Sectoral Dynamics of Industrial Policy in a Two-sector Economy: the Case of Korea's Heavy and Chemical Industry (HCI) Promotion (1973-1979)

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September 24, 2023

Abstract

This study examines the impact of state's industrial policy on sectoral capacity utilization and growth in total output in the context of Korean industrialization during the Heavy and Chemical Industry (HCI) Promotion period (1973-1979). Using a Kalecki-Steindl framework, this paper explores the intricate short-run and long-run dynamics of sectoral capacity utilization in a two-sector open economy. It seeks to offer more nuanced assessment of some of key industrial policy instruments while providing an alternative perspective on the current discourse surrounding the economics of industrial policy. The study finds that while industrial policy has a positive effect on capacity utilization (aggregate demand) in both targeted and non-targeted sectors, increased market power of firms in targeted industries generally reduces the effectiveness of the state's intervention in terms of aggregate demand and capital growth. Second, the industrial policy regime is highly susceptible to adverse external price shocks, such as an oil crisis, which lowers the utilization rates in both industry sectors and is likely to result in stagnation and thus excess capacity issues. These findings are consistent with the Korean experience in which *chaebols* (big business groups) flourished, and the economy suffered from stagflation due to oil price shock in the final stage of HCI promotion.

Keywords — Industrial policy, Sectoral capacity utilization, Market power, Kalecki-Steindl framework, South Korea, Heavy and chemical industry promotion, Oil price shock

***JEL Classification*:** C62, E12, E22, E25, O25, O41

1 Introduction

The impact of the rampant COVID-19 pandemic since 2019, which has led to the recent supply chain shortage crisis and the prospect of imminent stagflation, has renewed interest in industrial policy among policymakers[1] as well as the mainstream development economics community.[2] Industrial policy is typically defined as the government's strategic and preferential assistance provided to particular firms or industries that are deemed essential for the country's economic growth and the welfare of its population. This definition implies that industrial policy is *selective* in nature (Chang, 1994, p.60). The fundamental objective of industrial policy within this framework pertains to effecting a shift from a conventional agricultural-based economy towards a more advanced and diversified industrial and service-oriented economy, a process commonly referred to as industrialization (Syrquin, 2008). From 1973 to 1979, the South Korean government initiated a significant industrial policy known as the Heavy and Chemical Industry (HCI) Promotion policy, aimed at promoting the development of underpinning industries for economic growth.[3] The main form of the government's support entails easy access to preferential interest rates, preferential capital subsidies, preferential loans, exemptions from import tariffs and debt guarantee.

There is no agreement in the literature on the effectiveness of large-scale industrial interventions (Noland and Pack, 2003; Harrison and Rodríguez-Clare, 2010). The case of Korea is not an exception (Auty, 1992). Despite worries about market distortion and corruption, Korea's sectoral interventions may have had a positive impact on economic growth and successfully brought about a structural transformation of the economy (Amsden, 1992). In contrast, the 1979-81 economic downturn is largely attributed to the HCI promotion (World Bank, 1987). In particular, the Korean HCI drive has been criticized at the micro level for the misallocation of subsidized credit to create excess HCI capacity that gave a low financial return (Kwack, 1984; Park, 1986; Rhee, 1987; Leipziger, 1988; Kim et al., 2021) although more recent empirical literature (e.g., Lane, 2021; Choi and Levchenko, 2021) provides causal evidence on its efficacy. Using the Kalecki-Steindl distributional framework, this paper conducts a reevaluation of industrial policy by examining how each component of the industrial policy impacts sectoral capacity utilization and overall economic growth.

The Kalecki-Steindl distributional framework has served as a prominent framework for

[1] "Is industrial policy making a comeback?" *Council on Foreign Relations*, Mar. 16^{th}, 2021; "Industrial Policy's Comeback" *Boston Review: Forum*, Sep. 15^{th}, 2021; "Many countries are seeing a revival of industrial policy" *The Economist: Special Report*, Jan. 10^{th}, 2022.

[2] "Economists Reconsider Industrial Policy" *Project Syndicate*, Aug. 4^{th}, 2023. See also Juhász et al. (2023) for their review of the recent literature on industrial policy.

[3] The state designated several key strategic fields: electronics, automobiles, shipbuilding, machinery, petrochemicals, iron and steel, and nonferrous metals as a backbone of the economic development plan. This agenda was called 'The Five-Year Economic and Social Development Plan,' and the HCI promotion policy was enacted through the third implementation period of the plan (1972-76) and the fourth period (1977-1981).

understanding the potential impact of market power concentration on economic growth and income distribution. Specifically, the framework posits that oligopolistic markup pricing has a significant impact on profit or labour income shares, which, in turn, determine consumption and investment spending, net exports, and other macroeconomic variables such as capacity utilization, employment, and economic growth. These outcomes, in turn, provide feedback mechanisms to markups and income distribution, further reinforcing their impact on economic growth and distributional outcomes. In particular, this framework suggests that a few large firms with market power can lead to lower wages and reduced investment, which may impede economic growth, while higher profits can stimulate investment but may also lead to reduced consumption.

A group of two-sector models developed in the Kaleckian tradition offer a workable framework for various policy regimes that take into account the significance of income distribution and sectoral demand. For instance, Dutt (1995) investigates the interest rate policy of developing nations with industrial and agricultural sectors. Lavoie and Ramírez-Gastón (1997) and Kim and Lavoie (2017) present the Kaleckian traverse model with target rate of return pricing scheme to illustrate how the economy shifts from one steady growth path to another. Fujita (2018) investigates how sectoral capacity utilization interacts with the whole sectoral interdependence described in Sraffa (1975). Beqiraj et al. (2019) develop a two-sector Kaleckian model of the service and manufacturing sectors with differentiated markups and exogenous structural change arising from a shift in consumers' preferences. Finally, Nishi (2020) incorporates endogenous labour productivity into the baseline Kaleckian model, generating a periodic solution path of the economy.

While the Kaleckian literature has a sizable collection of two-sector models illuminating the significance of income distribution and sectoral dynamics, the industrial policy regime requires further elements to accurately represent East Asian emerging economies such as Korea in the 1970s. This paper contributes to the existing literature by integrating the following additional features, offering a more comprehensive analytical framework for industrial policy. First, this study incorporates the cost of intermediate goods into the pricing equations alongside international trade, establishing a distinctive two-sector economy framework in which one sector is highly subordinate to another. The two sector economy is divided into targeted and non-targeted sectors (referred to as the Heavy and Chemical Industry (HCI) or H sector and Light Industry or L sector). This unilateral dependence between the two sectors is facilitated by protectionist policy or import substitution. Secondly, in this study the mobilization of capital is distinguished by disparate access to privileged credit or preferential interest rates. Therefore, Korea's successful experience under the HCI promoting industrial policy presents further theoretical and empirical evidence challenging the tenets of the Washington Consensus, particularly concerning interest rate liberalization and efficient capital mobilization (Chang, 1993; Arestis, 2004). Finally, this paper expands the Kalecki-Steindl framework to encompass an open economy, where the export promotion component is facilitated with a *de facto* pegged exchange rate system. The primary goal of this expanded two-sector open economy framework is to address effective demand concerns in East Asian developing nations like Japan and Korea post-World War II, as highlighted in (Mott and Ho, 2020). This element plays a pivotal role, enabling the model to stimulate rapid economic growth by generating demand from foreign sectors.

The paper presents the following major findings on the impact of industrial policy on the dynamics of sectoral capacity utilization. First, preferential interest rates and export promotion have a positive effect on capacity utilization rate in both H and L sectors. In particular, the difference between preferential and market interest rates plays a central role in capital accumulation, thus boosting economic growth. This outcome sharply contrasts with the neoclassical view particularly the notion that relatively higher interest rates under liberalized financial regime is *growth-promoting*, a viewpoint consistently refuted by Dutt (1990), Burkett and Dutt (1991) and Grabel (1995).[4] Second, the two-sector model suggests he increasing market power of firms in the HCI (H) sector generally reduces the capacity utilization rate of both sectors, reflecting a *wage-led* demand regime. This finding aligns with empirical evidence, as seen in Onaran and Stockhammer (2005) and Onaran and Galanis (2014). Third, the concentration of market power in the targeted sector, or the H sector, can result in a higher potential for capacity utilization compared to the non-targeted sector, or the L sector. However, there is still a limit to how much a firm or sector can increase capacity utilization, as it is constrained by the availability of labour and capital resources. This suggests that while the H sector may have a higher potential for capacity utilization, it is still susceptible to over-investment and excess capacity as the economy stagnates under the open market two-sector economy. Lastly, the present analysis reveals that the industrial policy regime is particularly vulnerable to external factors such as commodity price shocks or inflation resulting from factors outside the control of the regime, such as an oil price shock. Specifically, the findings suggest that the susceptibility of the industrial policy regime to these external factors is relatively high, indicating that the regime may be disproportionately affected by such shocks. These results underscore the need for policymakers to consider these factors when designing and implementing industrial policy measures, as failure to do so may lead to unintended consequences or exacerbate the impact of external shocks on the economy. In contemporary contexts, governments are expanding the scope of industrial policy to encompass an array of economic concerns, including the post-pandemic inflationary

[4] Dutt (1990); Burkett and Dutt (1991) propose a Kaleckian model in which increases in deposit rates rather than loan interest rates lead to lower rates of investment and growth by reducing effective demand. Grabel (1995) presents the post-Keynesian interpretation of the financial liberalization that it is growth-distorting rather than growth-promoting based on the Third World experiences.

era, increasing urgency of green industrial transformation and challenges related to secular stagnation and diminishing labour shares. Notably, South Korea's industrial policy serves as an illustrative example, guiding an emphasis on discrete assessments of individual policy components within the realm of industrial policy with more relevant implications for both economic growth and income distribution.

The rest of the paper is structured as follows. Section 2 briefly contextualizes and evaluates the HCI promotion policy and presents observed episodes during the HCI promotion period. Section 3 introduces the Kalecki-Steindl framework and derives the equilibrium conditions for the sectoral capacity utilization with the system stability conditions. Section 4 analyzes the short-run and long-run dynamics of the capacity utilization and their trends. Section 5 simulates the sectoral economy and discusses the simulated economy with real data. Finally, section 6 concludes the study with a brief summary of the main implications of the paper.

2 Overview and Evaluation of the HCI Promotion Policy

2.1 Contextualizing Sectoral Intervention under the HCI Promotion

The state's initial economic revitalization initiatives in the 1960s focused more on export promotion than import substitution. This drive focused on the consumption goods industries or light industries and made the most of the low labour costs. However, this labour-intensive export promotion faced a number of external challenges, most notably increased price rivalry brought on by the growth of nearby developing nations like China and Vietnam. The early 1970s oil price surge, which began by the first Oil Price Shock in 1973, increased production costs, which prevented the businesses from being price competitive. The government officials viewed the capital-intensive HCI promotion as an alternative growth strategy to cope with the declining labour cost competitiveness with increasing protectionism as well as increasing national security concerns in the early 1970s (Woo, 1991; Amsden, 1992; Horikane, 2005).[5] In fact, HCI firms were expected to have a strong linkage effect – either positive spillover effects

[5]The literature also points out that from a geopolitical perspective, officials also needed to adopt a more proactive approach than the labour-intensive export promotion strategy used in the 1960s. The Nixon Doctrine, the first significant military withdrawal of 20,000 out of 61,000 US troops by June 1971 (see *Letter From President Nixon to Korean President Park* at National Archives, Nixon Presidential Materials, XIX, Part 1: https://history.state.gov/historicaldocuments/frus1969-76v19p1/d58), further fueled policymakers' interest in heavy and chemical industrialization. Horikane (2005) regarded the HCI promotion policy as politically rational, grounded in the prevailing geopolitical circumstances.

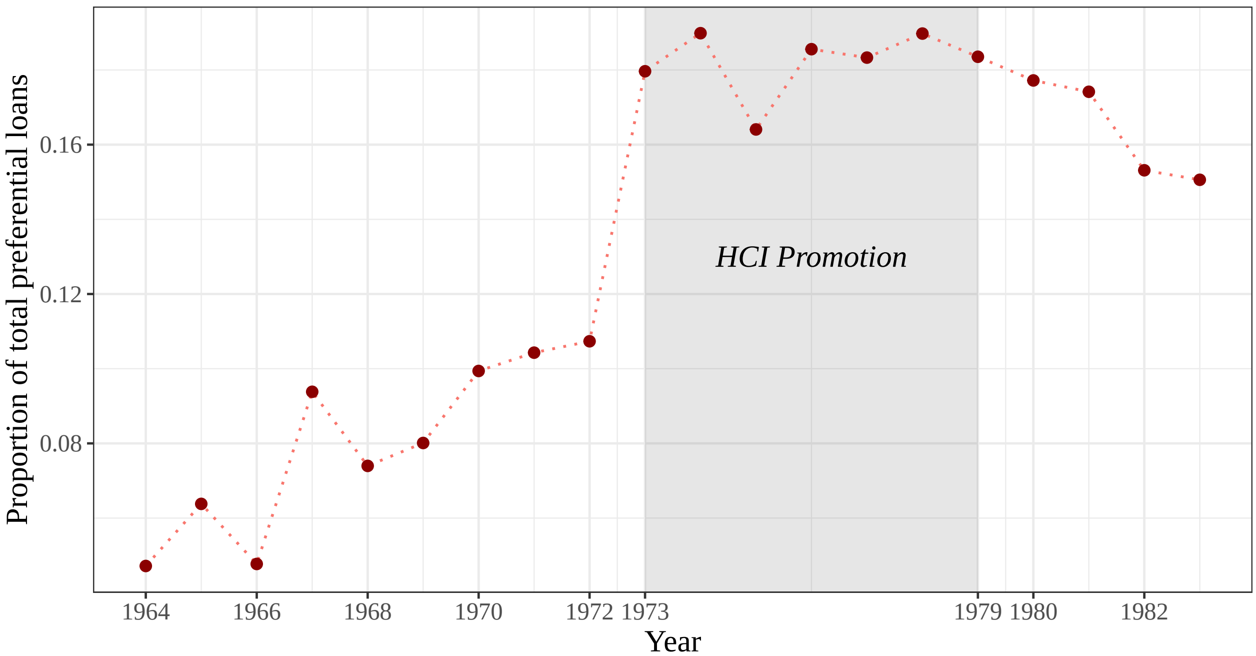
of an upstream firm's growth (automobile companies) on other downstream industries who produce inputs (tire and battery companies) for the upstream company or similar positive spillover effects from upstream companies but to the industry (raw materials such as steel and rubber) that enables the upstream industry to succeed (Hirschman, 1958; Liu, 2019). This input-output linkage may not only reduce transaction costs but also diversify potential risk (Haggard et al., 2000).

The HCI push was officially announced in 1973 as a major project of the third Five-Year Economic and Social Development Plan (1972-1976). One of the most essential elements of the project was the sufficient credit supply for many long-term investment projects such as construction, housing, basic heavy industry as social infrastructure. Considering the backwardness of financial institutions, the role of the government, which could act as a financial intermediary became necessary and crucial in credit allocation.

2.2 Credit Allocation during HCI Promotion

During the early phases of Korea's development, the government was in charge of distributing foreign aid among the industrial sectors rather than developing efficient financial markets that may act as efficient financial intermediaries to transmit money from savers to investors. In doing so, the government encouraged *chaebols* and employed severe financial repression to finance their operations. Lee (1992) argues that the government's considerable engagement in Korea's financial system can be seen as an "internal capital market" and characterizes the relationship between the *chaebol* as a "quasi-internal organisation" due to its tight ties to the *chaebol*. Amsden (1992, 1997) refers to the state's management of the *chaebols* "entrepreneurial" in that the state forbade *chaebols* to establish their own financial intermediaries.

Figure 1 shows the increase in the proportion of total preferential loans in the early 1970s. In 1973, the proportion jumped to more than 15 percent of entire loans and the volume sustained all through the promotion period. As a result, the growth rate of capital investment peaked around 45 percent in 1976 and 1978, and the rate dropped from 45 percent to around 10 percent in the final stage of HCI promotion (see Figure 2 (left)). The proportion of bank loans poured into the HCI sector accounted for more than 75 percent of total credit supplied to the entire manufacturing sector. Preferential capital subsidies and exemptions from import tariffs enabled the HCI sector to nearly double the total value of capital during the promotion (Lane, 2021). The scale of the financial support not only accelerated the structural change of the economy but also stimulated HCI firms' exports, which took more than 50 percent of the total export (Cho et al., 1991). In many regards, the HCI promotion in the 1970s was similar to the previous labour-intensive export promotion policy, but the size of loans was much bigger than it was before, and the the selection criterion was more industry-specific or



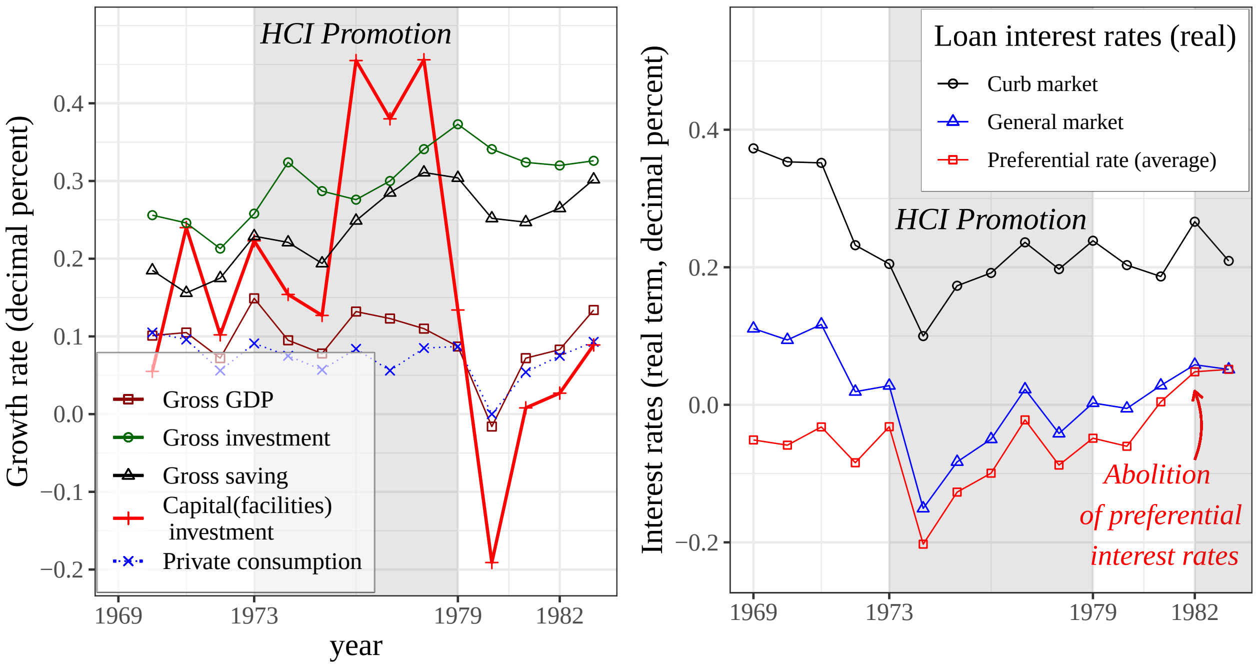
Source: Bank of Korea, Economic Statistics Yearbook (various issues), measured in Korean currency (KRW) value

Figure 1: Trends of Policy Loans for the HCI

targeted.

Besides credit allocation control, the government regulated interest rates in the credit market throughout the HCI promotion period. Figure 2 (right) shows the evolution of interest rate regimes. From 1964 to 1971 (labour-intensive light industry and export promotion period), the government raised interest rates for both loans and deposits by which most of rates doubled with the exception of corporate loans. The government treated the corporate sector in a different manner. The policymakers instructed banks to lower the interest rate for corporate loans to 8 percent, the rate significantly lower than the curb market rate of 30 to 40 percent (Chung, 2007). Compared to Taiwan and Japan, who also exercised substantial government control over the credit market, the significantly lower real interest rates in Korea, often below zero due to the recurring high inflation rate stifled the growth of the Korean banking sector, and the volume of financial savings was relatively small compared to other counterparts in East Asia (Cho, 1989). In addition, in order to mobilize private savings and thus encourage private investment, banks in the official credit market were also instructed to keep the interest rates on loans lower than those for deposits (18 percent and 22.8 percent, respectively) (Chung, 2007). Up until 1980, when the initial deregulation of the commercial banks was announced, banks were a major means of financing the HCI promotion and were under government control. In the 1970s, the credit market control fueled a rise in the curb market, an unofficial source of credit.

The policy under the earlier regime still led to a financial stress in the business sector

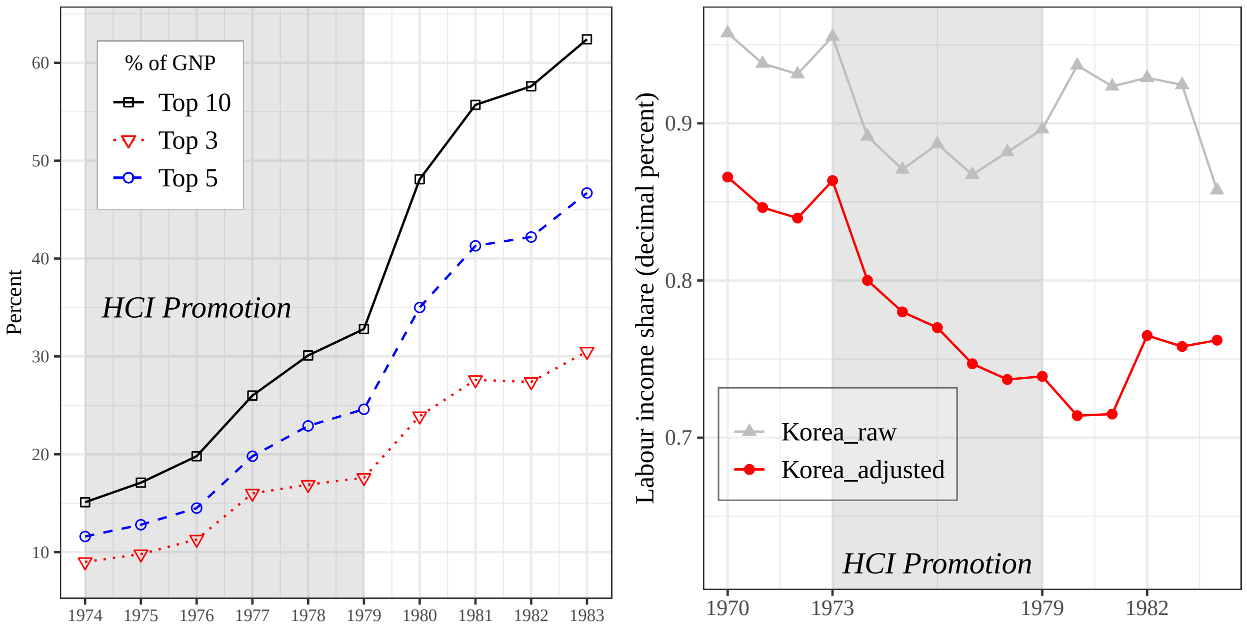


Source: Bank of Korea, ECOS

Source: BOK, Stat Bulletin (various issues)

Figure 2: Trends of the Growth Rate of Capital Investment, Other Macro Variables (Left) and Trends of Three Major Interest Rates (Right)

due to soaring interest costs for *chaebols* (Chung, 2007), requiring the government to take an immediate action. On 3 August 1972, the government announced *8.3 Measure* or the Presidential Emergency Decree, one of the most aggressive interventionist financial measures by Park's regime. Through the measure, President Park took an emergency financial action that could bail out the debt-ridden firms. The action allowed them to roll the debts over for three years with a favourable monthly interest rate of 1.35 percent and to declare a moratorium on the curb market debt. In 1973, interest rates were reverted from higher to lower regime. Figure 2 (right) describes the reverted interest rate structure during the HCI promotion. The gap between general market rate and curb market rate did not change,[6] but overall interest rates were drastically lowered. My model captures this feature: lower preferential rate which stayed below zero (average −8.8 percent) with (almost) constant interest rate differential between the preferential rate and the curb market rate. Firms in the heavy industry sector (targeted sector) could get easy access to either the preferential credit rate or the general market rate whereas others in the light industry (non-targeted sector) had to resort to the curb market rate.



Source: Kim (1987)

Source: Lee et.al (2014) for Kor_adj, OECD, Kor_raw

Figure 3: Combined Sales of Top 10 Largest Chaebols (Left) and Labour Income Share Trends: International Comparison (Right)

2.3 Observations in the HCI Push

Observation 1. The Growth of the *Chaebols* The remarkable growth of Korean big businesses did not occur until the early 1970s when the government's HCI promotion policy was implemented. In the middle of the HCI promotion period, the combined sales of top 10 *chaebols* reached 20 percent of total GNP and continued to rise during the 1980s as Figure 3 (left) shows. The expansion of the *chaebols* in the six targeted industries in 1979, the final year of the HCI promotion.

Observation 2. Declining Wage Share The HCI promotion was accompanied by a consistent decrease in the labour income share (Kim, 1990; Lee et al., 2014; Lee, 2015). This phenomenon is largely attributed to the rapid expansion of large business groups (*chaebols*) and their consequential leverage in wage bargaining negotiations, along with considerable extent of institutional wage suppression enforced by the authoritarian government (Kim and Topel, 1995).[7] Figure 3 (right) shows that the adjusted wage share[8] during the HCI

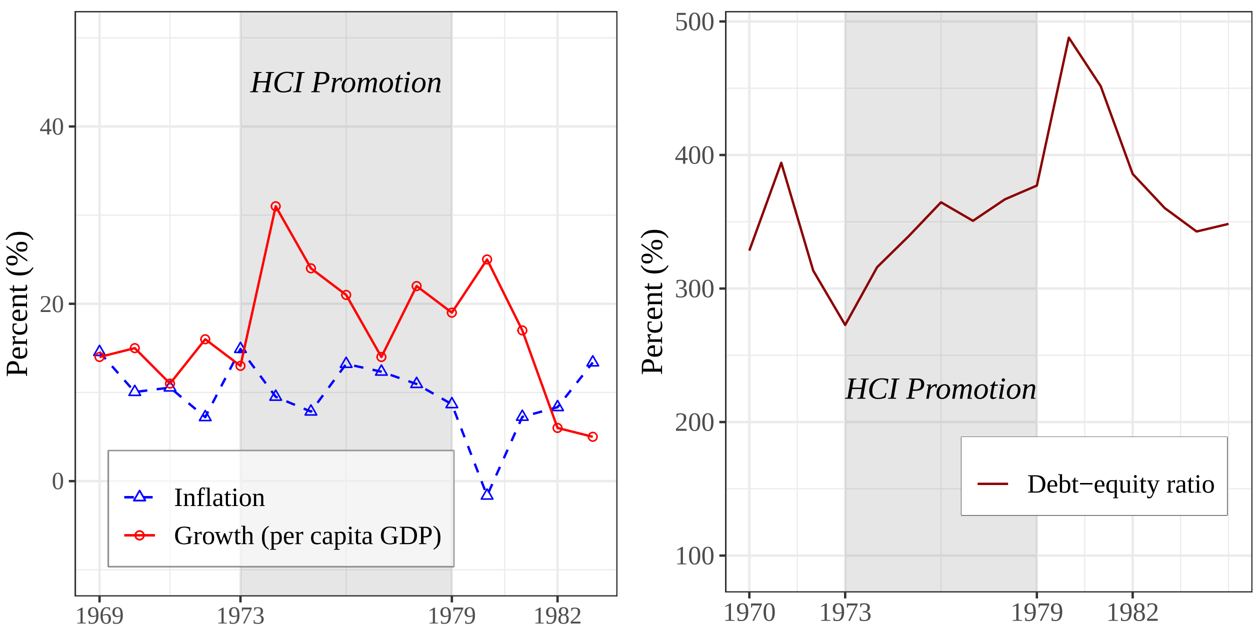
[6]This is due to the fact that favourable interest rates persisted throughout the 1960s. The difference from that of 1970s was that the former was industry-neutral whereas the latter was industry-specific.

[7]Kim and Topel (1995) points out that the lagged real-wage growth behind productivity indicates that government efforts to suppress wage growth for less skilled workers was effective at least until 1975.

[8]It is important to note that the estimation methods of labour share may vary depending on how the income of self-employed individuals is treated, particularly in cases like Korea where their proportion is significantly higher compared to other countries. Gollin (2002) suggests three options: (i) to consider the self-employment income same as labour income only; (ii) to consider the self-employment income as the same

promotion declined and rebounded as the promotion was terminated.

Observation 3. The Increase in the Idle Capacity The Korean HCI promotion policy resulted in capital misallocation and underused capacity (Kwack, 1984; Park, 1986; Rhee, 1987; Leipziger, 1988; Kim et al., 2021). This is mainly related to the negative real cost of borrowing and thus over-investment until 1982 when preferential interest rates were abolished. According to Jones and Sakong (1980), more than 30 or 40 percent of all investment made in the machinery sector were idled, and the government did not put any serious restraints on the *chaebols*' accumulation. Instead it committed to growth by business promotion and concentration to reduce project gestation period rather reduce inequality (Jones and Sakong, 1980). Towards the end of the 1970s, the economy of the concerned country was beset with a host of challenges, including a persistent current account deficit, escalating foreign debt, and a deceleration in growth rates. Moreover, the economy suffered a further setback due to the compounded impact of the second Oil Price Shock in 1978.



Source: Economic Statistics Yearbook, BOK

Source: BOK, Financial Statement Analysis

Figure 4: Trends of Inflation and Growth Rate and Debt-equity Ratio of Manufacturing Sector

Observation 4. High Inflation and Declining Growth Rate Inflation was

share of labour income as that of other economic sectors; (iii) to equalize the self-employment income to the average wage income of wage earners whose number is obtained from the data. This figure uses the second option as used in Lee et al. (2014); Lee (2015) which point out that third option overestimates the labour share in the sense that the real data (available from 1975) shows per-capita operating surplus of non-wage earners has always been lower than the compensation of the employees. The Bank of Korea (BOK) calculates the labour share using the first option. Thus, this measure tends to overestimate the labour share by ignoring the fact that the self-employed own capital.

rampant throughout the industrial promotion period due to the two oil price shocks occurred in 1973 and 1978. During this period, the overall annual per-capita real GDP growth rate was relatively high, but was falling from 1976 to 1980 as shown in Figure 4 (left panel).

Observation 5. Growth of HCI Sector with its Contribution to Exports and Escalating Debt-equity Ratio Throughout the HCI promotion period, the HCI sector dramatically expanded. In 1979, HCI industry took 54.7 percent of the entire industry (38.9 percent in 1970) while light industry took 45.3 percent (61.1 percent in 1970). As a result, its contribution to exports also increased, taking 41.9 percent of total exports in 1977. However, most of firms in the manufacturing sector including *chaebols* experienced a sharp increase in the debt-equity ratio as shown in Figure 4 (right). During the HCI promotion period, beside the government's policy loans, private banks were also encouraged to provide policy loans at favourable conditions to competitive enterprises. Consequently, private manufacturing firms took advantage of policy loans provided by commercial banks at preferential lending rates, which are still lower than those of curb market. This led to a sharp increase in the debt-equity ratio of firms in the manufacturing sector in Korea during the 1970s.

3 The Model

3.1 Characterization of Industrial Policy Regime

A two-sector open economy model is presented in this subsection. The H industry sector, also known as the heavy and chemical industries, is the focus of the government's industrial policy. The model's primary characteristics reflect the industrial policy context that provides support to the H sector through the development of specific policy instruments, including (i) preferential interest rates for the H sector to promote capital investment; (ii) unilateral reliance of the L sector on the H sector due to import substitution for intermediate goods; and (iii) transition towards export promotion and the implementation of a *de facto* dollar peg regime. The model's emphasis on the H sector underscores the government's efforts to foster economic development and improve its balance of payments position, while also providing a framework for analyzing the intersectoral linkages and policy trade-offs that arise in an open economy context.

In a capitalist economy, capitalists and workers operate within an environment characterized by the interaction of supply and demand in the marketplace. The capitalists, who own capital input can exercise their power to set prices and wages by setting markups, which affects the income distribution and thus workers' effective demands for goods and services.

The Structure of the Economy The economy is described as follows. There are two sectors operating in the economy: heavy and chemical industry (H sector) and light industry (L sector). We assume that Leontief production technology is used. This is a standard consideration in the Kaleckian literature in the sense that the Leontief function is able to capture a situation where idle capacity is generated. In reality, some level of fixed proportionality exists between inputs, which can result in idle capacity within firms. The Cobb-Douglas function, which assumes that inputs of capital and labour are substitutable at all levels of production, fails to capture the phenomenon of idle capacity. Hence, the the level of output production is given by

$$Q^x = \min\left[\frac{N^x}{a_N^x}, u^x\frac{K^x}{a_K^x}\right] = \min\left[\frac{N^x}{a_N^x}, u^x K^x\right], \quad x = \{H, L\} \tag{3.1}$$

where Q^x denotes output in real terms, N^x, required labour employment, and K^x, capital stock in real terms. a_K^x denotes the sectoral fixed amount of capital input stock per unit of potential output, which is assumed to be one so that a_N^x denotes the (relative) fixed amount of labour input per unit of potential output. Hence, the inverse of a_N^x is the sectoral capital-labour ratio or the relative productivity. $u^x \in (0, 1)$ is the key endogenous variable in the model, representing the industry-specific *actual* rate of capacity utilization given by

$$u^x := \frac{Q^x}{Q_F^x}, \quad x = \{H, L\}. \tag{3.2}$$

where Q_F^x denotes potential level of output. $u^x = 1$ when the capacity is fully utilized. It is important to note that, in addition to its definition, u^x is endogenously determined by a number of industrial policy instruments. As a result, the capacity utilization rates – the primary focus of this study – serves as industrial policy's medium, which has a variety of macroeconomic effects.

I also assume that labour is always abundant so that the production is solely determined by capital in the sense that unlimited labour supply is typical in the late industrializing economies such as Japan and Korea. This assumption may not be readily applicable to the HCI sector, which requires a labour force with specific sector-specific skills or high-level expertise, the availability of which could be restricted. However, the model comprehensively addresses both sectors, taking into consideration that one contributing factor to the sufficient supply of skilled labour was made possible by Korea's significant investment in education since the 1960s, coinciding with the implementation of nationwide land reform (Amsden, 1992). Under this assumption, the amount of labour required is pre-determined and fixed for a given level of output. This assumption can be supported by a low rate of unionization as well as less bargaining power and a labour market characterized by a large pool of unemployed workers who are willing and able to work at the prevailing wage rate. Thus, with the condition of full capacity utilization, Q_F^x is given by

$$Q_F^x = K^x, \;\; x = \{H, L\}, \tag{3.3}$$

and the actual production function is

$$Q^x = u^x K^x, \;\; x = \{H, L\}. \tag{3.4}$$

The required labour employment for output production will be determined by production technology. Also by the property of the Leontief technology whose efficiency is achieved by equalizing the labour and capital inputs, the labour requirements at full capacity utilization should be: $N^x = a_N^x K^x, \;\; x = \{H, L\}$. Thus, the actual level of labour employment is given by

$$N^x = a_N^x u^x K^x, \;\; x = \{H, L\}. \tag{3.5}$$

Firms in both sectors mark up their prices over prime costs to adjust their production to meet consumption demand as follows. For firms in the heavy industry,

$$p^H = (1 + \mu^H)\Big[w^H a_N^H + \gamma \epsilon p_m^*\Big] \tag{3.6}$$

where μ^H is the markup rate, which is exogenously determined. γ denotes the fixed requirement of the imported intermediate good per unit of output for firms in HCI sector. Since output is simply the multiple of capacity utilization and capital, γ is in fact one (H sector is fully subordinate to foreign production sector). ϵ is exchange rate defined as KRW/USD, and p_m^* the fixed foreign-currency price of the imported intermediate good. In case of firms in the L sector, capital input K^L is in fact the output produced by firms in H sector. One potential attribute of the model representing a two-sector open economy is the equivalence between capital input and intermediate goods imported from the foreign sector. The firms operating in the H sector require intermediate goods for their production processes, which are commonly imported from foreign sectors due to the lower level of technology of most indigenous firms in developing countries. That is, the firms in H sector may have to require foreign intermediate products that necessitate top technology.

Another point I want to make in the present model is that firms mark up mainly on unit labour cost and intermediate goods price without considering capital cost such as rental cost of machinery. Here I assume that the markup is based on the perceived degree of market power that the firm possesses in its industry rather than on the actual total cost of production. In the current model, the markup is seen as a measure of the firms' market power and the level of concentration in the market based on Kalecki (1942, 1971). In this view, firms may absorb some of the costs of capital in order to prioritize maintaining stable levels of employment and output rather than maximizing profits through mere price change.[9]

Finally, this model assumes that there is no depreciation of capital. This assumption leads us to think that the cost of production may be more closely related to investment rather than capital in the sense that the capital goods are not aging or that they are being replaced by newer capital goods at the same rate as they are depreciating. In other words, it refer to the expenses incurred when a firm acquires new capital goods, such as machinery or equipment to expand its productive capacity. In this model, they are simply the prices of intermediate goods produced by either foreign firms or domestic firms.

For firms in the light industry,

$$p^L = (1 + \mu^L)\Big[w^L a_N^L + \phi p^H\Big] \tag{3.7}$$

where ϕ is the fixed required rate of intermediate good per unit of output produced by firms in the heavy industry or HCI sector. This model postulates that the light industry highly depends on the production of heavy industry while the heavy industry highly depends on the production of foreign sector. Hence, the structure of this economy lies in somewhere between Kaleckian two-sector model which lacks the interdependence of industries and Sraffian economy which assumes a full interdependence of industries. We also need to note that under the Kaleckian-Steindl framework, the markup pricing has a strong distributional implication. That is, the sectoral profit share π^x is determined by markup rate and the ratio of materials to labour costs as follows:

$$\pi^H = \frac{\mu^H\Big(1 + \frac{\gamma \epsilon p_m^*}{w^H a_N^H}\Big)}{1 + \mu^H\Big(1 + \frac{\gamma \epsilon p_m^*}{w^H a_N^H}\Big)} \tag{3.8}$$

$$\pi^L = \frac{\mu^L\Big(1 + \frac{\phi p^H}{w^L a_N^L}\Big)}{1 + \mu^L\Big(1 + \frac{\phi p^H}{w^L a_N^L}\Big)} \tag{3.9}$$

where π^x is a monotonic increasing function of markups and the ratio of material to labour costs.[10] Here we assume that $w^H > w^L$, signifying a more pronounced institutional wage suppression on less-skilled workers, as expounded in the preceding chapter. At this point, we may think of the case in which labour mobility between the sectors is notably challenging.

Investment or capital accumulation is determined by two main components: net profit rate and capacity utilization rate. $I = g_K \cdot K$ where g_K is the rate of capital growth, in

[9]There are some Kaleckian literature that added unit interest costs to unit labour costs when applying the markup (e.g., Godley and Cripps, 1983; Godley and Lavoie, 2007). One issue, however, is what is the relevant interest rate, nominal or real that determines the real normal profit rate (Lavoie, 1995). Kalecki himself did not think interest rates played much of a role, because he thought that interest rates did not significantly vary through the business cycle.

[10]See Appendix Section A for the algebraic notes for the profit ratio.

particular, which is given as

$$g_K^x = \frac{I^x}{K^x} = \alpha_0^x + \alpha_1^x(R^x - i^x) + \alpha_2^x u^x, \;\; x = \{H, L\} \tag{3.10}$$

where α_0 is autonomous component, so called *animal spirit* from Keynes (1936) which may represent consumer confidence. It is assumed to that sensitivity parameters are positive ($\alpha_1 > 0$ and $\alpha_2 > 0$). This investment function highlights the role of endogenous factors such as profits and capacity utilization in determining firm's investment decision. Here I distinguish each parameter by sector to take full advantage of sectoral variation facilitated by the two-sector model. i^x is the industry-specific interest rate in real term. So i^H denotes the preferential loan interest rate with the condition that $i^H < i^L$ in real term. R^x is the sectoral or industry-specific rate of return or profit which, in view of equation (3.6) and equation (3.7), is given by

$$R^x := \frac{\pi^x Q^x}{K^x} = \pi^x u^x, \;\; x = \{H, L\} \tag{3.11}$$

where π^x is the profit share of total income.[11]

Equation (3.10) is the slightly revised version of the canonical Kaleckian investment function, $I/K = a + br + c \cdot Q/K$, where r is profit rate and Q/K is capacity utilization, which is found in Rowthorn (1981), Dutt (1984), Blecker (1989), and Bhaduri and Marglin (1990). There are two main reasons for the revision: first, since equation (3.6) and equation (3.7) include the unit material costs from the use of intermediate goods, the investment reflects the net profit rate that nets out the borrowing costs; second, the investment decision is expected to be significantly affected by the credit interest rates under the HCI promotion regime. Hence, the capital stock in each of the two sectors grows according to the rates of investment in each sector, which is composed of the rate of autonomous investment, the rate of net profit and the rate of capacity utilization. Depreciation of the capital is assumed away to reflect that the effect of depreciation is very small in the short run. This assumption is motivated by the belief that the impact of capital depreciation on investment and output is negligible over short time horizons. Hence, by assuming away depreciation, the current model can focus on the immediate dynamics of investment and output, without being encumbered by additional complexity.[12]

With respect to international trade, the export performance of firms in the H sector

[11] The profit rate R^x is computed based on the profit share π^x. See Appendix Section A for the algebraic notes for the profit rate.

[12] While the assumption of zero depreciation is useful for short-run models, it is worth noting that it is a significant departure from the real-world phenomenon of physical capital wear and tear, and other factors that result in the depreciation of capital. Over longer time horizons, the effect of depreciation can become increasingly important, and accounting for it becomes necessary in more detailed models of investment and growth that aim to capture the long-run evolution of the capital stock and the level of output.

depends on price competitiveness as measured by $\frac{\epsilon p^{H^*}}{p^H}$ where p^{H^*} denotes the foreign currency price of foreign manufactured goods. The export performance, represented by the ratio of export E relative to capital stock K, is given by

$$\frac{E^H}{K^H} = \zeta_0 + \zeta_1 \epsilon \overline{\Big(\frac{p^{H^*}}{p^H}\Big)}, \tag{3.12}$$

where $\zeta_i > 0$ are all constants. ϵ is the fixed nominal exchange rate as defined in equation (3.6). The expression $\overline{\left(\frac{p^{H^*}}{p^H}\right)}$ illustrates that within this economic context, large firms in the H sector exhibit rapid responsiveness to the fluctuations in foreign prices. This responsiveness allows them to continually adjust their export prices, ensuring the maintenance of price competitiveness, aided by favourable government-driven updates to the exchange rate. Thus, export is assumed to be largely determined by the exchange rate policy or ϵ in this model.

Now, we want to derive equations for the sectoral equilibrium conditions by setting the sectoral excess demand to be zero. Each sectoral equilibrium condition leads to the equation for the sectoral capacity utilization. Thus, the equation shows the equilibrium path of capacity utilization rate in each sector, which is affected by the changes in the key exogenous variables such as markups or profit shares, interest rates for the credit, etc. The demand for investment goods produced by the firms in the heavy industry sector is composed of the intermediate demand for investment goods in the light industry sector, $p^H \phi Q^L$, real investment in both sectors, $p^H I^H + p^H I^L$, and foreign demand for investment goods, $p^H E^H$. Then the excess demand for heavy industry is given by

$$ED^H = \underbrace{\phi Q^L + (I^H + I^L) + E^H}_{\text{Demand for investment goods}} - \underbrace{Q^H}_{\substack{\text{Supply of} \\ \text{investment goods}}} \tag{3.13}$$

Equivalently, we have

$$\begin{aligned}
\frac{ED^H}{K^H} &= \frac{\phi Q^L}{K^H} + \frac{I^H}{K^H} + \frac{I^L}{K^H}\frac{K^L}{K^L} + \frac{E^H}{K^H} - \frac{Q^H}{K^H} \\
&= \phi u^L k + \alpha_0^H + \alpha_1^H(\pi^H u^H - i^H) + \alpha_2^H u^H \\
&+ \Big[\alpha_0^L + \alpha_1^L(\pi^L u^L - i^L) + \alpha_2^L u^L\Big] k + \zeta_0 + \zeta_1 \epsilon \Big(\frac{p^{H^*}}{p^H}\Big) - u^H
\end{aligned} \tag{3.14}$$

where $k = \frac{K^L}{K^H}$.

Similarly, the excess demand for light industry is given by

$$\frac{p^L ED^L}{p^L K^L} = \frac{p^L(C^H + C^L - Q^L)}{p^L K^L} = \frac{\overbrace{w^H N^H + w^L N^L}^{\substack{\text{Total consumption}\\ \text{out of their wage bill}\\ \text{with zero saving propensity}}}}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \tag{3.15}$$
$$= (1-\pi^H)\frac{pu^H}{k} - \pi^L u^L$$

where $p = \frac{p^H}{p^L}$, and C^x indicates the consumption demand of workers in x sector. Here, aggregate consumption is solely composed of labour workers' consumption (i.e., $s = 1$). This assumption is consistent with the Kaleckian literature that oftentimes posits that investment is assumed to be determined by the rate of profit and not affected by the level of saving. This implies that if capitalists save all their income, it will not affect the level of investment or aggregate demand.

Following Nishi (2020), the labour productivity growth rate in each sector is endogenously determined as a function of the profit share π^x and capacity utilization u^x as given:

$$\widehat{1/a_N^x} = q^x(\pi^x, u^x) = \beta_0^x + \beta_1^x \pi^x + \beta_2^x u^x, \text{ with } q_\pi^x \lesseqgtr 0 \text{ and } q_u^x > 0, \ x = \{H, L\} \tag{3.16}$$

where q_π^x and q_u^x are the first derivative with respect to profit share and the rate of capacity utilization, respectively. Thus, $\beta_1^x = q_\pi^x$ and $\beta_2^x = q_u^x$. The sign of q_π^x picks up whether productivity growth takes a profit-led or a wage-led regime. Usually in Korea, the Marx-Webb effect by which real wage growth leads to labour productivity growth (Storm and Naastepad, 2013; Lavoie, 2017) is dominant and thus wage-led productivity regime is empirically supported by the data available at the Office of Labor Affairs, Ministry of Labor and the Bank of Korea (Amsden, 1992, p.201). For the sake of analysis, we consider both wage-led and profit-led productivity growth regimes so that we may explore all possible cases of productivity growth regimes. The positive sign of q_u^x validates a common situation that greater utilization leads to higher productivity.

The labour productivity also leads to endogenous change in the growth of nominal wages (Nishi, 2020). As labour productivity gap between sectors widens, wage gap between sectors also increases. Thus, the growth rate of sectoral nominal wage is given by

$$\hat{w}^x = \eta^x \cdot \widehat{1/a_N^x} = \eta^x q^x(\pi^x, u^x), \ x = \{H, L\} \tag{3.17}$$

where $0 \leq \eta^x \leq 1$ denotes the strength of association between the productivity and the wage rate and is affected by the bargaining power of unions. That is, a rise in unions' bargaining power leads to an increase in η^x, thereby $\hat{w}^x$ increases. When $\eta^x = 1$, then wages grow at the same pace that labour productivity rises. In the model, η^x is exogenous. Also, it is believed in general $\eta^H > \eta^L$, implying that workers in the H firms usually have higher bargaining power than their counterparts in L sector, and thus their wage is higher than that of workers in L sector.

The short-run equilibrium condition that $ED^x = 0$ finally yields the equations for the sectoral capacity utilization. The equilibrium rates for two sectoral capacity utilization rates will solve the following system of two equations:

$$u^H = \Bigg[\underbrace{\frac{\phi + \alpha_2^L + \alpha_1^L \pi^L}{1 - \alpha_2^H - \alpha_1^H \pi^H}}_{\mathbf{A}}\Bigg] k u^L + \Bigg[\underbrace{\frac{\alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L)k + \zeta_0 + \zeta_1 \epsilon\left(\frac{p^{H^*}}{p^H}\right)}{1 - \alpha_2^H - \alpha_1^H \pi^H}}_{\mathbf{B}}\Bigg]. \tag{3.18}$$

$$u^H = \Bigg[\underbrace{\frac{\pi^L}{p(1-\pi^H)}}_{\mathbf{C}}\Bigg] k u^L \tag{3.19}$$

where $k = \frac{K^L}{K^H}$ and $p = \frac{p^H}{p^L}$.[13]

Hence the short-run equilibrium is defined as:

$$u^{H^*} = \frac{\mathbf{B}(\bar{k}) \cdot \mathbf{C}}{\mathbf{C} - \mathbf{A}} \tag{3.20}$$

$$u^{L^*} = \frac{\mathbf{B}(\bar{k})}{(\mathbf{C} - \mathbf{A})\bar{k}} \tag{3.21}$$

where relative capital stock between the two sectors k is fixed as $\bar{k}$. The derivation above ensures that the capacity utilization rates are endogenously determined by many factors. One of the primary reasons that the rate is below one is to maintain market power and avoid competition. Thus, as shown in equation (3.18) and equation (3.19), u^x is significantly influenced by the profit share, π^x, which is mainly determined by the degree of firms' market power or markups, μ^x. By producing less than the maximum possible output, in particular, firms in H sector can sustain their higher output prices than those produced at full capacity. In addition, they can quickly adjust its production to match sudden changes in market demand.

Parametric Assumptions Here I want to present parametric assumptions for the current model to be operational. Note that the accuracy and reliability of the values of the parameters are crucial. I will attempt to validate these assumptions by providing simulation

[13] See Appendix Section B for the algebraic details on the derivation.

evidence in the simulation section, and convincing parameter values are presented in Appendix Section D. The forthcoming dynamic illustration of the model and simulation section will be preceded by a succinct presentation of the underlying assumptions, which are essential for a clear understanding of the subsequent analysis, in particular, the existence of a unique equilibrium of the system.

Assumption 1. $\mathbf{C} > \mathbf{A} > 0$ and $\mathbf{B} > 0$.

where $\mathbf{A}$ and $\mathbf{C}$ refers to the positive slope of equation (3.18) and equation (3.19), respectively. $\mathbf{B}$ refers to the positive intercept of equation (3.18). This assumption requires that α_0^x, α_1^x and α_2^x are sufficiently small for a unique equilibrium to exist in the system. This assumption states that the slope of capacity utilization equation for light industry (equation (3.19)) is steeper than that of capacity utilization equation for heavy industry (equation (3.18)) so that we have a unique equilibrium of the economy.

Assumption 2. The effect of profit share of H firms (π^H) on $\mathbf{C}$ is greater than that of price change, yielding $p > \frac{1-\pi^H}{\pi^L}$. It is because $\frac{\partial \mathbf{C}}{\partial \pi^H} > \frac{\partial \mathbf{C}}{\partial p}$ with $\frac{\partial \mathbf{C}}{\partial \pi^H} = \frac{p\pi^L}{\Delta^2}$ and $\frac{\partial \mathbf{C}}{\partial p} = \frac{\pi^H - 1}{\Delta^2}$.

This assumption ensures that the slope of equation (3.19) increases as firms in H sector gain more market power.

In terms of a linear relationship between capacity utilization of H industry and that of L industry (i.e., $\frac{\Delta u^H}{\Delta u^L}$), their different slopes show that u^H responds to the increase in u^L with higher sensitivity in L sector than in H sector. This difference partly explains the different degree of dependence between the two industries. Since firms in L industry is solely dependent upon the domestic H industry, the increase in the u^L has a greater effect on u^H in L industry, making the slope steeper. In addition, in equilibrium, u^H varies directly with u^L (direct variation). A simple proof is presented in the following proposition.

Proposition 1. *u^{H^*} varies directly with u^{L^*} in equilibrium.*

Proof. In equilibrium, equation (3.20) and equation (3.21) yield: $u^{H^*} = \bar{k} \cdot u^{L^*}\mathbf{C}$, and it is true that $\frac{du^{H^*}}{du^{L^*}} = \bar{k} \cdot \mathbf{C} > 0$. □

The following section shows how industrial policy generates the dynamics of sectoral capacity utilization under the HCI promotion regime are shown in the section that follows. By including the export function and industrial reliance in the model, it is possible to think more practically about how different industries react to market changes by utilizing different aspects of industrial strategy. Since their export is the inverse function of the price of their output, firms in the heavy industry sector, for instance, may not be able to fully exercise their market power by raising their markups μ^H. The present model helps one to see the result by considering the situation when the firms in the heavy industry sector charge different prices for the domestic and international markets. In this way, the model can not only differentiate the effects of the increase in the market power of domestic firms ($\mu^H \uparrow$) and external price shock (e.g., $p^{m*} \uparrow$) on the economy but also depicts the subordinate connection between the heavy and light industry sectors under the HCI promotion regime in a more realistic manner.

3.2 Comparative Dynamic Analysis of Sectoral Economy

3.2.1 Positive Effects of HCI Promotion Policy

1) Preferential Interest Rate Effect

During the HCI promotion in Korea, the preferential/lower interest rate policy was implemented to induce selected firms to stimulate investment and promote economic expansion. This policy also coincided with the growth of large business conglomerates, or *chaebols*, which benefited from preferential rates to expand the scale of their business operations. The preferential interest rate policy can have a positive effect on the increase in the capacity utilization through the aggregate demand effect: preferential interest rates make it less expensive for firms to finance investments in capital goods. This in turn allows firms to increase their production capacity to meet the growing aggregate demand, as captured by equation (3.10).

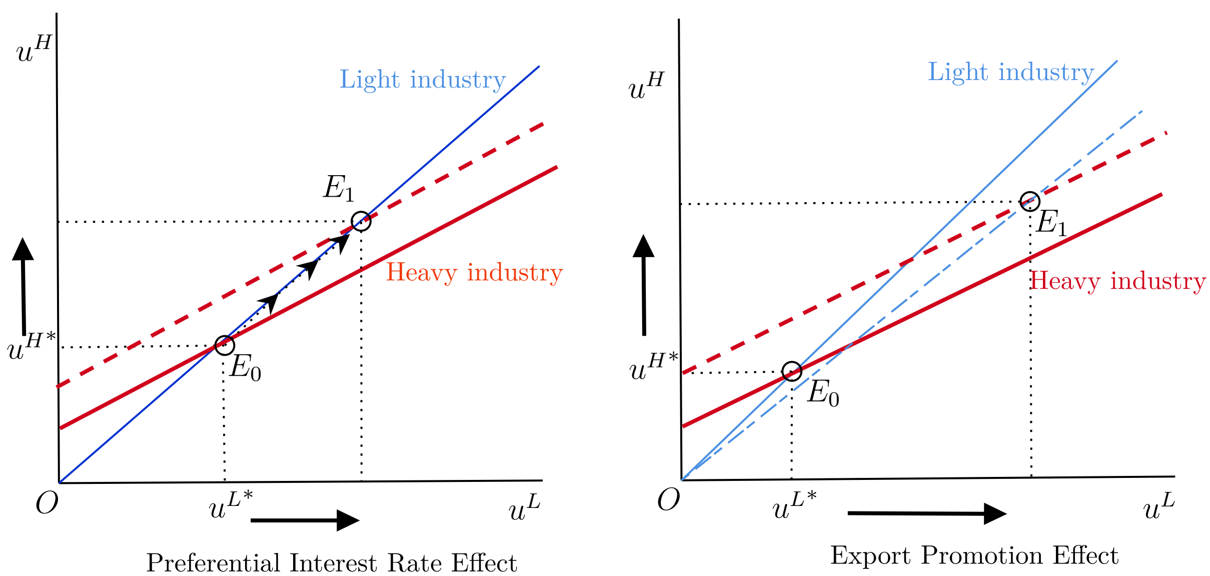


Figure 5: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Preferential Interest Rates ($i^H \downarrow$) (left) and Export Promotion (ϵ = KRW/USD $\uparrow$) (right)

Figure 5 (left) illustrates the positive effect of the preferential interest rates (i.e., $i^H \downarrow$), which is an exogenous variable. The decrease in the interest rates for the firms in the targeted H sector will shift up the intercept of equation (3.18). As a result, the utilization of both sectors will rise. The outcome is encouraging in the sense that providing cheap credit for the firms in H sector through preferential interest rates are one of the most representative instruments of HCI push. This growth implication sharply contrasts with the neoclassical view on development finance – notably the McKinnon-Shaw hypothesis (McKinnon, 1973; Shaw, 1973) and its extended studies including Kapur (1976); Mathieson (1980); Fry (1997) – that lower interest rates under the repressed financial regime may dampen economic growth through inefficient credit allocation. The major benefit of preferential interest rate policy during the 1970s Korea's HCI promotion was that it provided an incentive for large business groups to invest in heavy and chemical industries. These industries required significant capital investments and were considered high-risk ventures, and so the preferential interest rates helped to offset some of the risks and incentivized the large business groups to invest in them. At the same time, the policy also helped the subordinate small and medium-sized firms grow in terms of capacity utilization. This was because the large business groups that invested in heavy and chemical industries often relied on these smaller firms as subcontractors. By investing in these industries, the large business groups created demand for the products and services provided by the smaller firms, which in turn helped to increase their capacity utilization.

Thus, the lower interest rate policy is generally expected to increase capacity utilization, as it reduces the cost of borrowing for firms and incentivizes investment in new projects or the expansion of existing ones. However, in the case of the HCI promotion in Korea, the lower interest rate policy was implemented selectively, only for firms in certain sectors. This policy, combined with other features of the HCI promotion, led to both an initial increase in capacity utilization, as well as a subsequent decrease in utilization and a rise in idle capacity.

The initial increase in capacity utilization was due to the fact that the lower interest rate policy allowed firms in the selected sectors to invest more in new projects or expand existing ones. This increased production and employment, which in turn led to a higher level of capacity utilization. However, the subsequent decrease in utilization was caused by several factors, including the overcapacity that resulted from the rapid expansion of heavy and chemical industries, as well as the stagnation of the Korean economy in the late 1970s. Therefore, while the lower interest rate policy generally has a positive effect on capacity utilization, its impact can be complex and depend on various factors such as the specific industries or sectors targeted by the policy, as well as broader macroeconomic conditions.

2) Export Promotion under a (*de facto*) Dollar Peg Regime

The foreign exchange policy measure for export promotion under the HCI promotion policy was to devaluate the Korean won (KRW) by nearly 100 percent (Dornbusch and Park, 1987). Here I want to examine the effect of the government involvement in the foreign exchange rate. Korea's exchange rate system was classified by the IMF as a unified floating exchange rate system, but in fact the Korean won (KRW) was pegged to US dollar (USD) until the end of the 1970s (Nam and Kim, 1999). Whether it is intended by the government is not certain, but the initial exchange regime seems to significantly improve the competitiveness of exporting goods, facilitating the transition from import substitution to export promotion. In the model, the export is mainly determined by price competitiveness or terms of trade whose components are the exchange rate denoted by ϵ and the price ratio between the similar goods produced in foreign countries and those from the H sector, $\frac{p^{H^*}}{p^H}$. Figure 5 (right) illustrates the dynamics generated by export promotion via the exchange rate effect alone.

3.2.2 Unintended Consequences

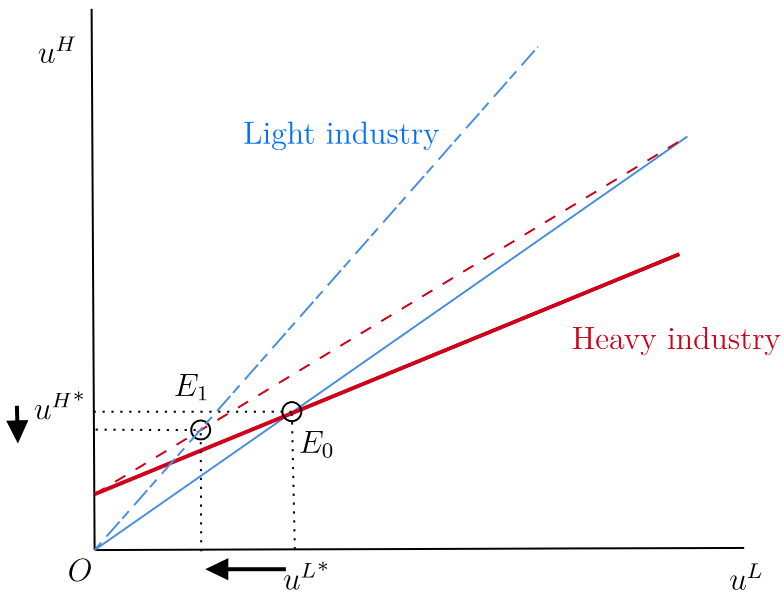


Figure 6: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Higher Import Substitution (Sectoral Dependence) ($\phi \uparrow$)

1) Unilateral/Sectoral Dependence (Import Substitution) Effect

In the early stages of industrial policy, sectoral dependence underscores the importance of import substitution as a primary protectionist policy. Notably, while Korea emphasized exports during the HCI promotion, steel largely remained an import-substitution industry (Amsden, 1992). Within this framework, firms in the L sector increasingly rely on the output (intermediate good) produced by the H sector. In the present model, we employ ϕ to represent the degree of sectoral dependence of the light industry on the heavy industry. Figure 6 illustrates the effect of higher degree of sectoral dependence on the sectoral utilization. As ϕ increases, both **A** and **C**, the slopes of equation (3.18) and equation (3.19) respectively get steeper, causing utilization rates in both sectors to decrease. Notably, this impact is more substantial for L sector firms as sectoral dependence directly influences their pricing decisions in equation (3.7) according to the following mechanism: $\phi \uparrow \rightarrow \ p^L \ \rightarrow p \downarrow$. Conversely, the effects on the H sector may remain relatively marginal. Consequently, this feature of import substitution has notable distributional consequences, as the increasing production costs of L sector firms negatively affect their production and income. This sheds light on the remarkable transition from import substitution to export promotion observed in the developmental trajectories of Korea and neighbouring East Asian emerging economies, including Hong Kong, Singapore, and Taiwan (Rodrik et al., 1995; Irwin, 2021). This transformation underscores the primacy of the parameter ϵ in characterizing Korea's HCI promotion drive within this model, eclipsing the role of ϕ in its significance.

2) The Effect of Market Power through Industrial Policy

A rise in the markup ratio ($\mu^H \uparrow$) has an impact on the economy with two channels: the rise in the domestic relative price and the decrease in the export due to the reduced price competitiveness in the international market as shown in Figure 7. The markup rate plays a crucial role in determining income distribution within the traditional Kaleckian economy. However, in a two-sector open economy operating under a selective industrial policy regime, firms may refrain from fully exercising their market power due to concerns about maintaining price competitiveness in the global market. Thus, with the higher degree of market power and the price discrimination between domestic and foreign goods markets, firms in the HCI sector keep their export prices competitive in the global market to sustain their export performance (i.e., E^H). This is a highly feasible option for them under the HCI promotion regime due to the preferential interest rates, which can also serve as a subsidy for those who participate in the intense price competition in the international market.

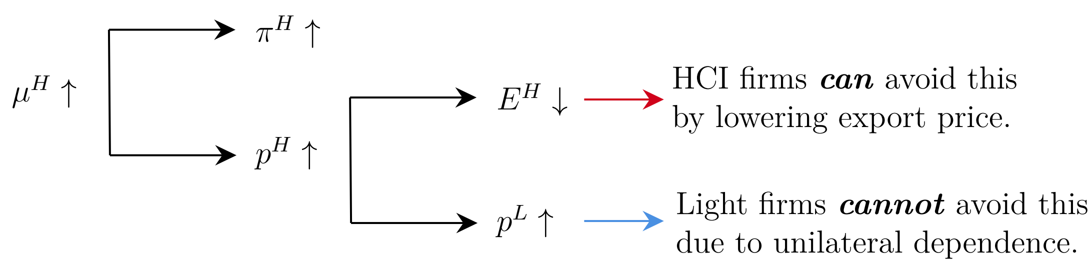


Figure 7: The Channel of the Markup Effects

Thus the increase in the profit share in the firms of H sector ($\pi^H \uparrow$) will make the slope of equation (3.18), $\mathbf{A}$, steeper as the denominator of $\mathbf{A}$ decreases. The intercept of equation (3.18), $\mathbf{B}$, will also increase when we assume that HCI firms manage to stay price competitive in the export market and thus the effect of the increase in the market power on the export market is trivial. Given assumption 2, the slope of equation (3.19), $\mathbf{C}$ will also increase as π^H rises,[14] implying that light industry responds to the change in the market power of firms in the heavy industry sector. Figure 8 shows the outcome hinges on the

[14] Recall $\frac{\partial \mathbf{C}}{\partial p} = \frac{\pi^H - 1}{\Delta^2} < 0$.

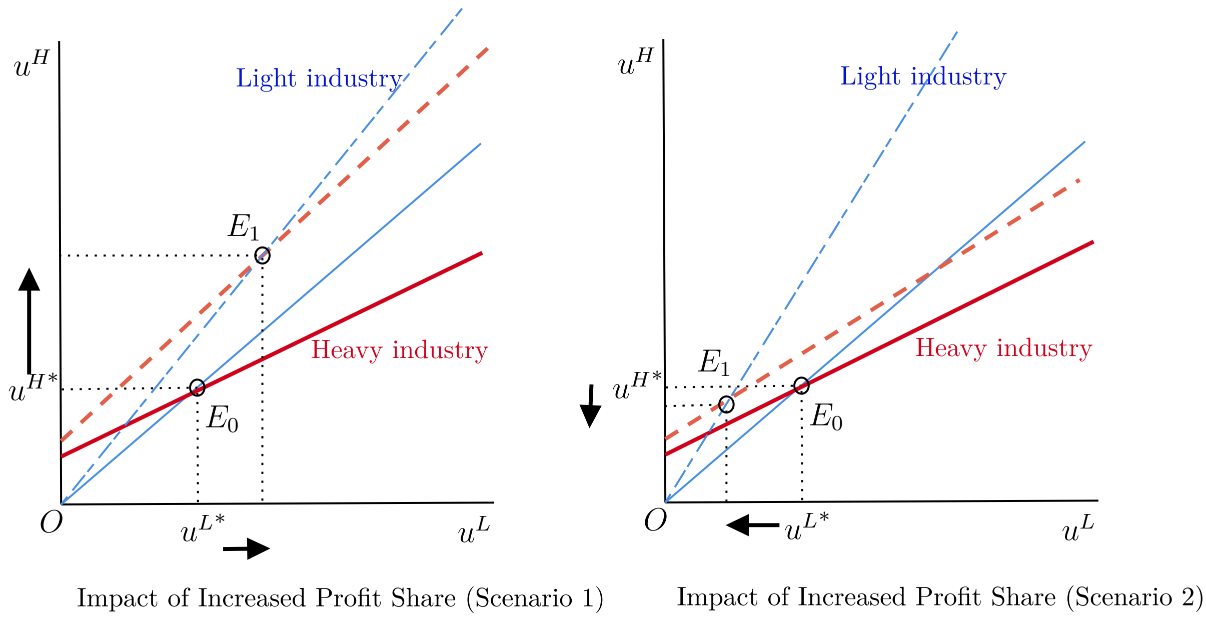


Figure 8: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Increased Market Power ($\mu^H \uparrow$) or Profit Share ($\pi^H \uparrow$)

sensitivity of each sector. Scenario 1 shows the equilibrium rates of utilization increase in both sectors whereas scenario 2 shows the opposite. This also implies any mixed outcomes in which either the rate of H sector or the rate of L sector increases or decreases. As a result, the rate of utilization in H sector becomes more sensitive to the change in the rate of utilization in L sector. Later through the simulation, we will find that the demand regime of each sector – whether it is profit-led or wage-led – highly depends on the productivity growth regime of each sector.

3) Oil Price Shock Effect

Finally, let us consider an external price shock or the increase in the resource price in the international commodity market. In equation (3.6), the oil shock can simply be incorporated in the model by identifying it as the increase in the cost of imported material ($p_m^* \uparrow$), which will increase p^H, the price of intermediate goods produced by firms in HCI sector. Figure 9 shows that the impact of the oil price shock is similar to that of the increase in the markups. Unlike the scenario of rising markup rates, the H sector firms have limited scope to mitigate the shock. This suggests that exports could substantially decline. However, according to equation (3.8), the profit share might still rise, especially when the exporting H sector firms suppress wages when they cannot refrain from transferring increased production costs to consumers. This will impact workers' consumption, further decreasing aggregate demand.

As a result, in equation (3.18), **A** will markedly increases, whereas **B** decreases significantly. Meanwhile, **C** in equation (3.19) also shows an increase. Figure 10 depicts the sectoral dynamics of an oil price shock, highlighting reduced capacity utilization across

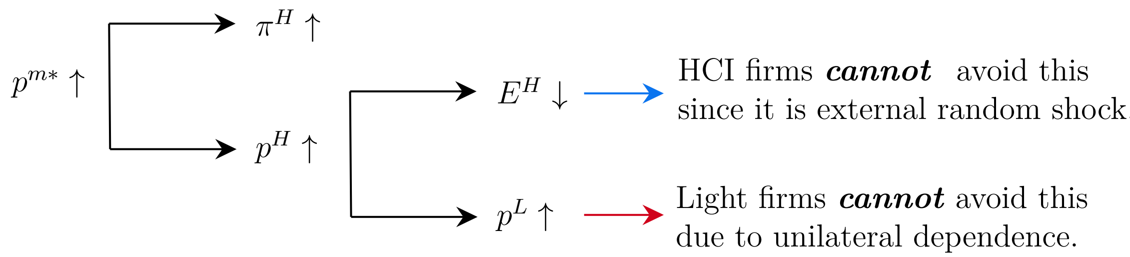


Figure 9: The Channel of the Oil Price Shock ($p^{m*} \uparrow$)

both sectors. This result emphasizes the severe repercussions of oil price shocks, making the HCI promotion or industrial policy regime vulnerable to external disturbances, especially significant commodity price shocks.

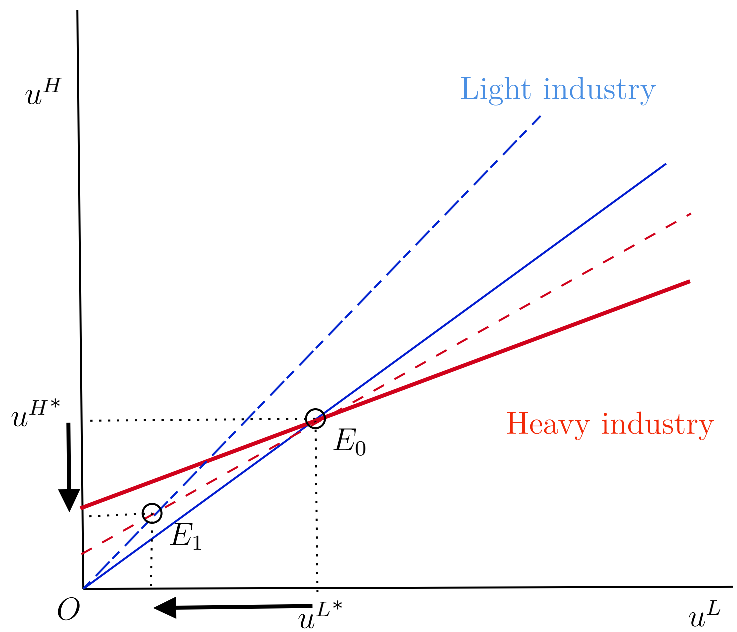


Figure 10: Short-run Equilibrium of Sectoral Capacity Utilization and the Impact of Oil Price Shock ($p_m^* \uparrow$) (right)

Now we may consider the macroeconomic implications of both increased profit share and the impact of price shock. We first need to note that capacity utilization and sectoral (or aggregate) demand are closely linked. That is, as the sectoral capacity is utilized at a full level, the economy is experiencing strong and sustained growth of sectoral demand. This unintended effect of industrial policy instrument or external shock lead to further engagement of the government, justifying the argument for the larger role of the state in the process of industrialization of many developing countries including South Korea.

4 Short-run and Long-run Dynamics Analysis

This section proceeds to obtain the condition for the existence of steady state of key endogenous variables: sectoral capacity utilization rate, u^H, u^L and relative unit labour cost, z. More importantly, this section derives the local stability conditions for the steady states, substantiating the previous illustrative discussion of comparative statics of the equilibrium of two rates of sectoral capacity utilization. In other words, without considering the local stability of the steady state or if the steady state is locally unstable, the exercise does not make sense. The first part of the section will derive the equations for the steady states of the short-run dynamics system. The second part will figure out the conditions for the existence of unique solution to steady-state economy as well as its stability based on the Routh-Hurwitz condition, which proposes a necessary and sufficient condition for the local stability of the dynamic system. We will also state a couple of propositions based on the same condition.

4.1 Short-run Dynamics

Steady state of Two-sector Economy The dynamics of capacity utilization in each sector depends on the difference between excess demand and utilization: when excess demand exceeds utilization, a rise in the capacity utilization occurs in both sectors, and vice versa. The dynamics of each state variable is represented as its time-derivative:

$$\begin{aligned}\dot{u}^H &= \theta^H\left(\frac{ED^H}{K^H}\right)\\ &= \theta^H\Bigg((\phi+\alpha_1^L\pi^L+\alpha_2^L)ku^{L^*}+(\alpha_1^H\pi^H+\alpha_2^H-1)u^{H^*}\\ &\quad+\alpha_0^H-\alpha_1^H i^H+\alpha_0^L k-\alpha_1^L i^L k+\zeta_0+\zeta_1\epsilon\Big(\frac{p^{H^*}}{p^H}\Big)\Bigg)\end{aligned} \tag{4.1}$$

$$\begin{aligned}\dot{u}^L &= \theta^L\left(\frac{ED^L}{K^L}\right)\\ &= \theta^L\left((1-\pi^H)\frac{pu^{H^*}}{k}-\pi^L u^{L^*}\right)\end{aligned} \tag{4.2}$$

where $\theta^x > 0$ denotes the parameters of the speed adjustment of the changes in the capacity utilization rate in response to the disequilibrating perturbation in each sector. In order to express p in terms of income distribution share z, defined as $\frac{w^H a_N^H}{w^L a_N^L} = \frac{\pi^L(1-\pi^H)\mu^H\gamma p_m^*}{\pi^H(1-\pi^L)\mu^L\phi p^H}$,[15] I use the proxy of price ratio used in Nishi (2020) by assuming that the relative price is mainly

[15] See Appendix Section A for the algebraic notes for the derivation of the relative unit labour cost ratio.

determined by relative income distribution $\frac{1-\pi^L}{1-\pi^H}$ and relative unit labour cost z and that the influence of sectoral intermediate good's price γp_m^* and ϕp^H are not significant. That is,

$$p = \frac{p^H}{p^L} = \frac{(1+\mu^H)(w^H a_N^L + \gamma p_m^*)}{(1+\mu^L)(w^L a_N^H + \phi p^H)} \approx \Big(\frac{1-\pi^L}{1-\pi^H}\Big) z \tag{4.3}$$

Thus, equation (4.2) can be rewritten as

$$\dot{u}^L = \theta^L \Bigg((1-\pi^L) z \frac{u^{H^*}}{k} - \pi^L u^{L^*} \Bigg) \tag{4.4}$$

Finally, taking the logarithm of relative unit labour cost z and its time derivative yields:

$$\begin{aligned} \dot{z} &= z\Big(\hat{w}^H - \widehat{1/a_N^H} - \hat{w}^L + \widehat{1/a_N^L}\Big) \\ &= -z\Big((1-\eta^H)\cdot \widehat{1/a_N^H} - (1-\eta^L)\cdot \widehat{1/a_N^L}\Big) \\ &= z\Big((1-\eta^L) q^L(\pi^L, u^L) - (1-\eta^H) q^H(\pi^H, u^H)\Big) \end{aligned} \tag{4.5}$$

where the second and third expressions are derived from equation (3.17) and **??**, respectively.

The steady state of the short-run dynamics system is defined by $\dot{u}^H = \dot{u}^L = \dot{z} = 0$, which yields the following conditions:

$$(\phi + \alpha_1^L \pi^L + \alpha_2^L) k u^{L^*} + (\alpha_1^H \pi^H + \alpha_2^H - 1) u^{H^*} + \alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L) k + \zeta_0 + \zeta_1 \epsilon \Big(\frac{p^{H^*}}{p^H}\Big) = 0 \tag{4.6}$$

$$(1-\pi^L) z \frac{u^{H^*}}{k} - \pi^L u^{L^*} = 0 \tag{4.7}$$

$$(1-\eta^L) q^L(\pi^L, u^L) - (1-\eta^H) q^H(\pi^H, u^H) = 0 \tag{4.8}$$

In the following section, I will investigate the conditions for the existence of unique solution to this economy and derive meaningful propositions from steady-state local stability conditions which are obtained based on the three equations above.

4.2 Conditions for the Local Stability of the Equilibrium

Stability Conditions To obtain the condition for the local asymptotic stability of the steady state, the system needs a linearization around the sectoral steady state as follows:

$$
\begin{bmatrix} \dot{u}^H \\ \dot{u}^L \\ \dot{z} \end{bmatrix} = \underbrace{\begin{bmatrix} j_{11} & j_{12} & 0 \\ j_{21} & j_{22} & j_{23} \\ j_{31} & j_{32} & 0 \end{bmatrix}}_{\mathbf{J}} \begin{bmatrix} u^H - u^{H^*} \\ u^L - u^{L^*} \\ z - z^* \end{bmatrix}
$$

where $\mathbf{J}$ is the Jacobian matrix for the long-run dynamic system whose non-zero elements of $\mathbf{J}$ and their signs are determined as follows:

$$
j_{11} = \frac{\partial \dot{u}^H}{\partial u^H} = \theta^H(\alpha_1^H \pi^H + \alpha_2^H - 1) < 0. \tag{4.9a}
$$

$$
j_{12} = \frac{\partial \dot{u}^H}{\partial u^L} = \theta^H k(\phi + \alpha_1^L \pi^L + \alpha_2^L) > 0. \tag{4.9b}
$$

$$
j_{13} = \frac{\partial \dot{u}^H}{\partial z} = 0. \tag{4.9c}
$$

$$
j_{21} = \frac{\partial \dot{u}^L}{\partial u^H} = \theta^L(1 - \pi^L)\frac{z}{k} > 0. \tag{4.9d}
$$

$$
j_{22} = \frac{\partial \dot{u}^L}{\partial u^L} = -\theta^L \pi^L < 0. \tag{4.9e}
$$

$$
j_{23} = \frac{\partial \dot{u}^L}{\partial z} = \theta^L\left((1 - \pi^L)\frac{u^H}{k}\right) > 0. \tag{4.9f}
$$

$$
j_{31} = \frac{\partial \dot{z}}{\partial u^H} = -z^*(1 - \eta^H)q^H_{u^H} < 0. \tag{4.9g}
$$

$$
j_{32} = \frac{\partial \dot{z}}{\partial u^L} = z^*(1 - \eta^L)q^L_{u^L} > 0. \tag{4.9h}
$$

$$
j_{33} = \frac{\partial \dot{z}}{\partial z} = 0. \tag{4.9i}
$$

The following is the characteristic equation based on the 3×3 Jacobian matrix $\mathbf{J}$.

$$
p(\lambda) = \det(\lambda \mathbf{I} - \mathbf{J}) = \lambda^3 + c_1\lambda^2 + c_2\lambda + c_3 = 0 \tag{4.10}
$$

where λ denotes a characteristic root, $c_1 = -\operatorname{Tr} \mathbf{J}$ (where Tr denotes the trace of the matrix $\mathbf{J}$), c_2 is the sum of the principal minors' determinants of $\mathbf{J}$, and $c_3 = -\det \mathbf{J}$ (where det denotes the determinant of matrix $\mathbf{J}$). Each coefficients are computed as follows:

$$
c_1 = -\operatorname{Tr} \mathbf{J} = -j_{11} - j_{22} = \theta^H(1 - \alpha_1^H \pi^H - \alpha_2^H) + \theta^L \pi^L > 0
$$

$$c_2 = \begin{vmatrix} j_{22} & j_{23} \\ j_{32} & j_{33} \end{vmatrix} + \begin{vmatrix} j_{11} & j_{13} \\ j_{31} & j_{33} \end{vmatrix} + \begin{vmatrix} j_{11} & j_{12} \\ j_{21} & j_{22} \end{vmatrix} = -j_{23}j_{32} + j_{11}j_{22} - j_{12}j_{21}$$
$$= -\theta^L \underbrace{(1-\pi^L)\frac{u^H}{k}zq^L_{u^L}\eta^L}_{\Omega_1} + \theta^H \underbrace{(1-\alpha_1^H\pi^H - \alpha_2^H)\pi^L}_{\Omega_2} - \theta^H\theta^L(\underbrace{\phi + \alpha_1^L\pi^L + \alpha_2^L)(1-\pi^L)z}_{\Omega_3}$$

and

$$c_3 = -\det \mathbf{J} = j_{23}(j_{11}j_{32} - j_{12}j_{31})$$
$$= \theta^H\theta^L\Big(\Omega_3 u^H q^H_{u^H} - \Omega_1\Omega_2\Big)$$

On the basis of Routh-Hurwitz criterion, the necessary and sufficient condition for the local stability of steady state of the system requires all eigenvalues have negative real part if and only if

$$c_1 > 0, c_2 > 0, c_3 > 0 \text{ and } c_1c_2 > c_3.$$

(i) $c_1 > 0$ is confirmed by equation (4.9a), equation (4.9e) and equation (4.9i).
(ii) $c_2 > 0$ requires $\theta^H\Omega_2 > \theta^L\Omega_1 + \theta^H\theta^L\Omega_3$.
(iii) $c_3 > 0$ requires $\Omega_3 u^H q^H_u > \Omega_1\Omega_2$.
(iv) $c_1c_2 > c_3$ requires $[\theta^H(1-\alpha_1^H\pi^H - \alpha_2^H) + \theta^L\pi^L](\theta^H\Omega_2 - \theta^L\Omega_1 - \theta^H\theta^L\Omega_3) > \theta^H\theta^L(\Omega_3 u^H q^H_{u^H} - \Omega_1\Omega_2)$. Condition (iv) is confirmed by the requirements of (i), (ii), (iii) and a specific value of θ^{H^*} for which a Hopf bifurcation occurs.

The condition generates the following propositions given that $\Omega_1 > 0, \Omega_2 > 0$ and $\Omega_3 > 0$.

Proposition 2. *After a certain threshold ($\theta^H = \frac{\Omega_2 - \Omega_1}{\Omega_3}$), the adjustment speed of the capacity utilization in HCI sector needs to be sufficiently faster than that of L sector for the local stability of the unique steady state in the short-run economy to exist. Equivalently, θ^L has an upper limit so that $\theta^H > \theta^L$ to hold for the stability.*

Proof. Given $\theta^x > 0$, $\theta^H\Omega_2 > \theta^L\Omega_1 + \theta^H\theta^L\Omega_3$ has an equivalent functional form of $\theta^L < \frac{\Omega_2\theta^H}{\Omega_3\theta^H + \Omega_1}$ with asymptotic lines $\theta^H = -\frac{\Omega_1}{\Omega_3}$ and $\theta^L = \frac{\Omega_2}{\Omega_3}$. The latter works as an upper limit for θ^L to hold the local stability condition for the steady state. For $\theta^H > \frac{\Omega_2 - \Omega_1}{\Omega_3}$, the adjustment speed for the HCI is always faster than that of L sector as the upper limit of θ^L is effective (see Figure 11).

□

Proposition 3. *For the short-run economy's local stability, the growth rate of labour*

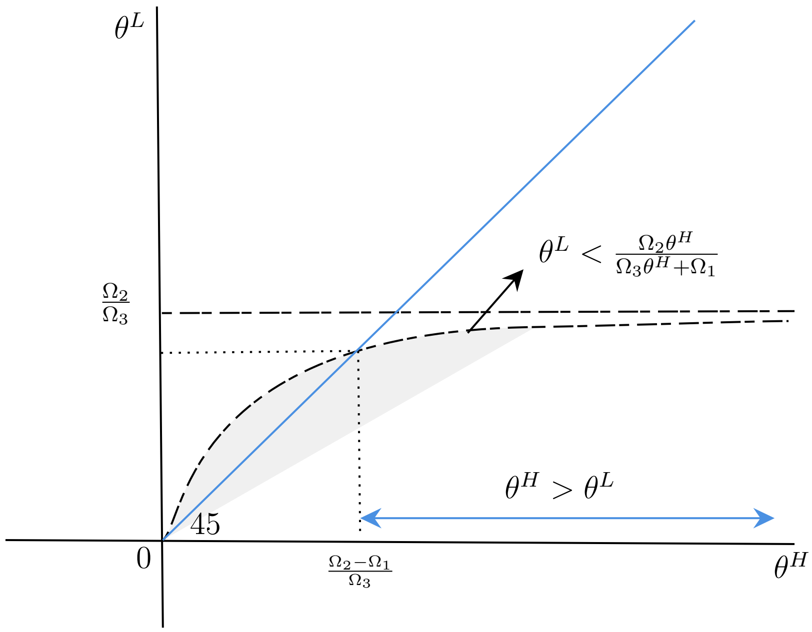


Figure 11: Existence of the Upper Bound for Adjustment Speeds of L Sector's Demand given $\theta^H > 0$ and $\theta^L > 0$

productivity in H sector has to increase as the capacity utilization rate in H sector grows given $\Omega_1 > 0,\ \Omega_2 > 0$ and $\Omega_3 > 0$.

Proof. Since the local stability condition requires $\Omega_3 u^H q_u^H(u^H) > \Omega_1\Omega_2$, we have $u^H q_u^H(u^H) > \frac{\Omega_1\Omega_2}{\Omega_3} > 0$. Thus, $q_u^H(u^H) > 0$ with $u^H > 0$. $\square$

4.3 Long-run Dynamics

The growth rate of the stock of capital is defined as the difference between the growth rate of the capital stock of each sector. All the capital goods or investment goods in HCI sector are either consumed by the domestic firms in the light industry or exported and consumed by the foreign firms. So using equation (3.10), the changes in the domestic capital stock is defined as

$$\begin{aligned}
\dot{k} &= (g_I^L - g_I^H)k \\
&= \Big[\alpha_0^L + \alpha_1^L(R^L - i^L) + \alpha_2^L u^{L^*}(k) - \alpha_0^H - \alpha_1^H(R^H - i^H) - \alpha_2^H u^{H^*}(k)\Big]k \\
&= \Big[\alpha_0^L + \alpha_1^L(\pi^L u^{L^*}(k) - i^L) + \alpha_2^L u^{L^*}(k) - \alpha_0^H - \alpha_1^H(\pi^H u^{H^*}(k) - i^H) - \alpha_2^H u^{H^*}(k)\Big]k \\
&= \Big[\alpha_0^L - \alpha_1^L i^L + u^{L^*}(k)\Big(\alpha_1^L\pi^L + \alpha_2^L\Big) - \alpha_0^H + \alpha_1^H i^H - u^{H^*}(k)\Big(\alpha_1^H\pi^H + \alpha_2^H\Big)\Big]k
\end{aligned} \tag{4.11}$$

The long-run steady state condition further requires $\dot{k} = 0$ so that $g_I^L = g_I^H$ and the long-run steady-state is defined as a set of $(u_\ell^{*H}, u_\ell^{*L}, z_\ell^*, k_\ell^*)$ in which subscription ℓ refers to the long run values. The long-run steady state is described as:

$$
\begin{aligned}
&0 = (\phi + \alpha_1^L \pi^L + \alpha_2^L) k_\ell u_\ell^{L^*} + (\alpha_1^H \pi^H + \alpha_2^H - 1) u_\ell^{H^*} + \alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L) k_\ell + \zeta_0 + \zeta_1 \epsilon \Big(\frac{p^{H^*}}{p^H}\Big) \\
&0 = (1 - \pi^L) z_\ell \frac{u_\ell^{H^*}}{k_\ell} - \pi^L u_\ell^{L^*} \\
&0 = \eta^L q^L(\pi^L, u_\ell^L) - \eta^H q^H(\pi^H, u_\ell^H) \\
&0 = \alpha_0^L - \alpha_1^L i^L + u_\ell^{L^*}\Big(\alpha_1^L \pi^L + \alpha_2^L\Big) - \alpha_0^H + \alpha_1^H i^H - u_\ell^{H^*}\Big(\alpha_1^H \pi^H + \alpha_2^H\Big)
\end{aligned}
\tag{4.12}
$$

For the long-run steady state to be economically meaningful, the following condition must be satisfied.

$$
\begin{aligned}
\frac{du_\ell^{H*}}{dk_\ell} &< 0 \\
\frac{du_\ell^{L*}}{dk_\ell} &< 0 \\
\frac{d\dot{k}_\ell}{dk_\ell} &< 0
\end{aligned}
\tag{4.13}
$$

In order to understand the long-run trend of key variables derived from the model, we need to note that in the long-run, the economy can stagnate for two reasons: the increase in market power of the firms in the targeted industries and negative external (price) shock. The former is based on Steindl (1952)'s discovery that there is a trend toward stagnation in the markups. Under the current model, however, the economy can still expand despite sectoral disparity in the market power as long as other benefits from other instruments such as higher saving rates and preferential interest rates exceed it. In sum, the current study shows that only the markup differential (difference in the market power) across the sectors makes a significant difference in term of sectoral utilization whereas the interest rate differential does not. The model also demonstrates how the oil price shock dampens the economy in the absence of any protective measures. Thus, the model suggests that industrial policy require further redistribution measures for the stabilization of the economy against the external price shock such as oil price shock. The findings above are consistent with the Korean episode in which *chaebols* prospered, the wage share (real wage) was suppressed, and the economy suffered from stagnation in the final stage of HCI promotion.

5 Numerical Analysis and Discussion

In this section, I employ numerical examples to elucidate the behavior of the economy's short-run and long-run solution paths under distinctive sectoral productivity growth regimes. Initially, the results derived from the comparative statics figures are outlined. Subsequently, a table presents the steady-state values of crucial endogenous variables across different productivity regimes. Another table then identifies the associated demand and growth regimes within the context of industrial policy. For further reference, Appendix Section D provides the parameter values utilized in the simulation. In the latter part of this section, we delve into a brief discussion on the consistency with the real data and the distributional implication of industrial policy.

5.1 Short-run and Long-run Behaviours of Key Variables

Table 1: Impacts of Industrial Policy Measures (Model Prediction) under Wage-led Productivity Regime for Both Sectors)

		Endogenous variables				
Industrial policy regime		u^H	u^L	u^A	z	g^A
Policy instruments	$i^H \downarrow$	+	+	+	+	+
	$\phi \uparrow$	−	−	−	−	−
	$\epsilon \uparrow$	+	+	+	+	+
External shock (Oil shock)	$p_m^* \uparrow$	−	−	−	−	−
Market power	$\mu^H \uparrow$	?	?	?	?	?

Note: u^H: capacity utilization rate in H sector; u^L: capacity utilization rate in L sector; u^A: aggregate capacity utilization rate; z: relative labour input cost ratio; g^A: aggregate growth rate

Table 1 shows that various industrial policy instruments have distinctive effects on the sectoral economy. The preferential interest rate for H sector firms has led to aggregate demand expansion and long-run economic growth. Furthermore, the positive impact on the increase in relative labour input cost ratio (z) implies a shift towards more capital-intensive production in the H sector. The overall effect of higher dependence (ϕ) of the L sector firms on the H sector firms is negative. In particular, higher reliance can result in inefficiencies within the L sector firms. These inefficiencies may pose potential constraints on their expansion, especially if their inputs are heavily dependent on the H sector. This stands in stark contrast to the situation faced by the H sector firms. The third instrument (ϵ) represents the positive impact of export promotion by exchange rate manipulation. This industrial policy instrument is among the most important, especially given the limitations of the import substitution revealed in the current model. Within the context of industrial policy, the economy is facing the following unanticipated challenges: the oil shock and market power hike. It is apparent that the increase in oil prices has significantly harmed all of the endogenous factors. This widespread impact of the oil price shock highlights the economy's susceptibility to such external shocks and the significance of diversifying energy sources or enhancing resilience against such disruptions within the context of industrial policy. The effects of market power seem to be unclear: either positive or negative on capacity utilization. However, as we will explore in more detail later in Table 3, the rise in the profit share of H sector companies would typically have a negative impact on aggregate demand (*wage-led* demand) and capital accumulation (*wage-led* growth).

Table 2: Steady State Values of Key Variables with Productivity Growth Regimes

Productivity growth regimes →	WLP H sector +WLP L sector	PLP H sector +PLP L sector	WLP H sector +PLP L sector	PLP H sector +WLP L sector
Variables	Short run steady state values			
$\mathbf{u^{H^*}}$	0.317	0.317	0.326	0.308
$\mathbf{u^{L^*}}$	0.593	0.593	0.616	0.569
$\mathbf{z^*}$	0.134	0.134	0.136	0.133
Variables	Long run steady state values			
$\mathbf{u_\ell^{H^*}}$	0.255	0.255	0.260	0.249
$\mathbf{u_\ell^{L^*}}$	0.282	0.282	0.288	0.275
$\mathbf{z_\ell^*}$	0.120	0.120	0.122	0.119
$\mathbf{k_\ell^*}$	0.379	0.379	0.384	0.375

Note: WLP and PLP denote *wage-led* productivity regime and *profit-led* productivity regime, respectively.

Table 2 shows both short-run and long-run steady-state values of key variables for all possible combinations of productivity growth regimes. The findings of the simulation reveal that, regardless of the productivity regime adopted by each sector, the capacity utilization rate of the H sector is notably lower than that of the L sector in the short run. This shows that firms in the H sector typically have a higher potential for capacity utilization, easily leveraging their greater market power in the face of optimistic market prospects. In the long run, this relationship remains consistent, even though the disparity between the two sectors narrows considerably. This marked decrease in capacity utilization of H sector firms in the long run underscores the challenges faced by Korea's economy: substantial capital misallocation during the final phase of the HCI promotion, especially within the HCI sector.

Table 3 provides a comprehensive analysis of demand and growth regimes within the Korean economy. The examination encompasses both short-term and long-term perspectives and spans four distinct productivity growth regimes. The outcomes of this analysis shed light

Table 3: Demand and Growth Regimes for Different Productivity Growth Regimes

Productivity growth regime	Comparative statics in the short run				
	Profit share shock	$\mathbf{u^H}$	$\mathbf{u^L}$	$\mathbf{u^A}$ (demand)	$\mathbf{k}$ (growth)
WLP H sector and WLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	PLD WLD	PLD WLD	PLD WLD	Not applicable Not applicable
PLP H sector and PLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	WLD PLD	WLD PLD	WLD *PLD*	Not applicable Not applicable
WLP H sector and PLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	WLD WLD	WLD WLD	WLD WLD	Not applicable Not applicable
PLP H sector and WLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	WLD WLD	WLD WLD	WLD WLD	Not applicable Not applicable
Productivity growth regime	**Comparative statics in the long run**				
	Profit share shock	$\mathbf{u^H}$	$\mathbf{u^L}$	$\mathbf{u^A}$ (demand)	$\mathbf{k}$ (growth)
WLP H sector and WLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	PLD WLD	PLD WLD	PLD WLD	PLG WLG
PLP H sector and PLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	WLD PLD	WLD PLD	WLD PLD	WLG WLG
WLP H sector and PLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	WLD WLD	WLD WLD	WLD WLD	WLG WLG
PLP H sector and WLP L sector	$\pi^H \uparrow$ $\pi^L \uparrow$	WLD WLD	WLD WLD	WLD WLD	WLG WLG

Note: PLD and PLG denote *profit-led* demand regime and *profit-led* capital growth regime, respectively. WLD and WLG denote *wage-led* demand regime and *wage-led* capital growth regime, respectively. Numerical results are shown in Appendix Section C.

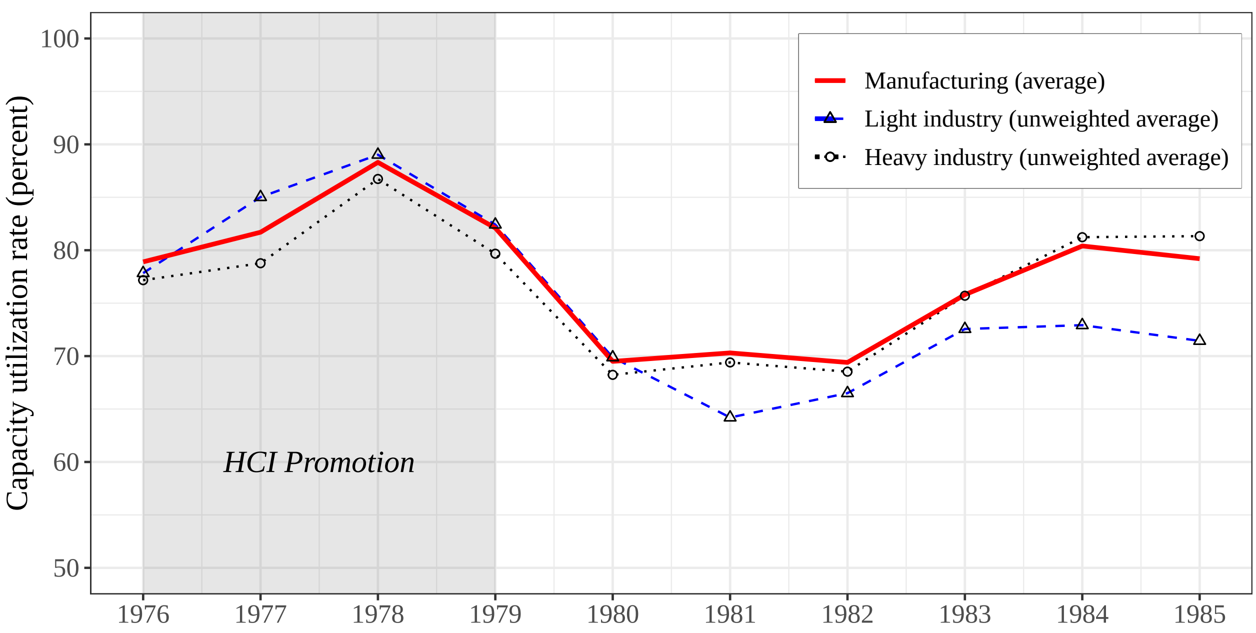
on significant stylized facts associated with the industrial policy framework underpinning the Korean HCI promotion policy.

When the productivity growth regimes are different between the sectors, a noteworthy finding emerges: both sectors consistently operate within a wage-led demand regime (WLD) and a wage-led growth (WLG) regime, both in the short run and the long run. This observation underscores the resilience of the wage-led orientation in the presence of sectoral heterogeneity in terms of productivity growth regime, signifying the robustness of this demand and growth regime configuration in such scenarios.

In cases where both sectors share a common productivity growth regime, the resultant outcomes are contingent upon the specific nature of that regime, whether it leans towards being wage-led or profit-led. For instance, when both sectors exhibit a wage-led productivity regime, an increase in market power among H sector firms, including large business conglomerates known as *chaebols*, induces a profit-led demand regime within both sectors and both in the short run and the long run. Consequently, it becomes evident that, for scenarios where both sectors concurrently exhibit profit-led productivity regimes, an increase in the market power among H sector firms leads to the manifestation of a wage-led demand regime within the economy. This outcome offers insights into the characteristics of the Korea's industrial policy dynamics, specifically into the nuanced interplay between sectoral productivity growth regimes, market power dynamics, and the ensuing implications for demand and growth orientations of the industrializing Korean economy.

5.2 Oil Shock and Stagflation

Figure 12 presents the actual trajectories characterizing the rates of sectoral capacity utilization. First, it highlights that both rates of sectoral capacity utilization follow a congruent trajectory as shown in proposition 1. Second, during the period of HCI promotion, the rate of heavy industry is lower than that of light industry. This observation is substantiated by Table 2. From 1978 to 1982, there's a clear pattern of declining capacity utilization in both industries. This downturn, or stagflation, is largely associated with the second Oil Price Shock and the ramifications of increased market power, which led to over-investment by HCI firms and subsequent financial insolvency.



Source: Author's calculation based on Kim (1990)

Figure 12: Sectoral Capacity Utilization Rate

The situation when the two rates move in tandem can be normal in the new equilibrium following a positive shock such as preferential interest rate policy or export promotion policy as we discussed earlier. In the new final equilibrium, both rates will be higher or both rates will be lower when both sectors have spare capacity, so any positive shock in one industry will have a positive feedback effect in the other industry. In other words, Kaleckian models assume away the assumption of full utilization or full employment, which would require a reproportioning of economic activity (labour and capital), from one industry to the other.[16]

As we previously discussed, to facilitate an increase in overall capacity utilization and economic expansion, it is necessary for the effects of preferential interest rates and export promotion to dominate those of price shocks, increased profit share and subordinate corporate structure. However, it is still unclear whether the decrease in utilization rates in both industries during the second half of the HCI promotion period was due to the increased market power, the price effect or their mixed effect. While the economy nearly recovered from the first Oil Price Shock in 1973, cost-push inflation resulting from the increased level of oil prices may have had an adverse impact on overall capacity utilization, leading to a marked rise in idle capacity in the heavy industry sectors.

The inefficiency of capital allocation, a more direct cause of the increase in the idle capacity under the HCI promotion, is further supported by Auty (1992) who points out that *Big Push* theorists neglected the possibility of inadequate implementation capacity when the HCI promotion transformed from HCI Drive to HCI Big Push.[17] which triggers inflation and a real appreciation of the exchange rate. This in turn causes the higher import demands of the Big Push stage of the HCI promotion and lagged output from the long-gestation HCI projects to push the trade balance into deficit. In addition, the impact of market power of the firms in the heavy industry on macroeconomy should be noted based on Kim (1990) and Park (1986) who argue that the gap between the increasing domestic demand and the down-scaled support for the capacity of light industries was the main cause of inflation and that the concentration of investment on HCI triggered inflation, respectively. Furthermore, increased profit share of firms in the H sector and higher sectoral dependence also contribute to the accumulation of idle capital capacity. Although industrial policy may successfully coordinate investment projects between firms, it generates a strong incentive for over-investment due to the negative borrowing cost of the preferential credit. The efficiency of capital allocation is a critical factor in determining the success of industrial policies aimed at promoting key industries or firms in those industries. However, some scholars have pointed out that the transition from HCI Drive to HCI Big Push neglected the possibility of inadequate implementation capacity, leading to inflation and a real appreciation of the exchange rate. Auty (1992) notes that the HCI Big Push seeks to capture the externalities arising from simultaneous entry into HCI

[16] In the model presented in Lavoie and Ramírez-Gastón (1997), it may be that during part of the transition the two rates will not move in the same direction.

[17] According to Auty (1992), The HCI Drive seeks to accelerate the sequence of backward integration from light industry through capital-intensive intermediates into skill-intensive machinery and engineering. An HCI Big Push is even more ambitious since it seeks to capture the externalities arising from simultaneous entry into HCI sectors at different stages in the production chain.

sectors at different stages in the production chain, which may trigger higher import demands and a trade balance deficit. The concentration of investment on HCI and the market power of firms in the heavy industry can also contribute to inflation, as argued by Kim (1990) and Park (1986), respectively.

5.3 Distributional Implication

Understanding how output is distributed between labour and capital in the different phases of the business cycle, is more challenging. There are two conflicting views on the relationship between capacity utilization and labour share. The first view is established by the early Cambridge School scholars such as Robinson (1962, 1969); Harcourt (1972); Kaldor (1985), arguing that firms' markup pricing decreases wage share as capacity utilization increases beyond its normal level. In contrast, a notion adopted by Goodwin (1967); Davidson (1972); Shapiro and Stiglitz (1984); Bowles and Boyer (1988); Kurz (1994); Foley (2003); Taylor (2004); Barbosa-Filho and Taylor (2006) states that the real wages and the labour share increase with economic growth with which the level of capacity utilization increases and the economy gets closer to full employment. Nikiforos and Foley (2012) offer a strong case for a U-shaped distributive curve based on U.S. data, utilizing the Kaleckian theory that markup price is the major predictor of the income distribution. Their study considers the influence of overhead costs and negotiation processes on wage share.

The observation of a decline in the wage share during the period of HCI promotion suggests the dominance of the second connection. Specifically, in the advent of the Second Oil Price Shock, the bargaining power of workers might further weaken, allowing HCI firms to gain augmented market power. This, in turn, led to idle capital capacity, resulting in a reduction of wage share. It can be also suggested that the notable shift in the trend of utilization in 1978 was primarily due to external shocks, particularly the skyrocketing oil price. These factors are deemed to have exerted more pronounced impact on the macroeconomy than the industrial policy measures themselves.

The difference between labour productivity and capital productivity, particularly among businesses in the H sector, is another factor for the drop in the wage share. The capital stock has grown dramatically, but the labour productivity does not appear to have increased. Positive externality, which was anticipated by the HCI-specific Big Push, may not materialize, but instead, labour productivity turns out to be falling behind capital accumulation and the expansion of large business groups. Wage share decreased as a result.

6 Conclusion

This study examines the impact of selective industrial policy on the sectoral economy, with a specific focus on sectoral capacity utilization. The Korean government's promotion of the Heavy and chemical industry (HCI) is taken as a case study to examine the effectiveness of a selective industrial policy regime where large firms in the targeted sector grow at a faster rate than those in non-targeted sectors. The paper analyzes the key policy tools used by the Korean government, including preferential interest rate policies that provide discriminatory access to cheap credit and transitioning from import substitution to export promotion under a dollar peg regime.

The study identifies the primary sources of unintended consequences of the HCI promotion. First, import substitution creates unilateral dependence between heavy and light industries, which negatively affect aggregate demand. Second, a rapid surge in market power among H sector firms known as *chaebols* turns out to be harmful to overall economy within the Kalecki-Steindl framework. Finally, industrial policy regime is vulnerable to external price shocks, possibly leading to recession and the increase in the excess capacity. Therefore, the model explains that the success of an industrial push hinges on the government's initiative to ensure that beneficial effects outweigh unfavorable ones.

The findings of this paper highlight crucial implications for policymakers concerning industrial policy, particularly in the context of susceptibility to inflation or oil price shocks. In order to mitigate these risks, it is advisable for policymakers, especially in low-income countries, to contemplate a strategic shift towards renewable energy sources, thereby reducing reliance on fossil fuel imports. This transition not only promotes sustainable green growth but also acts as a buffer against inflationary shocks. Moreover, the study underscores that industrial policy need not be bound by traditional growth paradigms such as the principle of manifest comparative advantage or fully liberalized financial regime. As exemplified by Korea's case, a proactive approach involving substantial investment in research and development for emerging sectors like artificial intelligence or green technology can revitalize traditional manufacturing industries. This is facilitated through targeted financial incentives among which preferential interest rate policy turns out to be crucial. Lastly, in light of the significant impact on sectoral output production and income distribution, there arises a pertinent need for a regulatory framework that addresses market power dynamics. By embracing these multifaceted policy implications, nations can navigate the complexities of industrial policy more adeptly, fostering robust economic growth and resilience in an ever-changing global landscape.

In conclusion, this paper highlights the impact of selective industrial policy on sectoral dynamics of capacity utilization and its macroeconomic consequences. Careful consideration of the unintended consequences is necessary to achieve successful implementation of the strategic industrial policy. The paper contributes to the existing literature by providing insights into the impact of selective industrial policy on the sectoral economy and the cyclical nature of the sectoral capacity utilization rate. Further research can focus on identifying optimal industrial policies for developing or advanced economies, taking into account the challenges associated with sectoral coordination and addressing the potential for reinforcing oligopolistic or monopolistic power of selected firms.

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Appendices

A Algebraic Notes for Profit Share and Profit Rate

The sectoral profit share π^x is determined by μ^x (markup rate) and the ratio of materials to labour costs. Without considering the sectoral index, we have:

$$p = (1+\mu)(ULC + UMC)$$

where ULC denotes unit (average) labour cost and UMC denotes unit material cost.

Since the sectoral value added per output, $va^x := \dfrac{VA^x}{Q^x} = \underbrace{ULC^x}_{wage} + \underbrace{\mu^x(ULC^x + UMC^x)}_{profit}$

$$\text{and the sectoral profit share, } \pi^x = \frac{profit^x}{total\ income^x}$$

$$= \frac{\mu^x(ULC^x + UMC^x)}{ULC^x + \mu^x(ULC^x + UMC^x)} = \frac{\mu^x\left(1 + \boxed{\dfrac{UMC^x}{ULC^x}}\right)}{1 + \mu^x\left(1 + \boxed{\dfrac{UMC^x}{ULC^x}}\right)},$$

the profit ratio and the profit rate of firms in each sector are determined as follows:

$$va^H = w^H a^H + \mu^H(w^H a^H + \gamma\epsilon p_m^*)$$

$$va^L = w^L a^L + \mu^L(w^L a^L + \phi p^H)$$

and

$$\pi^H = \frac{\mu^H\left(1 + \frac{\gamma\epsilon p_m^*}{w^H a^H}\right)}{1 + \mu^H\left(1 + \frac{\gamma\epsilon p_m^*}{w^H a^H}\right)}$$

$$\pi^L = \frac{\mu^L\left(1 + \frac{\phi p^H}{w^L a^L}\right)}{1 + \mu^L\left(1 + \frac{\phi p^H}{w^L a^L}\right)}.$$

Equivalently,

$$\mu^H = \frac{\pi^H}{1-\pi^H} \cdot \frac{1}{1+\frac{\gamma p_m^*}{w^H a_N^H}}$$

$$\mu^L = \frac{\pi^L}{1-\pi^L} \cdot \frac{1}{1+\frac{\phi p^H}{w^L a_N^L}}$$

The expressions above can be rewritten as

$$w^H a_N^H = \frac{1-\pi^H}{\pi^H} \cdot \mu^H \gamma p_m^*.$$

$$w^L a_N^L = \frac{1-\pi^L}{\pi^L} \cdot \mu^L \phi p^H.$$

Hence,

$$z = \frac{w^H a_N^H}{w^L a_N^L} = \frac{\frac{1-\pi^H}{\pi^H} \cdot \mu^H \gamma p_m^*}{\frac{1-\pi^L}{\pi^L} \cdot \mu^L \phi p^H} = \frac{\pi^L(1-\pi^H)\mu^H \gamma p_m^*}{\pi^H(1-\pi^L)\mu^L \phi p^H}$$

The sectoral profit rate R^x is given by

$$R^x = \frac{\pi^x u^x}{a_K^x} = \pi^x u^x, \quad x = \{H, L\}$$

where $a_K^x = 1$ is assumed.

B Algebraic Notes for the Derivation and Illustration of Sector-specific Excess Demand Functions

The excess demand for heavy industry is given by

$$ED^H = \underbrace{\phi Q^L + I^H + I^L + E^H}_{\text{Demand for investment goods}} - \underbrace{Q^H}_{\substack{\text{Supply of} \\ \text{investment goods}}}.$$

Normalizing each term above by capital stock, we have

$$
\begin{aligned}
\frac{ED^H}{K^H} &= \frac{\phi Q^L}{K^H} + \frac{I^H}{K^H} + \frac{I^L}{K^H}\frac{K^L}{K^L} + \frac{E^H}{K^H} - \frac{Q^H}{K^H} \\
&= \phi u^L \frac{K^L}{K^H} + \alpha_0^H + \alpha_1^H(R^H - i^H) + \alpha_2^H u^H \\
&+ \left[\alpha_0^L + \alpha_1^L(R^L - i^L) + \alpha_2^L u^L\right]k + \zeta_0 + \zeta_1\epsilon\Big(\frac{p^{H^*}}{p^H}\Big) - u^H \\
&= \phi u^L k + \alpha_0^H + \alpha_1^H(\pi^H u^H - i^H) + \alpha_2^H u^H \\
&+ \left[\alpha_0^L + \alpha_1^L(\pi^L u^L - i^L) + \alpha_2^L u^L\right]k + \zeta_0 + \zeta_1\epsilon\Big(\frac{p^{H^*}}{p^H}\Big) - u^H
\end{aligned}
$$

where $k = \frac{K^L}{K^H}$.

The equilibrium condition requires $ED = 0$. Hence, we have:

$$
0 = (\phi k + \alpha_1^L \pi^L k + \alpha_2^L k)u^L + (\alpha_1^H \pi^H + \alpha_2^H - 1)u^H + \alpha_0^H - \alpha_1^H i^H + \alpha_0^L k - \alpha_1^L i^L k + \zeta_0 + \zeta_1\epsilon\Big(\frac{p^{H^*}}{p^H}\Big)
$$

Finally, we have the condition for heavy industry as follows:

$$
u^H = \left[\frac{\phi + \alpha_2^L + \alpha_1^L \pi^L}{1 - \alpha_2^H - \alpha_1^H \pi^H}\right] k u^L + \left[\frac{\alpha_0^H - \alpha_1^H i^H + (\alpha_0^L - \alpha_1^L i^L)k + \zeta_0 + \zeta_1\epsilon\Big(\frac{p^{H^*}}{p^H}\Big)}{1 - \alpha_2^H - \alpha_1^H \pi^H}\right].
$$

Similarly, the excess demand for light industry is given by

$$
ED^L = C^H + C^L - Q^L
$$

where C^H and C^L are consumption of workers and firms in the H and L sector, respectively. Substituting equation (3.4), equation (3.5) and equation (3.12) into equation (3.15), and normalizing each term by the capital stock, we obtain.

$$
\begin{aligned}
\frac{p^L ED^L}{p^L K^L} &= \frac{\overbrace{w^H N^H + w^L N^L}^{\substack{\text{Total consumption}\\ \text{out of their wage bill}\\ \text{with zero saving propensity}}} + \overbrace{(1-s)(R^H p^H K^H + R^L p^L K^L)}^{\substack{\text{Capitalists'}\\ \text{total consumption}\\ \text{out of their profit income}\\ \text{with the saving rate of } s}}}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \\
&= \frac{w^H N^H + w^L N^L + (1-s)R^H p^H K^H + (1-s)R^L p^L K^L}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \\
&= \frac{(1-\pi^H)p^H Q^H + (1-\pi^L)p^L Q^L + (1-s)(R^H p^H K^H + R^L p^L K^L)}{p^L K^L} - \frac{p^L Q^L}{p^L K^L} \\
&= (1-\pi^H)\frac{pu^H}{k} + (1-\pi^L)u^L - u^L \\
&= (1-\pi^H)\frac{pu^H}{k} - \pi^L u^L = 0
\end{aligned}
$$

where $p = \frac{p^H}{p^L}$.

We finally get $u^H = \left[\frac{\pi^L}{p(1-\pi^H)}\right] k u^L$.

C Matrix Representation of the System of Equations in the Short Run and the Long Run Dynamics and Computational Results

Short Run System:

$$
\begin{bmatrix} \alpha_1^H \pi^H + \alpha_2^H - 1 & k(\phi + \alpha_1^L \pi^L + \alpha_2^L) & 0 \\ (1-\pi^L)\frac{z}{k} & -\pi^L & (1-\pi^L)\frac{u^H}{k} \\ -(1-\eta^H)q_{u^H} & (1-\eta^L)q_{u^L} & 0 \end{bmatrix} \begin{bmatrix} du^H \\ du^L \\ dz \end{bmatrix} = \begin{bmatrix} \alpha_1^H u^H \\ 0 \\ (1-\eta^H)q_{\pi^H} \end{bmatrix} d\pi^H + \begin{bmatrix} -\alpha_1^L \\ \frac{z}{k}u^H + u^L \\ -(1-\eta^L)q_{\pi^L} \end{bmatrix} d\pi^L
$$

Using Cramer's rule, we have the following solutions:

1) Wage-led productivity regime for both sectors

$$
\begin{aligned}
du^H &= 0.0241319 d\pi^H - 0.0320307 d\pi^L \\
du^L &= 0.0708371 d\pi^H - 0.110556 d\pi^L
\end{aligned}
$$

2) Profit-led productivity regime for both sectors

$$du^H = -0.0167608 d\pi^H + 0.00875924 d\pi^L$$
$$du^L = -0.0338888 d\pi^H + 0.00609378 d\pi^L$$

3) Wage-led productivity regime for H sector and profit-led productivity regime for L sector

$$du^H = -0.0182709 d\pi^H - 0.0340273 d\pi^L$$
$$du^L = -0.042536 d\pi^H - 0.124998 d\pi^L$$

4) Profit-led productivity regime for H sector and wage-led productivity regime for L sector

$$du^H = -0.0184959 d\pi^H - 0.0340273 d\pi^L$$
$$du^L = -0.043693 d\pi^H - 0.124998 d\pi^L$$

Long Run System:

$$\begin{bmatrix} \alpha_1^H\pi^H + \alpha_2^H - 1 & k(\phi + \alpha_1^L\pi^L + \alpha_2^L) & 0 & (\phi + \alpha_1^L\pi^L + \alpha_2^L)u^L + \alpha_0^L - \alpha_1^L i^L \\ (1-\pi^L)\frac{z}{k} & -\pi^L & (1-\pi^L)\frac{u^H}{k} & -\frac{1-\pi^L}{k^2} z u^H \\ -(1-\eta^H)q_{u^H} & (1-\eta^L)q_{u^L} & 0 & 0 \\ -(\alpha_1^H\pi^H + \alpha_2^H) & \alpha_1^L\pi^L + \alpha_2^L & 0 & 0 \end{bmatrix} \begin{bmatrix} du_\ell^H \\ du_\ell^L \\ dz_\ell \\ dk_\ell \end{bmatrix}$$
$$= \begin{bmatrix} \alpha_1^H u^H \\ 0 \\ (1-\eta^H)q_{\pi^H} \\ \alpha_1^H u^H \end{bmatrix} d\pi^H + \begin{bmatrix} -\alpha_1^L \\ \frac{z}{k}u^H + u^L \\ -(1-\eta^L)q_{\pi^L} \\ -\alpha_1^L u^L \end{bmatrix} d\pi^L$$

Using Cramer's rule, we have the following solutions:

1) Wage-led productivity regime for both sectors

$$du_\ell^H = 0.0134603 d\pi^H - 0.0134972 d\pi^L$$
$$du_\ell^L = 0.0173448 d\pi^H - 0.0176554 d\pi^L$$
$$dk_\ell = 0.0131113 d\pi^H - 0.0308672 d\pi^L$$

2) Profit-led productivity regime for both sectors

$$du_\ell^H = -0.0121612 d\pi^H + 0.0120601 d\pi^L$$
$$du_\ell^L = -0.0108333 d\pi^H + 0.0104521 d\pi^L$$
$$dk_\ell = -0.00632815 d\pi^H - 0.0114779 d\pi^L$$

3) Wage-led productivity regime for H sector and profit-led productivity regime for L sector

$$du_\ell^H = -0.0117891 d\pi^H - 0.012763 d\pi^L$$
$$du_\ell^L = -0.00920121 d\pi^H - 0.0156384 d\pi^L$$
$$dk_\ell = -0.00990744 d\pi^H - 0.033881 d\pi^L$$

4) Profit-led productivity regime for H sector and wage-led productivity regime for L sector

$$du_\ell^H = -0.0118166 d\pi^H - 0.0127328 d\pi^L$$
$$du_\ell^L = -0.00934234 d\pi^H - 0.0154831 d\pi^L$$
$$dk_\ell = -0.0107829 d\pi^H - 0.0359577 d\pi^L$$

D Parametric Setting

Table 4: Parametric Setting for the Short-run Dynamics

Symbol	**Parameters** description	Values	Sources
a_K^H	Fixed amount of capital input per unit of potential output (H sector)	1.0	by assumption
a_K^L	Fixed amount of capital input per unit of potential output (L sector)	1.0	by assumption
i^H	Nominal preferential interest rate	0.117	BOK data (1973-1979)
i^L	Nominal market interest rate	0.167	BOK data (1973-1979)
π^H	Profit share in H sector	0.223	Average profit share based on Lee (2015)
π^L	Profit share in L sector	0.223	Average profit share based on Lee (2015)
ϵ	Nominal exchange rate	0.333	pre-determined by author
ϕ	Unilateral dependency rate of L sector on H sector	0.2	pre-determined by author
s	Saving rate	1	by assumption
k	Relative short-run capital ratio ($= \frac{K^L}{K^H}$)	0.25	pre-determined by author
α_0^H	Autonomous investment in H sector	0.01	pre-determined by author
α_0^L	Autonomous investment in L sector	0.05	pre-determined by author
α_1^H	Coefficient of sensitivity on net profit in g_K^H	0.01	pre-determined by author
α_1^L	Coefficient of sensitivity on net profit in g_K^L	0.01	pre-determined by author
α_2^H	Coefficient of sensitivity on capacity utilization rate in g_K^H	0.55	Nishi (2020)
α_2^L	Coefficient of sensitivity on capacity utilization rate in g_K^L	0.5	Nishi (2020)
ζ_0	Coefficient in export function in H sector	0.02	pre-determined by author
ζ_1	Coefficient in export function in H sector	0.02	pre-determined by author
θ^H	Adjustment speed of H sector with profit-led L sector	0.02664	Author's calculation
θ^H	Adjustment speed of H sector with wage-led L sector	0.009	Author's calculation
θ^L	Adjustment speed of L sector	0.01	pre-determined by author
η^H	Proxy of worker's bargaining power in H sector	0.28	pre-determined by author
η^L	Proxy of worker's bargaining power in L sector	0.3	pre-determined by author
q_π^H	Productivity growth rate by profit share in H sector (profit-led)	0.00025	pre-determined by author
q_π^H	Productivity growth rate by profit share in H sector (wage-led)	-0.00025	pre-determined by author
q_u^H	Productivity growth rate by utilization in H sector	0.025	Nishi (2020)
q_π^L	Productivity growth rate by profit share in L sector (profit-led)	0.00025	pre-determined by author
q_π^L	Productivity growth rate by profit share in L sector (wage-led)	-0.00025	pre-determined by author
q_u^L	Productivity growth rate by utilization in L sector	0.005	Nishi (2020)
p^{H^*}	Competing foreign goods price	1.01	pre-determined by author
	Endogenous variables description		
u^H	Rate of capacity utilization in H sector	Equation (3.2)	
u^L	Rate of capacity utilization in L sector	Equation (3.2)	
z	Relative labour input cost ratio	Equation (4.3)	
Q^H	Actual level of output in H sector	Equation (3.4)	
Q^L	Actual level of output in L sector	Equation (3.4)	
p_H	Price level of goods in H sector	Equation (3.6)	
p_L	Price level of goods in L sector	Equation (3.7)	
R^H	Rate of return of firms in H sector	Equation (3.11)	
R^L	Rate of return of firms in L sector	Equation (3.11)	
g^H	Growth rate of capital stock in H sector	Equation (3.10)	
g^L	Growth rate of capital stock in L sector	Equation (3.10)	
E^H	Export of firms in H sector	Equation (3.12)	

Note: The parameter values used in the simulation and numerical analysis are not necessarily calibrated to reflect the real economy but instead to illustrate the basic properties for the steady-state of the model and characterize a representative economy under the industrial policy regime.