and advanced industries like bio-medicine. The 2003 Economic Review Committee Report: Towards a Dynamic Global City planned to reshape Singapore into a new creative and globalized economy driven by manufacturing and services. Singapore ushered in a new round of industrial reconstruction toward a knowledge-based economy. From 2005 onwards, Singapore also launched the Research, Innovation and Enterprise (RIE) plans, further emphasizing the importance of research and innovation in driving economic growth and development in the long term.

The above outline partially refers to the generalizations of Chia (2005). Due to the large amount and varying degrees of these policies, this study alone cannot cover all policies in the development of Singapore. Thus, I select 6 most significant industrial policies between the 1980s and 2000s among all policies above in Singapore for the later empirical analysis and summarize them in Table 1.

2.2.3 Divergence in Industrial Structure

Figure 2 illustrates the value added of the manufacturing and service sectors as a percentage of the annual GDP for Singapore and Hong Kong. In 1970, the manufacturing shares for Singapore and Hong Kong were 17.5% and 30.9% respectively, establishing both as manufacturing hubs in the Asia Pacific region. The tertiary industry is a dominant component in both national economies, accounting for 65.0% in Singapore and 60.7% in Hong Kong.

From 1970 to 1975, manufacturing in Singapore experienced rapid growth, in line with the concurrent GDP per capita growth and its transcendence in 1975. By 1980, manufacturing

Table 1: Summary of 6 significant industrial policies in Singapore's development path

Industrial policy	Abbreviation	Implementation year	Main focus or target
Economic Expansion Incentives Act	EEI	1980	Relief from income tax, incentivized companies
The 1986 Economic Committee Report	ECR	1986	Prevent recession and upgrade high-tech industries (technology-intensive)
1991 Strategic Economic Plan: Manufacturing and Services as Twin Engines	SEP	1991	Two engines of growth: Manufacturing and Service (capital-intensive)
1998 Committee on Singapore's Competitiveness Report	CSCR	1998	Maintain two engines, domestic enterprises, foreign talents, and technology
2003 Economic Review Committee Report: Towards a Dynamic Global City	ERCR	2003	Creative and globalized economy (knowledge-intensive)
Research, Innovation and Enterprise plans	RIE	2005	Research and innovation

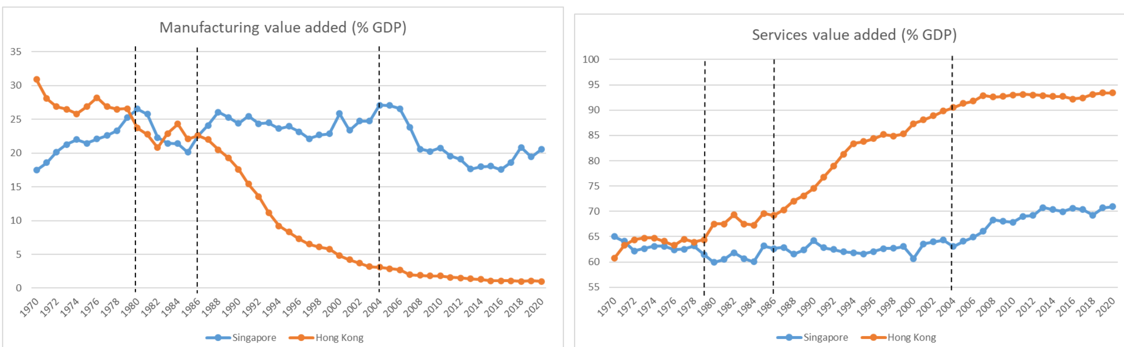

Figure 2: Manufacturing and service sector, value added (% GDP)

in Singapore had increased to 26.5% due to the expansion of labor-intensive industries, while manufacturing in Hong Kong had declined to 23.7% due to upgrading challenges. For the first time, the manufacturing share in Singapore exceeded that of Hong Kong.

The period from 1981 to 1986 was a transitional phase for Singapore as it restructured its industrial structure and the manufacturing share decreased. This period coincided with the second transcendence of its GDP per capita.

Between 1986 and 2004, the industrial structures of Singapore and Hong Kong diverged significantly. Hong Kong experienced a sharp hollowing out of manufacturing and became increasingly reliant on the service sector due to the failure of industrial upgrading under laissez-faire policies. Singapore, through the 1986 ECR and 1991 SEP, maintained balanced development in the manufacturing and service sectors. By 2004, the structural divergence had reached its peak, with Singapore's GDP per capita comprehensively surpassing Hong Kong's.

After 2004, Singapore continued to upgrade towards knowledge-intensive industries and placed equal emphasis on services. Its total annual GDP continued to rise and exceeded that of Hong Kong. The manufacturing share dropped to around 20%, while the service share rose slightly. Hong Kong maintained the trend with its manufacturing declining to less than 1%.

The four largest contributors to Singapore's economic growth in manufacturing are petrochemicals, computers and electronics, machinery and equipment, and pharmaceutical and biological medicine, respectively (as shown in Figure 3). From 1980 to 2000, computers and electronics emerged as the key industry to cultivate as high-tech and capital-intensive, and its economic share increased sharply from 2.15% to 12.36%. After 2000, pharmaceutical and biological medicine became the key industry as knowledge-intensive, and its economic share increased to around 4%. Manufacturing in Hong Kong, however, had negligible effects on economic growth after de-industrialization.

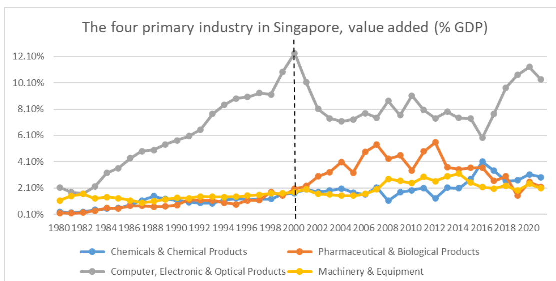

Figure 3: The four pillar manufacturing in Singapore, value added (% GDP)

Among service sectors, wholesale and retail trade is the largest contributor to growth in Singapore and most of the time in Hong Kong. Financing, insurance, real estate, and business services contribute almost as much to growth as trade services in Hong Kong but have a smaller impact in Singapore. During the period when the structural divergence expanded, it is clear that the four sectors in Figure 4 contributed more to growth in Hong Kong than in Singapore.

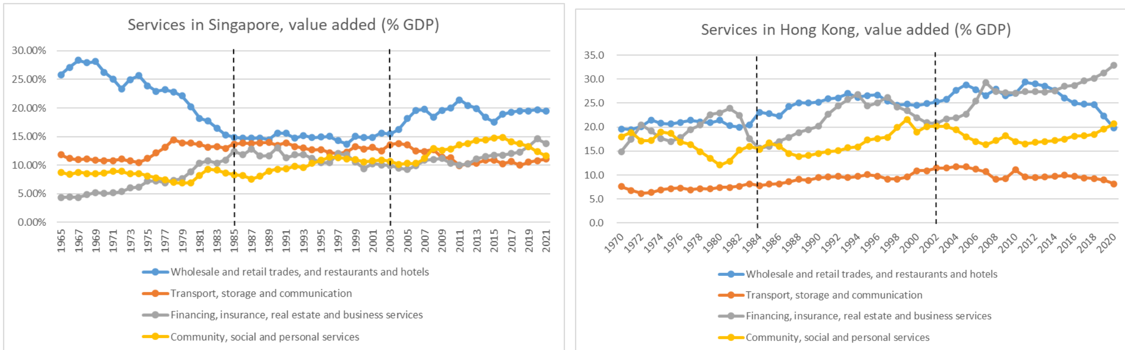

Figure 4: Service sectors in Singapore and Hong Kong, value added (% GDP)

3 Data and Methodology

3.1 Descriptive Data and Variables

To investigate the relationship between government policies and the divergence of industrial structure and economic growth, we obtained yearly data primarily from the World Bank Open Data. Some missing data from the World Bank was retrieved from the Department of Singapore Statistics (DOS) and Census and Statistic Department (C&SD), which are published by the Singapore and Hong Kong governments. The data period is from 1970 to 2022 with 53 observations in total.

The respective trends of GDP per capita, manufacturing, and service shares in Singapore and Hong Kong are illustrated in the figures in Section 2. Since we are interested in their divergence, we take the log of Singapore's and Hong Kong's data respectively, and subtract Hong Kong's data from Singapore's data to represent their divergence. Then we take the first difference to ensure that these variables are stationary, which is a necessary condition for a time-series VAR analysis. Specifically, we generate a variable DIV^{gdppc}, which takes the form of the first difference of $log(GDPPC^{sg}) - log(GDPPC^{hk})$, or alternatively, $\Delta log(\frac{GDPPC^{sg}}{GDPPC^{hk}})$, where the interior term $\frac{GDPPC^{sg}}{GDPPC^{hk}}$ measures the degree of the divergence in GDP per capita, and $\Delta log(\cdot)$ represents the percentage change. In all, the newly generated variable DIV^{gdppc} represents the rate of expansion or shrinkage of the divergence in GDP per capita between Singapore and Hong Kong. We apply the same procedure to generate DIV^{manu}, DIV^{serv}.

We quantify each policy by constructing a binary policy dummy. For policy k, the variable is represented as I_k. Specifically, we generate I_{EEI}, I_{ECR}, I_{SEP}, I_{CSCR}, I_{ERCR}, I_{RIE}, and for the six policies listed in Table 1. These policies are treated as exogenous variables that are directly determined by the Singapore government.

3.2 Model Specification

Despite massive similarities regarding fundamental social conditions and economic characteristics (e.g., international trade, business environment), there may still exist certain distinct economic features between Singapore and Hong Kong. To address concerns about endogeneity, the vector autoregressive regression (VAR) is thus adopted to examine the dynamics of industrial and development divergence between Singapore and Hong Kong given exogenous policy shocks. The endogenous variables include DIV^{gdppc}, DIV^{manu}, DIV^{serv}. The exogenous variables include the 6 policy dummies constructed above.

The equations for the structural VAR representation of the empirical model can be expressed as follows:

$$DIV_t^{manu} = \beta_0 + \sum_{i=1}^{n} \beta_{1i} DIV_{t-i}^{gdppc} + \sum_{i=1}^{n} \beta_{2i} DIV_{t-i}^{manu} + \sum_{i=1}^{n} \beta_{3i} DIV_{t-i}^{serv} + \sum_{k \in Policy} \beta_k I_k + \epsilon_t \quad (1)$$

$$DIV_t^{serv} = \beta_0 + \sum_{i=1}^{n} \beta_{1i} DIV_{t-i}^{gdppc} + \sum_{i=1}^{n} \beta_{2i} DIV_{t-i}^{manu} + \sum_{i=1}^{n} \beta_{3i} DIV_{t-i}^{serv} + \sum_{k \in Policy} \beta_k I_k + \epsilon_t \quad (2)$$

$$DIV_t^{gdppc} = \beta_0 + \sum_{i=1}^{n} \beta_{1i} DIV_{t-i}^{gdppc} + \sum_{i=1}^{n} \beta_{2i} DIV_{t-i}^{manu} + \sum_{i=1}^{n} \beta_{3i} DIV_{t-i}^{serv} + \sum_{k \in Policy} \beta_k I_k + \epsilon_t \quad (3)$$

where DIV_t^{manu} denotes the percentage change of divergence in manufacturing share between Singapore and Hong Kong; DIV_t^{serv} denotes the percentage change of divergence in service share between Singapore and Hong Kong; DIV_t^{gdppc} denotes the percentage change of divergence in GDP per capita between Singapore and Hong Kong; $Policy$ denotes the set $\{EEI, ECR, SEP, CSCR, ERCR, RIE\}$; i denotes the index of lag number; ϵ_t denotes the orthogonalized white noise error term.

Alternatively, the VAR model can be written in the form of Equation 4, where $A(L)$ is a matrix of polynomials in the lag operator L, y_t is the vector of the variables of interests, and $\sum_{k \in Policy} \beta_k I_k$ and ϵ_t are vectors of exogenous policy shocks and orthogonalized disturbances.

$$A(L)Y_t = \sum_{k \in Policy} \beta_k I_k + \epsilon_t, \ where \ Y_t = \begin{bmatrix} DIV_t^{manu} \\ DIV_t^{serv} \\ DIV_t^{gdppc} \end{bmatrix} \tag{4}$$

$$A = \begin{bmatrix} a_{11} & 0 & 0 \\ a_{21} & a_{22} & 0 \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \tag{5}$$

We impose the Cholesky restrictions by applying 3 exclusion restrictions on contemporaneous responses in matrix A as displayed in Equation 5. According to Lütkepohl (2005) and Bruno and Shin (2015), the variable i is affected by the contemporaneous shocks from any variable j with $i > j$ but not by those from variable k with $i < k$. Therefore, in our case, the first variable is the slower-moving variable since it is only affected by its own contemporaneous shock, while the third variable is the faster-moving variable since it is affected by contemporaneous shocks from all three variables.

As the benchmark, we consider the following ordering of the variables: 1. DIV^{manu}; 2. DIV^{serv}; 3. DIV^{gdppc}. Manufacturing is often considered a primary and rapid driver of growth and development (Rodrik, 2011; Szirmai and Verspagen, 2015), and at the same time brings a transition from manufacturing-led growth to a service-based economy, thus inducing a rise in the service sector, especially knowledge-intensive services (Etzioni, 1974; Pilat and Wölfl, 2005; Rowthorn and Ramaswamy, 1997). Also, the service sector and the shift in sectoral compositions further contribute to GDP per capita (Eichengreen and Gupta, 2013; Kuznets, 1971; Timmer and De Vries, 2009). We assume such mechanisms and moving rates are similarly kept when we examine the divergence of two regions. Based on the literature, divergence in GDP per capita is a better candidate for the faster-moving variable which should be ordered after the other two. Although the literature provides justification about the ordering of the first two variables, where divergence in manufacturing share should be placed before divergence in service share, their ordering may be less clear-cut compared to the last variable since some literature also indicates their interactions and complementation (Daniels and Bryson, 2002), so we switch their ordering as a robustness check.

Table 2: Augmented Dickey-Fuller (ADF) Unit Root Test

VARIABLES	Dickey-Fuller test for unit root				
$Z(t)$	Test Statistics	1% Critical Value	5% Critical Value	10% Critical Value	MacKinnon approximate p-value
DIV^{manu}	-6.570	-3.580	-2.930	-2.600	0.0000
DIV^{serv}	-6.604	-3.580	-2.930	-2.600	0.0000
DIV^{gdppc}	-5.321	-3.565	-2.921	-2.596	0.0000

Notes: 1. Null Hypothesis: the time series contains a unit root and is non-stationary.

4 Empirical Results

4.1 Stationarity Test and Lag Selection

Before conducting a VAR analysis, it is crucial to ensure stationarity. The Augmented Dickey-Fuller (ADF) unit root test results for the three variables included in the VAR system are reported in Table 2. After applying the log difference, the test statistics $Z(t)$ for DIV^{manu}, DIV^{serv}, DIV^{gdppc}, are all less than the 1% critical value. Consequently, we reject the null hypothesis of non-stationarity for all the three variables at the 1% significance level.

To ensure the robustness of the test results, we also perform the Phillips-Perron unit root test and report the test results in Appendix Table A. The results indicate that the test statistics $Z(t)$ and $Z(\rho)$ for DIV^{manu}, DIV^{serv}, DIV^{gdppc} are all less than the 1% critical value. Once again, we can reject the null hypothesis. Therefore, we can confirm that all variables in the VAR model are stationary.

Several information criteria (in Table 3) are utilized to determine the optimal lag length for the VAR model. Given the relatively small sample size of this study, we cap the maximum lag number at 8 to mitigate the risk of multicollinearity and overfitting and avoid the problem of the near singular matrix. The information criterion selection indicates that the optimal number of lags is 7. Upon determining the lag length, we proceed to estimate the VAR(7) model using empirical data.

Table 3: VAR Lag Order Selection Criteria

lag	LL	LR	FPE	AIC	HQIC	SBIC
0	223.663	-	1.6e-08	-9.42617	-9.10899	-8.56605*
1	228.498	9.6713	2.0e-08	-9.23249	-8.77936	-8.00374
2	240.6	24.203	1.8e-08	-9.37674	-8.78768	-7.77937
3	254.963	28.727	1.5e-08	-9.6262	-8.9012	-7.66021
4	262.185	14.443	1.8e-08	-9.54347	-8.68254	-7.20886
5	271.587	18.804	1.9e-08	-9.56218	-8.56531	-6.85894
6	286.174	29.175	1.8e-08	-9.82205	-8.68925	-6.75019
7	309.627	46.907*	1.2e-08*	-10.4943*	-9.22556*	-7.05382
8	312.842	6.4298	2.3e-08	-10.2252	-8.82055	-6.41612

Notes: 1. LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; HQIC: Hannan-Quinn information criterion; SBIC: Schwarz information criterion. 2. The * indicates the lag number selected by the criterion.

Table 4: The Granger Causality Test

Dependent Variable	Exluded	Chi-square	df	Prob.
DIV^{manu}	DIV^{serv}	5.650434	7	0.5811
	DIV^{gdppc}	4.227002	7	0.7533
	All	10.97802	14	0.6878
DIV^{serv}	DIV^{manu}	17.04667	7	0.0171
	DIV^{gdppc}	34.36570	7	0.0000
	All	51.83376	14	0.0000
DIV^{gdppc}	DIV^{manu}	14.29392	7	0.0462
	DIV^{serv}	10.82414	7	0.1465
	All	27.39802	14	0.0171

Notes: 1. Null Hypothesis: The excluded variable does not Granger cause the dependent variable.

4.2 Granger Causality Test

The results of the Granger causality test are displayed in Table 4. We test the individual and joint Granger causality of two excluded variables to the dependent variable. Regarding the Granger causality from DIV^{serv} and DIV^{gdppc} to DIV^{manu}, none of the statistics are significant, indicating that the DIV^{serv} and DIV^{gdppc} individually and jointly have no prediction power for DIV^{manu}. Regarding the Granger causality from DIV^{manu} and DIV^{gdppc} to DIV^{serv}, the statistics are 0.0171 and 0.0000 individually and 0.0000 jointly. Thus, we can reject the null hypothesis at 5% and 1% significance level individually and at 1% significance level jointly, indicating that both DIV^{manu} and DIV^{gdppc} Granger cause DIV^{serv}. Finally, regarding the Granger causality from DIV^{manu} and DIV^{serv} to DIV^{gdppc}, the statistics are 0.0462 and 0.1462 individually and 0.0171 jointly. Thus, we reject the null hypothesis at 5% only for the DIV^{manu} or the joint Granger causality but we cannot reject the null hypothesis for the DIV^{serv} Granger causality alone. This suggests that between the two industrial structures, only DIV^{manu} are useful to predict DIV^{gdppc}.

4.3 Analysis of Impulse Response Functions

Figure 5 presents the matrix of the impulse response functions from our three-variable VAR(7) with analytic asymptotic standard errors. The row of the matrix identifies variables that exert shocks while the column of the matrix identifies variables whose responses are followed. Each cell in this figure presents the impulse responses over 10 years to a one-standard-deviation innovation of the shock-exerting variable.

For cells in the first row, all responses of DIV^{manu}, are not significantly away from 0 facing shocks of DIV^{serv} and DIV^{gdppc}, indicating that DIV^{manu} is not affected by DIV^{serv} and DIV^{gdppc}. For cells in the second row, there is a significant negative response of DIV^{serv} to a DIV^{manu} shock at the first lag, which could be due to the short-term substitution effects between manufacturing and services sectors, and there is a negative response of DIV^{serv} to a DIV^{gdppc} shock at the sixth lag, which could be due to marginal effects. However, the scale of these responses is all around 1%, which is relatively small.

The key panels for analysis are the cells in the last row since we are interested in how

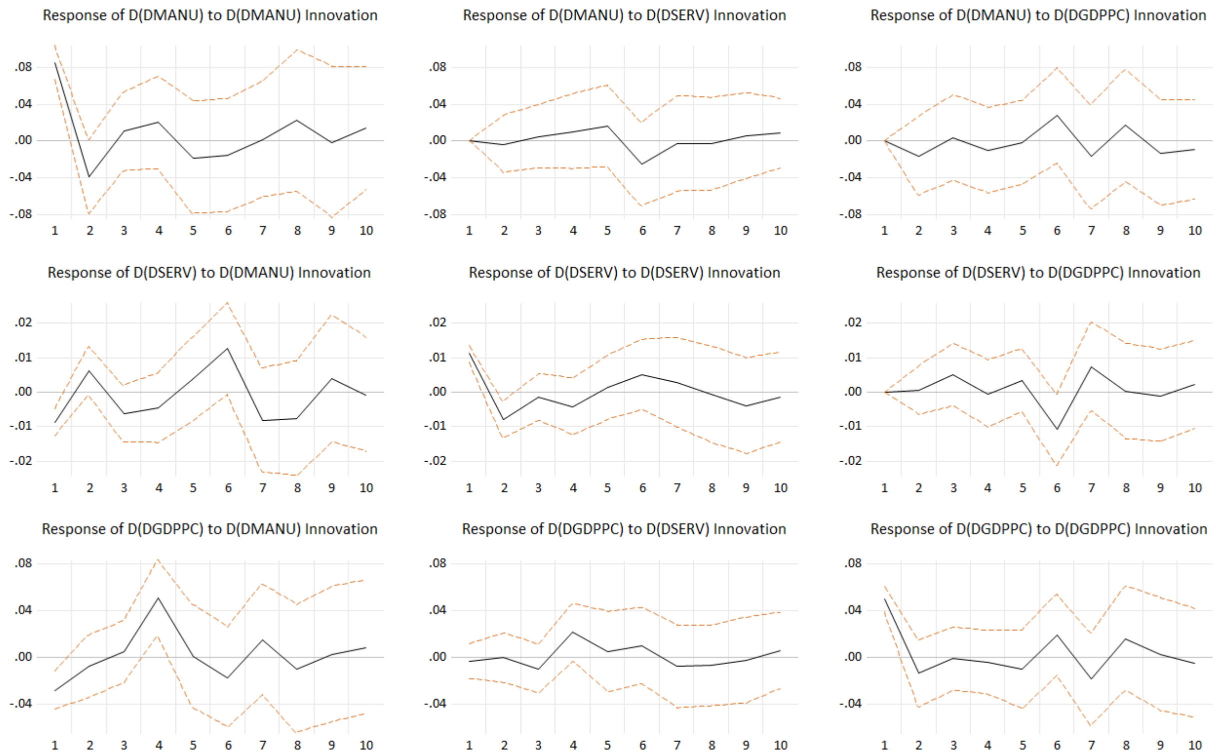

Figure 5: Responses to Cholesky One S.D. (d.f. adjusted) Innovations with Analytic Asymptotic S.E.s using the Benchmark Ordering

divergence in industrial structures, as a result of exogenous industrial policies, interacts with divergence in growth. From the first cell, a shock to DIV^{manu} will first lead to a slight decrease in DIV^{gdppc}. This effect might be ascribed to costs from adjustment processes or resource reallocations (Caballero and Engel, 1999; Lilien, 1982), which may initially depress the GDP per capita and lead to convergence. However, this effect is tentative in the short run and only lasts for one lag. After that, DIV^{gdppc} rises gradually and reaches a peak beyond 4% percent at the fourth lag. This notable increase suggests that divergence in manufacturing share will significantly contribute to divergence in growth in terms of changing rates with a delayed effect. This delayed effect could be due to adjustments in capital, investments, production, or labor market, which do not immediately transmit into growth (Jorgenson, 1963). This increase disappears after the fifth lag, indicating a limited effect of manufacturing share on growth. From the second cell, all responses are not significantly away from 0, indicating that there are basically no responses of DIV^{gdppc} facing shocks of DIV^{serv}.

The conjunction of the two impulse responses in the last row, together with the literature in Section 2, reveals the underlying mechanism that the active industrial policies in Singapore significantly led to divergence in industrial structures, including both divergence in manufacturing share and service share, among which, divergence in manufacturing share further contributes to divergence in GDP per capita and impact the development paths of Hong Kong and Singapore.

4.4 Vairance Decompositions

Figure 6 presents the variance decomposition from the three-variable VAR(7) giving the fractions of the structural variance based on 100 repetitions. We observe that the variance of DIV^{manu} is almost from all its own shocks, and it accounts for 40% of the variance of DIV^{serv}. DIV^{gdppc} also accounts for 20% of the variance of DIV^{serv} after the sixth lag. Most importantly, DIV^{manu} accounts for 20% of the variance of DIV^{gdppc} and this proportion increases to 40% after the fourth lag, while DIV^{serv} accounts for almost 0 of the variance of DIV^{gdppc}. This variance decomposition shows the degree of interactions of DIV^{manu}, DIV^{serv}, and DIV^{gdppc} in the VAR(7) and verifies that manufacturing functions as a key determinant of development divergence.

4.5 Robustness and Diagnostic Checks

The results of the recursive VAR may be sensitive to the identification assumptions and Cholesky ordering. Therefore, we consider an alternative ordering of the three variables as a comparison to our benchmark ordering as a robustness check. Specifically, we switch the ordering of DIV^{manu} and DIV^{serv}. The new impulse response functions and variance decompositions using the alternative ordering are displayed in Appendix Figure A and B, respectively. Moreover, we investigate generalized impulse response functions which will avoid the need to imply Cholesky restrictions and justify the specific Cholesky ordering. The results are displayed in Appendix Figure C. By analyzing all these graphs, our key result that industrial policies lead to development divergence through the manufacturing channel remains qualitatively unchanged.

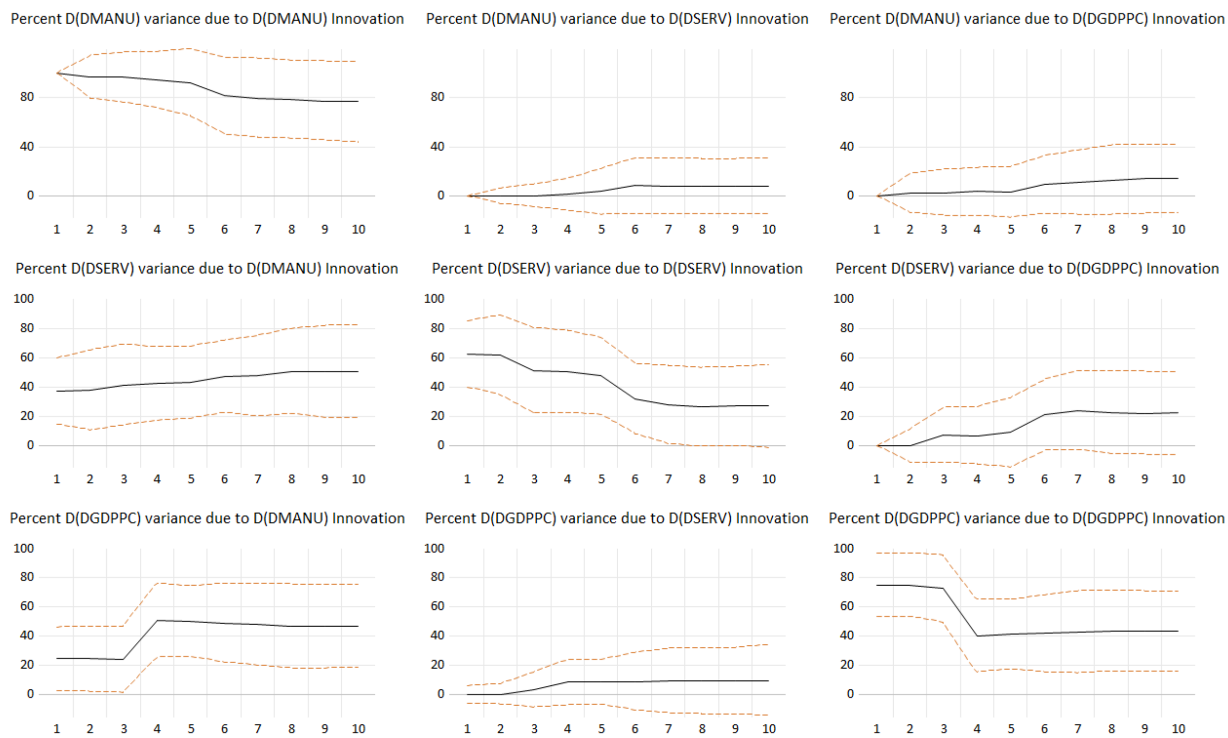

Figure 6: Variance Decomposition using Cholesky (d.f. adjusted) Factors with the Benchmark Ordering

Finally, we conduct the residual serial correlation test, the residual normality test, and the eigenvalue stability test to verify whether the model passes the diagnostic check.

The results of the first two tests are presented in Appendix Table B and C. For the residual serial correlation test, both the LRE statistics and the Rao F-statistics are insignificant. This indicates that we cannot reject the null hypothesis of no autocorrelation up to lag 7. As a result, we have grounds to assert that there is no serial correlation in the current model. For the normality test, all the Chi-square statistics regarding the Skewness and Kurtosis values are insignificant, suggesting we cannot reject the null hypothesis and residuals from the VAR(7) are normally distributed.

Furthermore, the eigenvalue stability test shows that all the eigenvalues lie inside the unit circle, confirming that the VAR also satisfies the stability condition. We draw the inverse roots of the AR characteristic polynomial to visualize the results, as depicted in Appendix Figure D.

5 Conclusion and Policy Implication

Given extensive similarities, Singapore and Hong Kong provide an ideal case study to evaluate the role of government in industrial policies. Both economies epitomized remarkable economic success before 1990, but took divergent paths thereafter. Through active government intervention, Singapore has navigated a well-regulated, ascending, and maturing industrial evolution path, unlike Hong Kong, thereby achieving economic transcendence.

This case study employs the structural VAR model with exogenous policy dummies to explore how these policy differences contribute to the dynamics of industrial and development divergence between Singapore and Hong Kong, by treating Singapore as the policy-exposed treatment and Hong Kong as the counterfactual control. The findings suggest that the proactive industrial policies implemented by the Singapore government, especially those between the middle 1980s and the early 2000s, have significantly expanded their divergence in GDP per capita through the channel of manufacturing, thus immensely conducive to Singapore's economic growth and balanced industrial structure. These policies help explain the relative economic advantages Singapore has enjoyed in its later development paths.

In an era when laissez-faire economics dominates mainstream economic theory, this project offers policy implications that government intervention can indeed make a difference in development. Drawing from the experiences of these two economies, Lam (2000) forecasts that Hong Kong will become more interventionist, while Singapore will move in the opposite direction. Both are expected to gravitate towards a mixed role of market and government in terms of growth and industrial restructuring. For policymakers, the recommended industrial strategy is to stay committed to the real economy, continuously consolidate the manufacturing sector, and pursue a balanced industrial structure to achieve long-run economic growth and sustainable development.

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A Appendices of Tables

Table A: Phillips-Perron Unit Root Test

VARIABLES	Phillips-Perron test for unit root				
$Z(t)$	Test Statistics	1% Critical Value	5% Critical Value	10% Critical Value	MacKinnon approximate p-value
DIV^{manu}	-6.636	-3.580	-2.930	-2.600	0.0000
DIV^{serv}	-6.606	-3.580	-2.930	-2.600	0.0000
DIV^{gdppc}	-5.171	-3.565	-2.921	-2.596	0.0000
$Z(\rho)$	Test Statistics	1% Critical Value	5% Critical Value	10% Critical Value	MacKinnon approximate p-value
DIV^{manu}	-51.775	-18.900	-13.300	-10.700	0.0000
DIV^{serv}	-43.081	-18.900	-13.300	-10.700	0.0000
DIV^{gdppc}	-35.866	-19.098	-13.388	-10.766	0.0000

Notes: 1. Null Hypothesis: the time series contains a unit root and is non-stationary.

Table B: VAR Residual Serial Correlation LM Tests

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	4.998788	9	0.8344	0.534208	(9,26.9)	0.8366
2	2.839413	9	0.9703	0.292638	(9,26.9)	0.9708
3	9.835141	9	0.3640	1.141692	(9,26.9)	0.3694
4	14.41006	9	0.1085	1.812394	(9,26.9)	0.1122
5	12.45244	9	0.1890	1.513014	(9,26.9)	0.1937
6	10.02741	9	0.3483	1.167896	(9,26.9)	0.3537
7	5.729775	9	0.7666	0.619947	(9,26.9)	0.7696

Notes: 1. Null Hypothesis: No serial correlation at lag h. 2. LRE stat refers to Edgeworth expansion corrected likelihood ratio statistic.

Table C: VAR Residual Normality Test

Component	Skewness	Chi-sq	df	Prob.	Kurtosis	Chi-sq	df	Prob.
1	-0.049958	0.018303	1	0.8924	3.202193	0.074950	1	0.7843
2	-0.073778	0.039917	1	0.8416	2.998814	2.58E-06	1	0.9987
3	0.273276	0.547650	1	0.4593	2.044274	1.674588	1	0.1956
Joint		0.605869	3	0.8951		1.749541	3	0.6260

Notes: 1. Null Hypothesis: Residuals are multivariate normal.

B Appendices of Figures

Figure A: Responses to Cholesky One S.D. (d.f. adjusted) Innovations with Analytic Asymptotic S.E.s using the Alternative Ordering

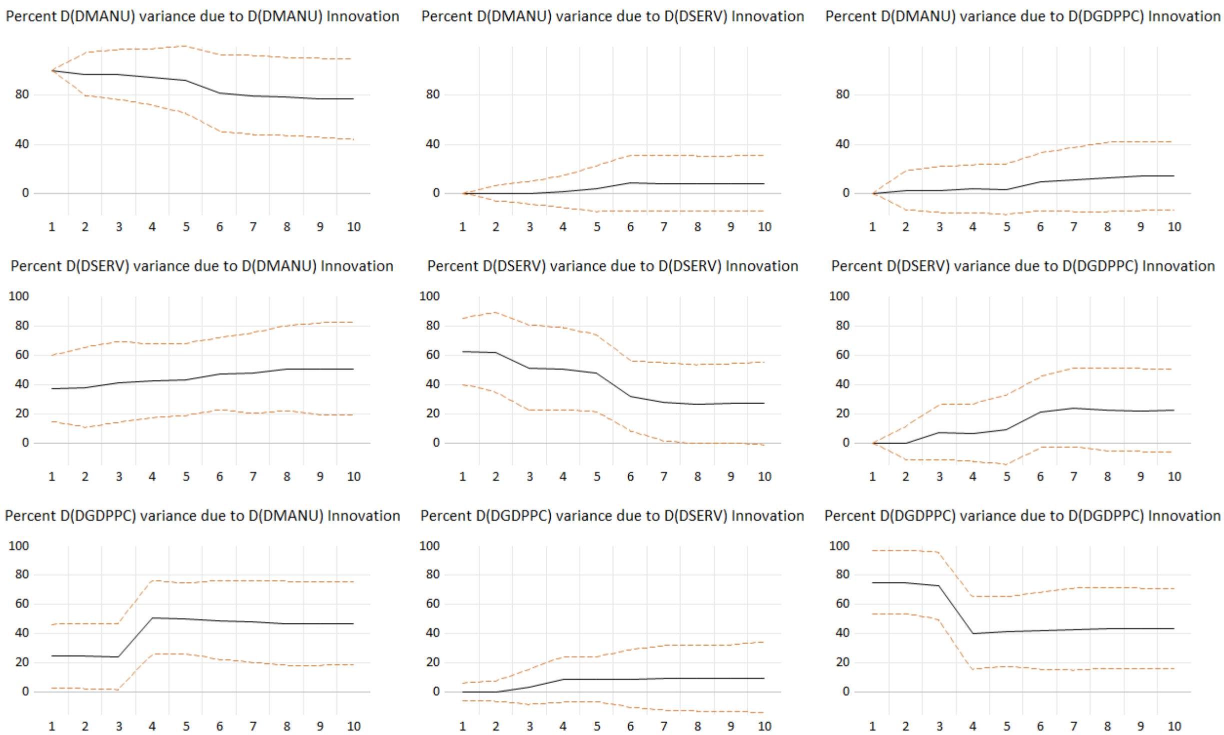

Figure B: Variance Decomposition using Cholesky (d.f. adjusted) Factors with the Alternative Ordering

Figure C: Responses to Generalized One S.D. (d.f. adjusted) Innovations with Analytic Asymptotic S.E.s

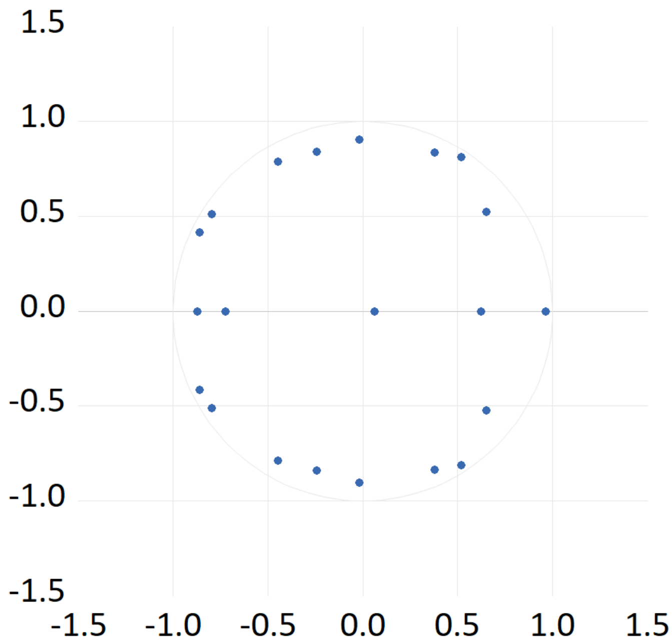

Figure D: Inverse Roots of AR Characteristic Polynomial