November 2023 Vol.45, No.4

# KDI Journal of Economic Policy



KDI Korea Development Institute

# KDI Journal of Economic Policy

## Statement of Purpose

The KDI Journal of Economic Policy (KDI JEP) is a professional journal published on a quarterly basis. The Journal publishes papers on the academic and policy issues related to the development of Korea's economy. The KDI Journal of Economic Policy welcomes innovative and insightful academic papers on all areas of economics with an emphasis on empirical analysis that contain solid policy implications. KDI JEP is published in English starting in 2015, volume 37 number 1.

The Journal aims to disseminate research outcomes and policy recommendations not only to experts at academia and research institutes but also to policy-makers and the general public. First published in March 1979, the original objective was to circulate ongoing- and past researches conducted in KDI, a leading economic think-tank of South Korea. Starting in August, 2001, the Journal has accepted manuscripts from outside in order to provide the readers more diverse perspectives on Korea's policy initiatives. The Journal now actively seeks and welcomes submissions by researchers at home and from abroad who have genuine interests in the Korean economy.

The contents of papers published in KDI JEP contain personal views of the authors, and thus do not represent the objectives of the Journal or the mission statements of KDI.

## Editorial Board

# KDI Journal of Economic Policy

**November 2023** VOL. 45, NO. 4

**Articles**

*KDI Journal of Economic Policy 2023, 45(4):1-22*
*https://dx.doi.org/10.23895/kdijep.2023.45.4.1*

# The Effectiveness of Capital Controls and Macroprudential Measures†

*By* JUNYONG LEE, KYOUNGHUN LEE, AND FREDERICK DONGCHUHL OH*

*We review the literature on the effectiveness of capital controls and macroprudential measures. First, we explain the purposes and examples of capital controls and macroprudential policies. We then analyze various theoretical models and empirical findings from prior studies that investigate the effectiveness of each instrument. Moreover, we review several studies that directly compare the two instruments and discuss whether policymakers should implement capital controls or macroprudential measures to overcome financial crises. Finally, based on a discussion of the findings of previous studies, we suggest several possible avenues for future research.*

Keywords: Capital Control, Macroprudential Measure, Financial Crisis
JEL Code: F38, G15, G28

## I. Introduction

Financial instability provoked by foreign capital has been a major macroeconomic challenge over time. Although international capital flows are considered an important source of investment and growth, they are highly volatile across economies. Large reversals in foreign capital flows have facilitated numerous financial crises, even in countries with seemingly solid fiscal and monetary policies. Governments have struggled to properly employ policy measures to protect their economies from such instability through such means as capital controls and macroprudential measures.

* J. Lee: Ph.D. Student, KAIST College of Business, Korea Advanced Institute of Science and Technology, 85 Hoegi-Ro, Dongdaemoon-Gu, Seoul 02455, Korea (E-mail: jyjy03@kaist.ac.kr); K. Lee: Senior Research Analyst, WOORI Finance Research Institute, 7th Floor, 48 Sogong-Ro, Jung-Gu, Seoul 04631, Korea (E-mail: khlee7692@gmail.com); F. D. Oh: Associate Professor, SNU Graduate School of International Studies, Seoul National University, 1 Gwanak-Ro, Gwanak-Gu, Seoul 08826, Korea (Corresponding author, E-mail: dcoh415@snu.ac.kr. Phone: +82-2-880-6993. Fax: +82-2-879-1496)

* Received: 2023. 8. 27.
* Referee Process Started: 2023. 9. 8.
* Referee Reports Completed: 2023. 11. 8.
† We would like to thank Juyoung Cheong, Kwanho Shin (the editor), and the anonymous associate editor and two reviewers for their valuable comments. Frederick Dongchuhl Oh gratefully acknowledges support from the New Faculty Startup Fund of Seoul National University. Any remaining errors are ours.

Capital controls refer to capital account interventions that manage capital inflows and outflows to ensure macroeconomic stability.[1] Capital controls apply exclusively to financial transactions between residents and non-residents. In integrated global capital markets, policymakers in many emerging countries have actively imposed countercyclical capital controls as microprudential policies against financial crises and recessions (Ostry *et al*., 2010). However, the global financial crisis (GFC) reminds us to question whether capital controls are effective policy instruments and thus whether their benefits should be reevaluated (Davis and Devereux, 2019; Zeev, 2017).

Concurrently, the need for macroprudential policies has attracted much attention from policymakers. Macroprudential measures are a set of provisions that calibrate regulatory and supervisory arrangements from a systemic perspective. These measures restrict the financial transactions of domestic agents, regardless of whether capital is provided by domestic agents or their foreign counterparts. Table 1 briefly compares capital controls and macroprudential measures. Indeed, relative to capital controls, the use and development of macroprudential policies have been rising since the GFC (Norring, 2022). Moreover, central banks actively employ both policy instruments in emerging markets to utilize their combined effects in financially distressed situations, such as currency crises (Oh, 2022). Therefore, it is paramount to analyze and compare the effectiveness of capital controls and macroprudential policies.

TABLE 1—CAPITAL CONTROLS VERSUS MACROPRUDENTIAL MEASURES

| | Capital Controls | Macroprudential Measures |
|---|---|---|
| Definition | Capital account interventions that aim to manage capital inflows and outflows for macroeconomic stability | A set of provisions that calibrate regulatory and supervisory arrangements from a systemic perspective |
| Restriction | Apply exclusively to financial transactions between domestic and foreign counterparts | Restrict domestic agents' financial transactions regardless of whether the capital is provided by domestic or foreign counterparts |
| Recent trend | The use and development have been declining since the GFC. | The use and development have been steadily increasing since the GFC. |
| Emerging vs. Advanced | Emerging countries have implemented both capital controls and macroprudential policies more than advanced economies. | |

*Source*: Galati and Moessner (2013; 2018), Korinek and Sandri (2016).

This study reviews and summarizes research findings on capital controls and macroprudential measures. First, we briefly explain the purposes of capital controls and macroprudential measures while also offering examples. Next, we review theoretical and empirical studies that analyze the effectiveness of capital controls

[1]Capital account indicates the part of the balance of payments that records financial transactions between domestic and foreign agents. According to the Balance of Payment Manual of the International Monetary Fund (IMF), the official name was changed from "capital account" to "financial account" 20 years ago, and "capital account" means something different. In current literature, nevertheless, many papers still use the term "capital account" with the old meaning.

and macroprudential policies during crises. Furthermore, by exploring recent studies, we discuss whether policymakers should implement capital controls or macroprudential policies to counter crises. Finally, possible avenues for future research on these topics are introduced.

There are other reviews of capital controls and macroprudential measures (Erten *et al*., 2021; Kahou and Lehar, 2017; Rebucci and Ma, 2020). Our study generally refers to recent reviews but differs from them as well. First, we simultaneously consider capital controls and macroprudential measures in a comprehensive framework. Although many countries actively consider implementing both policies to deal with financial crises, they have slightly different characteristics and goals that policymakers should take note of with regard to their country's situation. Comparing which policy is more effective for financial stability is a necessary question for policymakers worldwide, and data is lacking in the literature. We explain the rationale and significance of studying both policies in tandem and introduce several studies that clarify our understanding. Second, we discuss theoretical and empirical studies separately to enable researchers interested in these topics to understand the related literature. We provide clear and understandable explanations of the core ideas of each study. In addition, each section includes a comprehensive summary table of policy effectiveness studies. The summary tables contain information on whether a study is theoretical or empirical, its data, methodology, and results. Third, we review the latest papers, mostly published after 2010, for a better understanding of the latest research trends on our topic. These studies usually focus on more effective capital controls and macroprudential policies to deal with financial crises. We also suggest potential future research directions in line with the current literature. Thus, this study complements the extant literature review on two prominent economic policies against financial crises.

The remainder of the paper is organized as follows: Section 2 presents both the purposes and examples of capital controls and discusses research examining the effectiveness of these strategies. Section 3 considers macroprudential measures and reviews studies that tested their effectiveness. Section 4 discusses recent studies comparing the effectiveness of capital controls and macroprudential policies in overcoming financial crises. Finally, Section 5 concludes the study and suggests possible future research directions.

## II. Capital Controls

### A. *Purpose of Capital Controls*

Capital controls are policies that regulate international capital flow movements across borders. They are designed to limit or encourage capital account transactions. In recent studies, capital controls have been suggested as macroeconomic policy tools to address financial stability concerns. Capital controls on cross-border capital flows have received significant attention from academic researchers and policymakers.

Policymakers worldwide consider adopting capital controls for several reasons.

The first two reasons pertain to the "trilemma" hypothesis postulated in international macroeconomics, which indicates that countries have three possible options from which to choose when they manage international monetary policy: fixed exchange rates, independent monetary policy, and the free flow of capital (Farhi and Werning, 2014; Rey, 2015).[2] By hindering free capital flows through capital controls, governments can pursue the other two purposes. First, capital controls are the primary tool for managing a country's exchange rate. For instance, capital inflows can cause the appreciation of real exchange rates (Edwards, 1998),[3] making exported domestic goods less competitive in international markets. Restricting capital inflows (and encouraging capital outflows) therefore decreases the need for monetary expansion efforts and higher domestic inflation that would cause a rapid appreciation of the currency (Neely, 1999).

Second, capital controls contribute to the establishment of a more independent monetary policy. Countries with less developed financial markets are vulnerable to foreign monetary movements. In these countries, capital controls can regulate or change the composition of international capital flows, aggravating distorted incentives in the domestic financial system (Neely, 1999). Therefore, they must actively develop a suitable set of restrictive capital policies to prevent financial destabilization.

Third, capital controls mitigate the volatility of short-term capital flows (Gallagher *et al*., 2011). Capital inflows tend to increase when the economy is booming, and capital outflows tend to decrease during economic depressions (e.g., financial crises). Such short-term fluctuations may intensify economic difficulties, especially in emerging countries, where the vulnerability of foreign capital is severe. To cope with such situations and pursue financial stability, policymakers should consider implementing capital control policies to mitigate the negative effects of short-term capital flows.

## B. *Examples of Capital Controls*

The practical implementation of capital controls has a long history in international economic policy (Davis and Devereux, 2019; Edwards, 1999; Magud *et al*., 2018). In actuality, capital controls can be categorized according to several classification standards beyond the direction of flows (i.e., inflows or outflows) and/or the type of asset (e.g., equities, loans, and FDI).

First, capital controls can be classified depending on price or quantity. Price-based capital controls limit asset transactions through pricing mechanisms. These include taxes and subsidiaries on cross-border capital flows. Quantity-based capital controls regulate capital transactions through quantity controls, including outright prohibitions or quotas and encompassing quantitative limits on transactions of specific categories of assets, such as foreign direct investments, portfolio

[2]Farhi and Werning (2014) and Rey (2015) noted that the global financial cycle transforms the trilemma into a "dilemma," which means that the capital account is managed if and only if independent monetary policies are possible.

[3]Real appreciation refers to an increase in the relative price of domestic goods and services compared to foreign goods and services.

investments into equities or bonds, and bank loans.

Second, the timing of controls can be an important standard for classifying capital controls, specifically as ex-ante and ex-post capital controls. Ex-ante capital controls are designed to suppress excessive risk-taking and decrease the negative shock of a financial crisis. Tightening controls on capital inflows, loosening controls on capital outflows, and the resulting prevention of currency appreciation are examples of ex-ante capital controls that mitigate overheating during boom periods. In contrast, ex-post capital controls are implemented to overcome the negative effects of financial crises. These controls include encouraging new borrowing from foreign countries and tightening capital outflows. Recent studies of capital controls, especially after the GFC, have reached a consensus that it is optimal to adopt a mix of ex-ante and ex-post policies to minimize the welfare costs of financial instability (Benigno *et al*., 2013; Jeanne and Korinek, 2020).

## C. *Effectiveness of Capital Controls*

In this section, we review and discuss the literature on the effectiveness of capital control policies, including theoretical and empirical studies. Table 2 summarizes the studies of capital controls discussed in this section.

TABLE 2—SUMMARY OF STUDIES ON THE EFFECTIVENESS OF CAPITAL CONTROLS

| Study | Category | Data | Methodology | Findings |
|---|---|---|---|---|
| Chamon and Garcia (2016) | Empirics | Data on foreign exchange interventions from the Central Bank of Brazil | Panel regression is used to examine the effects of capital restrictions on the dollar-real bilateral exchange rate. | Brazil's capital inflows restrictions are effective in making domestic assets more expensive, thus insulating the Brazilian financial market from the international market during a crisis. |
| Costinot *et al*. (2014) | Theory | - | A theory of capital controls as dynamic terms of trade manipulation is developed based on an infinite-horizon endowment economy consisting of two countries. | A country with a rapid growth rate compared to the rest of the world has incentives to tax capital inflows or subsidize capital outflows for intertemporal consumption smoothing. |
| Dávila and Korinek (2018) | Theory | - | A model with fire sales in an economy with two types of agents is proposed. | Financial friction leads to two distinct types of pecuniary externalities: distributive externalities and collateral externalities. |

TABLE 2—SUMMARY OF STUDIES ON THE EFFECTIVENESS OF CAPITAL CONTROLS (CONT'D)

| Study | Category | Data | Methodology | Findings |
|---|---|---|---|---|
| Farhi and Werning (2014) | Theory | - | Nominal rigidity is incorporated into a standard New Keynesian model of a small open economy. | Capital controls are desirable even with flexible exchange rates when monetary policy cannot effectively manage the demand. |
| Forbes (2007) | Empirics | Data on non-financial Chilean firms obtained from Worldscope | Panel regression is used to examine the effects of Chilean tax restrictions on firm-financing constraints. | Tax controls significantly increase the financing cost of small publicly traded firms during the seven-year period of the *encaje.* |
| Pasricha *et al*. (2018) | Empirics | High-frequency data on capital control policies in 16 emerging market economies from 2001–2012 | Country-level time-variant capital policy action indicators are developed. | Strict capital controls have cross-border spillover effects, which are more prominent in the aftermath of a crisis. |
| Ma (2020) | Theory | - | An endogenous growth model with a borrowing constraints and pecuniary externalities is proposed. | The model could capture the persistent output loss associated with financial crises and eventually show that the optimal capital control policy generates meaningful welfare gains. |
| Mendoza (2002) | Theory | - | A model with occasionally binding leverage or collateral constraints is proposed. | The effectiveness of capital controls is related to pecuniary externalities. |
| Schmitt-Grohé and Uribe (2016) | Theory | - | A model of a small open economy combined with fixed exchange rates and downward nominal wage rigidity is used. | Fixed exchange rates, nominal rigidity, and free capital mobility jointly generate aggregate demand externality. |
| Zeev (2017) | Empirics | Capital control dataset consisting of 33 emerging countries between 1995 and 2014, based on the de jure annual measures of capital restriction of Fernández *et al*. (2016) | State-dependent impulse responses are estimated based on the local projection method by Jordà (2005). | In countries with stricter capital inflow controls, economic outputs (such as GDP) respond less to global credit supply shocks. |

Theoretical studies have mainly developed models based on the concepts of pecuniary externalities, aggregate externality, or terms of trade manipulation. First, many recent theoretical studies that focus on capital controls have introduced pecuniary externalities stemming from balance sheet effects. Mendoza (2002, 2010) proposed a theoretical model that occasionally binds leverage or collateral constraints. Constraints can bind when a negative shock hits the economy under high leverage. Under these constraints, each private agent who does not internalize the effect of borrowing limits generates pecuniary externalities. Dávila and Korinek (2018) also explained that individual decisions can attach pecuniary externalities to the market value of collateral. Specifically, they showed that financial friction can lead to two distinct types of pecuniary externalities. The first of these consists of distributive externalities that come from incomplete insurance markets in which under-insured agents exist. The second is collateral externalities stemming from price-dependent collateral constraints.[4] In another study, Ma (2020) developed an endogenous growth model with borrowing constraints and pecuniary externalities. In the model, private agents' expenditure plans are financially constrained during crisis periods, and the economic growth rate decreases compared to normal times. By incorporating endogenous growth into previous open models of the economy, the model can capture the persistent output loss associated with financial crises and eventually show that the optimal capital control policy will generate meaningful welfare gains. Models with borrowing constraints can also be found in other studies, including those of Bianchi (2011) and Benigno *et al*. (2013).

Other theoretical studies incorporated aggregate demand externalities. These types of externalities occur when aggregate demand differs from aggregate supply. Cross-border capital flows can generate aggregate demand externalities because capital inflows (outflows) are known to lead to an increase (decrease) in domestic aggregate demand. In other words, capital flows reallocate spending between domestic and foreign agents with different marginal propensities to consume (Erten *et al*., 2021). Theoretical studies generally argue that if a policymaker can internalize the effects of demand changes, they can regulate financial market transactions and effectively manage aggregate demand. For example, Farhi and Werning (2014) investigated a standard New Keynesian model of a small open economy with nominal rigidity to study optimal capital controls. They suggested that capital controls are desirable, even with flexible exchange rates, when monetary policy cannot effectively manage demand. In addition, Schmitt-Grohé and Uribe (2016) developed a model of a small open economy combined with fixed exchange rates and downward nominal wage rigidity. Using this model, they showed that fixed exchange rates, nominal rigidity, and free capital mobility jointly generate aggregate demand externalities, arguing therefore that capital controls to manage wage rigidity or unemployment problems can be beneficial during financial crises.

Furthermore, capital controls can arise from a country's willingness to influence its terms of trade (i.e., terms of trade manipulation). Costinot *et al*. (2014) developed

[4]In other words, Dávila and Korinek (2018) explained that distributive externalities arise when a policymaker can employ changes in prices to allocate wealth to under-insured agents in incomplete insurance markets. Meanwhile, collateral externalities arise when a policymaker can employ price changes to relax binding collateral constraints that rely on market prices.

a theory of capital controls that utilized the dynamic terms of trade manipulation. Specifically, they modeled an infinite-horizon endowment economy consisting of two countries. They assumed that one can choose taxes on international capital flows to maximize welfare, whereas the other country is inactive in terms of control. Solving the model, they showed that a country with a more rapid growth rate than the rest of the world has incentives to tax capital inflows or subsidize capital outflows, as such a country tends to be associated with lower (larger) future trade deficits (surpluses), giving it an incentive to raise future consumption relative to current consumption (i.e., increase current savings).[5] Taxing capital inflows and subsidizing capital outflows helps to smooth intertemporal consumption by distorting prices downward.

For empirical studies that test the effectiveness of capital controls, the most important task is to "quantitatively measure" the level of capital controls. Most empirical work measuring capital controls is based on the International Monetary Fund's (IMF) *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). AREAER contains a set of de jure restrictions on a wide range of international transactions for each IMF member country. A representative capital control measure is the capital restriction index developed by Fernández *et al*. (2016). This index considers broader information on the existence of capital inflow and outflow restrictions on ten asset categories, including equity, bonds, direct investment, derivatives, and commercial credits. It stems from dummy variables that classify whether restrictions on a particular category of cross-border transactions are in place in any given country year. The index covers 100 countries from 1995–2017, and a higher (lower) value indicates that a country has a tight (less) regulation of capital inflow and outflow.[6]

In light of capital openness, Chinn and Ito's (2006) *de jure* index of capital account liberalization is a prominent country-level measure in international finance literature. The Chinn–Ito index measures a country's level of financial openness and reflects information on the country's actual regulatory controls on cross-border capital flows. It is based on the dummy indicators related to restrictions on cross-border financial transactions described in the IMF's AREAER. Specifically, the index is the first principal component of four dummy variables regarding restrictions on capital account transactions, restrictions on current account transactions, requirements for the surrender of export proceeds, and the existence of multiple exchange rates, (Chinn and Ito, 2008). Its value ranges from -1.92 to 2.33, where a higher (lower) value means that a country exhibits a higher (lower) level of capital account openness.[7] According to these definitions, the Fernandez index and the Chinn–Ito index are negatively correlated.

Previous empirical studies have found a range of country-specific or cross-country evidence of the effectiveness of capital control policies during financial crises. Forbes (2007) investigated the Chilean tax on short-term capital flows (i.e., *encaje*)

[5] Costinot *et al*. (2014) explained that a country has a stronger incentive to distort prices downward by decreasing domestic consumption during periods of larger trade deficits. In contrast, it has a stronger incentive to distort prices upward by increasing domestic consumption during periods of larger trade surpluses.

[6] The capital control indexes of Fernández *et al*. (2016) can be found at http://www.columbia.edu/~mu2166/fkrsu/.

[7] The Chinn and Ito (2006) capital account openness index is available on the research page for Menzie Chinn and Hiro Ito: http://web.pdx.edu/~ito/Chinn-Ito_website.htm.

between 1991 and 1998. The goals of the *encaje* were to mitigate the appreciation of the Chilean peso for competitive export prices, to regulate short-term capital inflows, and to increase the central bank's ability to implement effective monetary policy, with a wedge between foreign and domestic interest rates. Using data on non-financial Chilean firms obtained from Worldscope, she found evidence that tax controls significantly increased the financing cost of small publicly traded firms during the seven years of the *encaje*. Chamon and Garcia (2016) focused on capital controls, this time in Brazil, one of the leading countries in the effort to actively manage capital inflows in response to the GFC. Brazil adopted taxes on portfolio inflows in October of 2009 and implemented several other policies to discourage inflows from late 2009 to mid-2011. They found evidence that such efforts did not yield significant changes in the exchange rate, implying limited success in alleviating exchange rate appreciation when using them. However, a tax on the notional amount of derivatives in 2011, the last restriction during the study period, strongly depreciated the exchange rate. Overall, their results indicate that Brazil's capital inflow restrictions effectively made domestic assets more expensive, thus separating the Brazilian financial market from the international market. Other country-specific studies discussed the effects of capital controls during crises: Dornbusch (2002) for Malaysia (on the Asian financial crisis) and Keller (2019) for Peru (on the 2008 GFC).

In cross-country studies, Pasricha *et al*. (2018) used high-frequency data on capital control policies in 16 emerging market economies around the time of the GFC (i.e., 2001–2012) to investigate the domestic and multilateral effects of capital controls. Specifically, they developed country-level time-variant capital policy action indicators, including easing and tightening restrictions. They showed that increases in capital account openness reduce exchange rate stability and monetary policy autonomy, a finding consistent with the monetary policy trilemma. In addition, strict capital controls caused cross-border spillover effects that are more prominent in the aftermath of the crisis. They explained that these spillovers imply the existence of a coordination problem between countries that use capital controls as an economic policy. Zeev (2017) studied the shock-absorbing capacity of capital controls by investigating whether capital controls moderate the influence of an international credit shock. The study used a capital control dataset consisting of 33 emerging countries between 1995 and 2014 based on the de jure annual measures of capital restriction of Fernández *et al*. (2016). Jordà (2005) estimated state-dependent impulse responses using the local projection method. Their main results indicated that capital inflow controls showed significant shock-absorbing capacity, whereas outflow controls had no significant effects. In countries with stricter capital inflow controls, economic outputs (e.g., GDP) respond less to global credit supply shocks. This result suggests that governments in emerging countries should consider capital inflow controls as an effective tool to improve macroeconomic stability against economic shocks.

Several studies point out the advantages of implementing capital controls, enabling countries to alter the maturity composition of financial flows. In addition, capital controls can be utilized to discourage short-term capital flows, which may cause balance-of-payment crises owing to their volatility. Ultimately, capital controls contribute to broader national goals. They allow countries to be more selective

regarding the types of investments they want and to divert flows to prioritized sectors. Specifically, Cordero and Montecino (2010) presented case studies of four countries (Malaysia, Chile, Colombia, and Brazil) regarding their use of capital controls and policy implications on economic growth.

In addition, capital controls have spillover effects on neighboring countries (Gallagher *et al*., 2011). Lambert *et al*. (2011) analyzed how portfolio inflows responded to capital controls based on evidence from Latin American countries. They used a detailed balance of payments and higher frequency data on portfolio equity and bond flows. They found evidence that the increase in the Brazilian tax on portfolio bond inflows affected other Latin American countries with significant surges in portfolio funds. This effect may explain almost all of the surges in bond inflows to Mexico in 2010. Forbes *et al*. (2011) also studied the changes in the Brazilian tax on foreign investors from 2006–2011 and tested their multilateral and direct effects on portfolio flows. They found that when capital controls are strengthened, foreign investors decrease their portfolio allocation to Brazil and increase their allocations to other Latin American countries. Overall, these studies emphasize that when we evaluate the effectiveness of capital controls, we should consider the spillover effects on investments in other countries.

Moreover, the widespread implementation of capital controls can create additional macroeconomic problems. Ostry *et al*. (2010) pointed out that the extensive use of capital controls has detrimental effects on the efficient allocation of investments across countries. They argue that the greater use of capital controls in one country compels countries whose economic circumstances do not justify using controls to impose superfluous restrictions on capital inflows. Their main perspective is that when policymakers decide on capital controls, they should carefully compare the benefits of removing financial instability and implementation costs. Furthermore, the widespread use of capital controls inevitably hinders some of the beneficial capital flows necessary for a country, thus creating distortions in balance sheets.

## III. Macroprudential Measures

### A. *Purpose of Macroprudential Measures*

Macroprudential measures can be defined as a set of provisions that calibrate regulatory and supervisory arrangements from a system-wide or systemic perspective. After the 2008 GFC, policymakers and scholars noted that macroprudential policy can play an important role in mitigating the negative effects of systemic risk on the overall economy (Claessens, 2015; Galati and Moessner, 2013; Kahou and Lehar, 2017). Countries have actively used macroprudential policies in tandem with capital controls and monetary policies (Akinci and Olmstead-Rumsey, 2018; Cerutti *et al*., 2017; Forbes, 2021). Consequently, there is growing policy debate about implementing macroprudential measures and their effects on economic outcomes (Tavman, 2015).

The main objective of macroprudential measures is to complement microprudential policies. Traditionally, microprudential policies assume that financial stability can be achieved through the regulations of individual institutions. However, the 2008 GFC

highlighted the shortcomings and deficiencies of a microprudential orientation. Although 99% of U.S. financially insured institutions met or exceeded the requirements of regulatory capital standards, they are widely considered the epicenter of the crisis (Kahou and Lehar, 2017). As argued by Borio (2011), the bottom-up approach to microprudential policies potentially includes fallacies of composition in that financial institutions can be stable at the individual level but fragile at the macro level. The underlying logic behind this argument is the characterization of risk. The microprudential orientation focuses on the exogenous risk because it considers the behavior and soundness of institutions on a stand-alone basis. In contrast, a macroprudential orientation emphasizes endogenous risk induced by the collective behavior of institutions. Macroprudential measures take a top-down approach to ensure the safety of the financial system as a whole.

Specifically, macroprudential tools try to ensure financial stability by reducing systemic risks. However, there is no clear consensus on how systemic risk can be defined and measured explicitly. Lehar (2005) defined a systemic crisis as "an event in which a considerable number of financial institutions default simultaneously." Acharya (2009) provided a model of systemic risk, referring to the failures of banks as a systemic crisis "if many banks fail together, or if one bank's failure propagates as a contagion causing the failure of banks." Although the literature proposes several measures of systemic risk based on these definitions, the question of which method better captures the concept of systemic risk remains open (Bisias *et al*., 2012; Brownlees and Engle, 2017; Engle, 2018). Therefore, the explicit and practical goals of macroprudential policies remain poorly defined.

## B. *Examples of Macroprudential Measures*

The actual use of macroprudential tools can be classified according to two usage scenarios: time and cross-sectional.[8] First, an important objective of macroprudential measures is to mitigate the procyclical behavior of the financial system. Examples include loan-to-value (LTV) ratio restrictions, countercyclical capital requirements, and dynamic provisioning. Caps on LTV ratios reduce bank losses by limiting excessive loans during booms. This strategy is the most common macroprudential policy and aims to prevent financial crises caused by bad loans (Lim *et al*., 2011; Morgan *et al*., 2019). Countercyclical capital requirements require financial institutions to hold more capital during an economic boom and less during an economic downturn. Dynamic provisioning requires banks to predict credit losses during bad times and to build capital buffers during good times. Combined with countercyclical capital requirements, it is widely believed that the dynamic provisioning introduced in Spain in 2000 bolstered the stability of the Spanish financial system by smoothing credit supply cycles (Balla and McKenna, 2009; Jiménez *et al*., 2017). Overall, these measures are designed to reduce the procyclicality of the financial system.

[8] Claessens (2015) provided information on the frequency at which each macroprudential policy was implemented in 42 countries.

Macroprudential measures can also allocate risk at a given point in time. Based on the risk management literature (Huang *et al*., 2012; Tarashev *et al*., 2010), these measures focus on shocks amplified through the interconnections among financial institutions. One such example is capital surcharges on systemically important financial institutions. For example, Huang *et al*. (2012) found that the marginal effect of each bank on systemic risk is mainly driven by its size, suggesting that "too-big-to-fail" is an important issue from a macroprudential perspective. Thus, the distinction between banks according to size effectively reduces systemic risk (Braouezec and Wagalath, 2018; Laeven *et al*., 2016).

Another approach to classify macroprudential measures is to categorize them into foreign exchange (FX)-related regulations and others. FX-related macroprudential tools aim to reduce the foreign currency exposure of banks. These policies are examples of capital flow management measures that are also classified as macroprudential measures (CFM/MPM), as they limit not only capital flows but also systemic risks (IMF, 2014). Indeed, the Korean government introduced such policies after the GFC because Korea has characteristics of both an advanced and an emerging economy. For example, Bruno and Shin (2014) reported lower sensitivity of Korea's capital flows compared to other Asian countries after several FX-related measures (e.g., a leverage cap on the notional value of FX derivatives contracts, and a levy on non-core FX denominated liabilities of the banking sector) were implemented. Ahn *et al*. (2022) and Yun (2022) also argued that such measures could contribute to an increase in the debt maturity levels of foreign bank branches. Overall, compared to capital controls, there is a great variety of macroprudential measures in terms of policy goals, leading to a lack of an underpinning for a unified framework.

### C. *Effectiveness of Macroprudential Measures*

In this section, we discuss the literature on the effectiveness of macroprudential measures. In contrast to the capital controls literature, studies of macroprudential measures have been conducted only in recent years and thus have not provided clear policy guidance. Nevertheless, we briefly review recent progress in theoretical and empirical studies on the rationale behind the use of macroprudential policies.[9] Table 3 summarizes studies that focused on the effectiveness of macroprudential measures.

[9]Lim *et al*. (2011), Galati and Moessner (2013, 2018), and Forbes (2021) provided comprehensive reviews of macroprudential instruments.

TABLE 3—SUMMARY OF STUDIES ON THE EFFECTIVENESS OF MACROPRUDENTIAL MEASURES

| Study | Category | Data | Methodology | Findings |
|---|---|---|---|---|
| Acharya *et al*. (2017) | Empirics | U.S. financial firms with equity market capitalization exceeding $5 billion as of the end of June of 2007 | Systemic risk is estimated using the expected shortfall. | The measure of systemic risk is useful for predicting the systemic crisis of 2007–2009. |
| Bekiros *et al*. (2020) | Theory | - | The non-fundamental house price expectation is incorporated into a DSGE model. | Monetary policy can more effectively mitigate the impact of non-fundamental shocks than macroprudential policy. |
| Braouezec and Wagalath (2018) | Theory | - | A bank's response to an exogenous shock on its balance sheet is analyzed under the constraint of a risk-based capital ratio. | The capital surcharge of BNP Paribas should be higher to mitigate systemic risk. |
| Cerutti *et al*. (2017) | Empirics | Macroprudential measures for 119 countries during 2000–2013 from the IMF survey, Global Macroprudential Policy Instruments | Panel regression is used to examine the effects of macroprudential instruments on credit growth. | Macroprudential policies negatively affect credit growth, in particular for emerging markets. |
| Gertler and Kiyotaki (2015) | Theory | - | Liquidity mismatch and bank runs are incorporated into a DSGE model. | The existence of a bank-run equilibrium depends on bank balance sheets and liquidation prices for bank assets. |
| Girardi and Ergün (2013) | Empirics | 74 U.S. financial institutions with equity market capitalization above $5 billion | Systemic risk is estimated using the conditional value-at-risk concept. | The systemic risk measure captures information differently in the time series of institutions' value-at-risk. |
| Horváth and Wagner (2017) | Theory | - | Bankers' investment decisions are examined when they anticipate countercyclical capital requirements. | Countercyclical capital requirements provide an incentive for banks to invest in more correlated projects. |
| Jiménez *et al*. (2017) | Empirics | Bank loans, bank balance sheets, and firm balance sheets in Spain | The impacts of dynamic provisioning on credit supply and firm-level real effects are examined. | Dynamic provisioning plays an important role in smoothing credit supply cycles. |

TABLE 3—SUMMARY OF STUDIES ON THE EFFECTIVENESS OF MACROPRUDENTIAL MEASURES (CONT'D)

| Study | Category | Data | Methodology | Findings |
|---|---|---|---|---|
| Morgan *et al*. (2019) | Empirics | Data on LTV policies and mortgage loans of 4000 banks from 46 countries | The relationship between residential mortgage loans and LTV policies is analyzed using the generalized method of moments. | Although LTV policies reduce mortgage loans for the average bank, their effects are smaller for large banks and banks with bad loans. |
| Ono *et al*. (2021) | Empirics | Business loan ratios of Japanese firms from 1975–2009 | The pattern of LTV ratios and their effects on borrowers are examined. | LTV ratios exhibit counter-cyclicality and have a negative impact on firm growth. |
| Punzi and Rabitsch (2018) | Theory | - | Welfare gains and losses are estimated using a DSGE model considering the ability to borrow of different households. | The LTV policy that only targets highly leveraged borrowers improves welfare. |
| Wong *et al*. (2011) | Empirics | Panel data for 13 countries, including information about whether each country adopts an LTV policy | The effects of LTV policies on mortgage delinquency rates and property markets are estimated. | LTV policy can effectively mitigate systematic risk. |
| Gambacorta and Murcia (2020) | Empirics | Bank-loan data from five Latin American countries (Argentina, Brazil, Colombia, Mexico, and Peru) | The impact of macroprudential policies on credit growth is investigated using meta-analysis techniques. | The macroprudential policies dampen credit cycles. |

Theoretical studies of macroprudential policies can be divided into those that discuss partial and general equilibrium models. Partial equilibrium models generally consist of banking and finance. They analyze the interaction between lenders and borrowers with many realistic assumptions, such as information asymmetry, incentive problems, and strategic interactions (Braouezec and Wagalath, 2018; Horváth and Wagner, 2017). Although these models generate fruitful insights into the effectiveness of macroprudential policies, they are mostly one- or two-period models that do not capture the role of business cycles. In contrast, general equilibrium models mainly employ dynamic stochastic general equilibrium (DSGE) models. This approach incorporates the time dimension into the analysis by solving infinite-horizon models. Thus, DSGE models are particularly attractive for deriving practical policy guidance because they have the advantage of being able to include simulations (Bekiros *et al*., 2020; Gertler and Kiyotaki, 2015; Punzi and Rabitsch, 2018). However, the financial institutions in these models are stylized due to their technical complexity. Overall, existing theoretical studies face tractability issues when evaluating the effects of macroprudential measures on the financial system as a whole.

Next, we review the empirical studies that focus on the effectiveness of macroprudential measures. The empirical analysis in this field is complicated owing to the absence of a comprehensive framework for examining the impacts of macroprudential policies. Furthermore, the lack of discussion pertaining to which variables are suitable for capturing macroprudential purposes leads to different interpretations of the results of macroprudential measures. The main issue is how to quantify systemic risk. Although the literature employs various methods, such as the conditional value at risk, vector autoregression, and expected shortfall approaches (Acharya *et al*., 2017; Girardi and Ergün, 2013), there is no commonly shared measure of systemic risk.

Several studies have argued that macroprudential measures improve financial stability (Hahm *et al*., 2013). Cerutti *et al*. (2017) examined the effectiveness of macroprudential measures implemented during 2000–2013 in 119 countries. They found that macroprudential policies are negatively associated with credit growth. Moreover, macroprudential tools are used more frequently, and their effects are stronger, in emerging markets. Jiménez *et al*. (2017) analyzed the role of dynamic provisioning by employing the case of Spain. They showed that dynamic provisioning provides capital buffers to mitigate credit crunches during bad times. Wong *et al*. (2011) observed that caps on LTV ratios reduce the systemic risk stemming from property markets. Gambacorta and Murcia (2020) evaluated the effectiveness of macroprudential policies for five Latin American countries. Using information on bank loan data, they concluded that macroprudential tools stabilize credit cycles. Moreover, the effects of macroprudential policies on credit growth are reinforced when a monetary policy is implemented simultaneously.

However, empirical evidence of the effects of macroprudence is inconclusive. Other studies used different methods and obtained different results. For example, Morgan *et al*. (2019) argued that LTV is less effective with regard to reducing mortgage loans for large banks and banks with loans, suggesting the need for other macroprudential policies rather than LTV policies. Ono *et al*. (2021) examined the effects of the LTV business ratio on firm growth. They found that LTV ratios exhibit counter-cyclicality, which is inconsistent with the underlying assumption of LTV caps. Moreover, they documented that firms obtaining high LTV ratios are more likely to grow more rapidly in terms of employment, sales, and return on assets. Their results suggest an unintended consequence of LTV caps: while LTV caps cannot effectively reduce loans during booms due to the counter-cyclicality of LTV ratios, such a policy may negatively affect firm growth. Overall, these studies highlight the importance of specifying the objectives of macroprudential measures and their effects on the overall system.

## IV. Capital Controls versus Macroprudential Measures

Finally, we discuss whether policymakers should implement capital controls or macroprudential policies to prevent or overcome crises. Few studies have directly compared the effectiveness of capital controls and macroprudential measures because the literature on macroprudential tools is still in its infancy. While the

concept of capital controls could be incorporated into a theoretical model using taxation on capital flows, macroprudential regulations have various goals and measures. This situation has led to a lack of a comprehensive framework considering both policies. Nevertheless, we review the underlying idea behind the use of capital controls or macroprudential measures through theoretical and empirical arguments. Table 4 summarizes studies that consider both capital controls and macroprudential measures.

TABLE 4—SUMMARY OF STUDIES COMPARING THE EFFECTIVENESS OF CAPITAL CONTROLS AND MACROPRUDENTIAL MEASURES

| Study | Category | Data | Methodology | Findings |
|---|---|---|---|---|
| Bacchetta *et al*. (2023) | Empirics | Corporate bond issuances in 17 emerging countries | The likelihood of issuing foreign currency bonds is estimated. | Capital controls have a stronger effect on financial stability than macroprudential measures. |
| Blundell-Wignall and Roulet (2014) | Empirics | Data on nine international commercial banks and 29 emerging countries | The effects of macroprudential policies and capital controls are estimated separately. | Capital controls in emerging countries negatively affect economic growth. |
| Forbes *et al*. (2015) | Empirics | Data on capital flows and macroprudential measures for 60 countries | The effectiveness of capital controls and macroprudential policies is examined using the propensity score matching method. | Most capital flow management measures do not achieve their goals, whereas macroprudential policies contribute to financial stability. |
| Frost *et al*. (2020) | Empirics | Data on capital flows and macroprudential measures for 83 countries | The effectiveness of capital controls and macroprudential policies is examined using the propensity score matching method. | Most capital flow management measures do not achieve their goals, whereas macroprudential policies contribute to financial stability. |
| Korinek and Sandri (2016) | Theory | - | The effectiveness of capital controls and macroprudential policies is analyzed considering a small open economy. | Both capital controls and macroprudential policies are important to avoid financial crises. |
| Ostry *et al*. (2012) | Empirics | Capital controls and macroprudential measures of 51 emerging countries during 1995–2008 | The effects of capital controls and macroprudential measures on crisis resilience are estimated. | Both capital controls and macroprudential measures can help improve financial stability. |

Korinek and Sandri (2016) presented a theoretical framework to compare the effectiveness of capital controls and macroprudential measures on financial stability. They focused on the fact that capital controls segment domestic and foreign agents,

whereas macroprudential regulations restrict domestic borrowing, regardless of who provides the capital. They then analyzed the feedback loop of capital flows, exchange rate depreciation, and financial crises. While capital controls and macroprudential tools share the common purpose of preventing a financial crisis, the authors found that it is optimal to implement both policies because they affect different agents. A government planner uses macroprudential regulations to discourage risk-taking by borrowers. Capital controls further strengthen financial stability by inducing domestic agents to hold more insurance in that their portfolios yield higher payoffs when the economy experiences adverse shocks, such as exchange rate depreciation. Thus, the importance of capital controls decreases as exchange rates become more stable because the effects of capital controls are mainly driven by changes in capital outflows. In this framework, macroprudential measures play more of a role in advanced countries and less of a role in emerging countries than capital controls.

However, empirical evidence for Korinek and Sandri's (2016) model is mixed. Ostry *et al*. (2012) found that both macroprudential policies and capital controls helped to enhance economic resilience during crises in 51 emerging economies from 1995 to 2008. They also documented that the effects of capital controls dominate those of foreign currency-related macroprudential measures. By examining 17 emerging markets between 2013 and 2015, Bacchetta *et al*. (2023) also noted that the effects of macroprudential policies on the issuance of foreign corporate bonds are substantially reduced when capital controls are used. These studies are in line with the argument that capital controls complement macroprudential policies when currency risk significantly affects financial instability. In contrast, Forbes *et al*. (2015) observed that while macroprudential measures in 60 countries reduce financial instability from 2009 to 2011, capital flow management measures do not. Frost *et al*. (2020) reported similar results for 83 countries from 2007 to 2017, also finding that capital controls can affect volatile capital inflows for emerging economies. Blundell-Wignall and Roulet (2014) showed that capital controls harmed the economic growth of 29 emerging economies between 2005 and 2012. They argued that capital controls during crises reduce the funding ability of firms because countries with high capital controls are not attractive to foreign investors. Because the sample periods of these studies are around the GFC, they raise the possibility that macroprudential policies are more effective during periods of global crises rather than during a crisis period in a specific country. In sum, although the theoretical argument suggests that capital controls benefit emerging countries more than advanced countries, related evidence is less conclusive.

## V. Conclusion

This study summarizes the literature on capital controls and macroprudential measures and discusses their effectiveness. First, we briefly review previous studies of capital controls and macroprudential measures. Capital controls have been a part of economic theory and have been employed in many countries for a long time. In contrast, macroprudential policy is a relatively new field of research and, thus, has yet to provide clear guidance for policy decisions. We then compare the effectiveness

of the two instruments.

In the remainder of this section, we propose some avenues for future research.

The first issue is that theoretical analysis considering both capital controls and macroprudential measures still needs to be improved. Although Korinek and Sandri (2016) suggested a helpful framework to distinguish between them, it does not fully capture the role of business cycles. Extending their model to include more macroeconomic dynamics potentially generates interesting policy implications.

Another critical question centers on the conditions under which capital controls or macroprudential measures effectively mitigate the negative effects of financial crises. For example, because a series of currency devaluations caused the East Asian crisis, many emerging countries relied on capital controls (Asiedu and Lien, 2004; Edwards, 1999). In contrast, the 2008 GFC began in advanced countries and raised the need to implement macroprudential measures. A fundamental understanding of the characteristics of countries and crises will provide policymakers with valuable guidance when responding to crises. The recent coronavirus disease 2019 (COVID-19 crisis) is an interesting test bed because it differs from previous crises in that both global consumption and production were affected by the pandemic. Igan *et al*. (2023) evaluated the resilience of banks in 52 countries during the COVID-19 crisis, finding that macroprudential measures significantly reduced banks' systemic risk. Comparing the effectiveness of macroprudential instruments and capital controls during these three crises in advanced and emerging economies sheds light on how the characteristics of crises and countries determine the effectiveness of capital controls and macroprudential measures.

Finally, from a practical point of view, the overall effects of capital controls and macroprudential measures on the economy as a whole must be discussed. Although the literature suggests that while these policies could contribute to financial stability, they could also have unintended consequences. For example, Ahn *et al*. (2022) documented that a levy on banks' short-term external borrowing can induce price distortions in foreign bank branches over domestic banks in that the marginal cost of funding increases more for domestic banks. Indeed, the IMF consults with member countries on various issues pertaining to the use of CFM, MPM, or CFM/MPM. While the effectiveness of these measures in reducing the volatility of capital flows or systemic risks is an important factor to those making policy decisions, other impacts on the real economy should be considered as well. Indeed, the IMF always emphasizes that CFM, MPM, or CFM/MPM cannot replace necessary macroeconomic adjustments. In this regard, studying how to coordinate these measures with other monetary or fiscal policies is one important avenue of future research.

## REFERENCES

**Acharya, V. V. 2009.** "A theory of Systemic Risk and Design of Prudential Bank Regulation," *Journal of Financial Stability*, 5(3): 224-255.

**Acharya, V. V., L. H. Pedersen, T. Philippon, M. Richardson. 2017.** "Measuring Systemic Risk," *Review of Financial Studies*, 30(1): 2-47.

**Ahn, J., Y. Kim, and H. Lim. 2022.** "For Whom the Levy Tolls: the Case of a Macroprudential Stability Levy in South Korea," *IMF Economic Review*, 70(3): 520-559.

**Akinci, O. and J. Olmstead-Rumsey. 2018.** "How Effective are Macroprudential Policies? An Empirical Investigation," *Journal of Financial Intermediation*, 33(C): 33-57.

**Asiedu, E. and D. Lien. 2004.** "Capital Controls and Foreign Direct Investment," *World Development*, 32(3): 479-490.

**Bacchetta, P., R. Cordonier, and O. Merrouche. 2023.** "The Rise in Foreign Currency Bonds: the Role of US Monetary Policy and Capital Controls," *Journal of International Economics*, 140(C), 103709.

**Balla, E. and A. B. McKenna. 2009.** "Dynamic Provisioning: a Countercyclical Tool for Loan Loss Reserves," *FRB Richmond Economic Quarterly*, 95(4): 383-418.

**Bekiros, S., R. Nilavongse, and G. S. Uddin. 2020.** "Expectation-driven House Prices and Debt Defaults: the effectiveness of MOnetary and Macroprudential Policies," *Journal of Financial Stability*, 49(C), 100760.

**Benigno, G., H. Chen, C. Otrok, A. Rebucci, and E. R. Young. 2013.** "Financial Crises and Macro-Prudential Policies," *Journal of International Economics*, 89(2): 453-470.

**Bianchi, J. 2011.** "Overborrowing and Systemic Externalities in the Business Cycle," *American Economic Review*, 101(7): 3400-3426.

**Bisias, D., M. Flood, A. W. Lo, and S. Valavanis. 2012.** "A Survey of Systemic Risk Analytics," *Annual Review of Financial Economics*, 4(1): 255-296.

**Blundell-Wignall, A. and C. Roulet. 2014.** "Macro-prudential Policy, Bank Systemic Risk and Capital Controls," *OECD Journal: Financial Market Trends*, 2013(2): 7-28.

**Borio, C. 2011.** "Implementing a Macroprudential Framework: Blending Boldness and REalism," *Capitalism and Society*, 6(1): 1-25.

**Braouezec, Y. and L. Wagalath. 2018.** "Risk-based Capital Requirements and Optimal Liquidation in a Stress Scenario," *Review of Finance*, 22(2): 747-782.

**Brownlees, C. and R. F. Engle. 2017.** "SRISK: A Conditional Capital Shortfall Measure of Systemic Risk," *Review of Financial Studies*, 30(1): 48-79.

**Bruno, V. and H. S. Shin. 2014.** "Assessing Macroprudential Policies: Case of South Korea," *Scandinavian Journal of Economics*, 116(1): 128-157.

**Cerutti, E., S. Claessens, and L. Laeven. 2017.** "The Use and Effectiveness of Macroprudential Policies: New Evidence," *Journal of Financial Stability*, 28(C): 203-224.

**Chamon, M. and M. Garcia. 2016.** "Capital Controls in Brazil: Effective?" *Journal of International Money and Finance*, 61(C): 163-187.

**Chinn, M. D. and H. Ito. 2006.** "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics*, 81(1): 163-192.

**Chinn, M. D. and H. Ito. 2008.** "A New Measure of Financial Openness," *Journal of Comparative Policy Analysis: Research and Practice*, 10(3): 309-322.

**Claessens, S. 2015.** "An Overview of Macroprudential Policy Tools," *Annual Review of Financial Economics*, 7(1): 397-422.

**Cordero, J. A. and J. A. Montecino. 2010.** "Capital Controls and Monetary Policy in Developing Countries," Working Paper, Center for Economic and Policy Research.

**Costinot, A., G. Lorenzoni, and I. Werning. 2014.** "A Theory of Capital Controls as Dynamic terms-of-trade Manipulation," *Journal of Political Economy*, 122(1): 77-128.

**Dávila, E. and A. Korinek. 2018.** "Pecuniary Externalities in Economies with Financial Frictions," *Review of Economic Studies*, 85(1): 352-395.

**Davis, J. S. and M. B. Devereux. 2019.** "Capital Controls as Macro-prudential Policy in a Large Open Economy," NBER Working Paper, 25710.

**Dornbusch, R. 2002.** "Malaysia's Crisis: Was It Different?" NBER Working Paper, 10641.

**Edwards, S. 1998.** "Capital Flows, Real Exchange Rates, and Capital Controls: Some Latin American Experiences," NBER Working Paper, 6800.

**Edwards, S. 1999.** "How Effective Are Capital Controls?" *Journal of Economic Perspectives,* 13(4): 65-84.

**Engle, R. 2018.** "Systemic Risk 10 Years Later," *Annual Review of Financial Economics*, 10(1): 125-152.

**Erten, B., A. Korinek, and J. A. Ocampo. 2021.** "Capital Controls: Theory and Evidence," *Journal of Economic Literature*, 59(1): 45-89.

**Farhi, E. and I. Werning. 2014.** "Dilemma Not Trilemma? Capital Controls and Exchange Rates with Volatile Capital Flows," *IMF Economic Review*, 62(4): 569-605.

**Fernández, A., M. W. Klein, A. Rebucci, M. Schindler, and M. Uribe. 2016.** "Capital Control Measures: A New Dataset," *IMF Economic Review*, 64(3): 548-574.

**Forbes, K. J. 2007.** "One Cost of the Chilean Capital Controls: Increased Financial Constraints for Smaller Traded Firms," *Journal of International Economics*, 71(2): 294-323.

**Forbes, K. J. 2021.** "The International Aspects of Macroprudential Policy," *Annual Review of Economics*, 13(1): 203-228.

**Forbes, K., M. Fratzscher, T. Kostka, and R. Straub. 2011.** "Bubble thy Neighbor: Direct and Spillover Effects of Capital Controls," Working Paper, 12th Jacques Polak Annual Research Conference.

**Forbes, K., M. Fratzscher, and R. Straub. 2015.** "Capital-flow Management Measures: What are They Good for?" *Journal of International Economics*, 96(S1): S76-S97.

**Frost, J., H. Ito, and R. Van Stralen. 2020.** "The Effectiveness of Macroprudential Policies and Capital Controls against Volatile Capital Inflows," Working Paper, De Nederlandsche Bank.

**Galati, G. and R. Moessner. 2013.** "Macroprudential Policy–a Literature Review," *Journal of Economic Surveys*, 27(5): 846-878.

**Galati, G. and R. Moessner. 2018.** "What do We Know about the Effects of Macroprudential Policy?" *Economica*, 85(340): 735-770.

**Gallagher, K., S. Griffith-Jones, and J. A. Ocampo. 2011.** "Capital Account Regulations for Stability and Development: A New Approach," Working Paper, Boston University.

**Gambacorta, L. and A. Murcia. 2020.** "The Impact of Macroprudential Policies in Latin America: An Empirical Analysis Using Credit Registry Data," *Journal of Financial Intermediation*, 42(C), 100828.

**Gertler, M. and N. Kiyotaki. 2015.** "Banking, Liquidity, and Bank Runs in an Infinite Horizon Economy," *American Economic Review*, 105(7): 2011-43.

**Girardi, G. and A. T. Ergün. 2013.** "Systemic Risk Measurement: Multivariate GARCH Estimation of CoVaR," *Journal of Banking and Finance*, 37(8): 3169-3180.

**Hahm, J. H., H. S. Shin, and K. Shin. 2013.** "Noncore Bank Liabilities and Financial Vulnerability," *Journal of Money, Credit and Banking*, 45(1): 3-36.

**Horváth, B. L. and W. Wagner. 2017.** "The Disturbing Interaction between Countercyclical Capital Requirements and Systemic Risk," *Review of Finance*, 21(4): 1485-1511.

**Huang, X., H. Zhou, and H. Zhu. 2012.** "Assessing the Systemic Risk of a Heterogeneous Portfolio of Banks During the Recent Financial Crisis," *Journal of Financial Stability*, 8(3): 193-205.

**Igan, D., A. Mirzaei, and T. Moore. 2023.** "Does Macroprudential Policy Alleviate the Adverse Impact of COVID-19 on the Resilience of Banks?" *Journal of Banking and Finance,* 147(C), 106419.

**IMF. 2014.** "Chapter 4 – Macroprudential Policy and Capital Flow Measures in Asia: Use and EFfectiveness," *Regional Economic Outlook: Asia and Pacific*, Washington D.C.: The International Monetary Fund.

**Jeanne, O. and A. Korinek. 2020.** "Macroprudential Regulation Versus Mopping up after the Crash," *Review of Economic Studies*, 87(3): 1470-1497.

**Jiménez, G., S. Ongena, J. L. Peydró, and J. Saurina. 2017.** "Macroprudential Policy, Countercyclical Bank Capital Buffers, and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments," *Journal of Political Economy*, 125(6): 2126-2177.

**Jordà, Ò. 2005.** "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review*, 95(1): 161-182.

**Kahou, M. E. and A. Lehar. 2017.** "Macroprudential Policy: A Review," *Journal of Financial Stability*, 29(C): 92-105.

**Keller, L. 2019.** "Capital Controls and Risk Misallocation: Evidence from a Natural Experiment," Working Paper, University of Pennsylvania.

**Korinek, A. and D. Sandri. 2016.** "Capital Controls or Macroprudential Regulation?" *Journal of International Economics,* 99(S1): S27-S42.

**Laeven, L., L. Ratnovski, and H. Tong. 2016.** "Bank Size, Capital, and Systemic Risk: Some International Evidence," *Journal of Banking and Finance*, 69(S1): S25-S34.

**Lambert, F. J., J. Ramos-Tallada, and C. Rebillard. 2011.** "Capital Controls and Spillover Effects: Evidence from Latin-American Countries," Working Paper, Banque de France.

**Lehar, A. 2005.** "Measuring Systemic Risk: A Risk Management Approach," *Journal of Banking and Finance,* 29(10): 2577-2603.

**Lim, C. H., A. Costa, F. Columba, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel, and X. Wu. 2011.** "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences," Working Paper, International Monetary Fund.

**Ma, C. 2020.** "Financial Stability, Growth and Macroprudential Policy," *Journal of International Economics,* 122(C), 103259.

**Magud, N. E., C. M. Reinhart, and K. S. Rogoff. 2018.** "Capital Controls: Myth and Reality," *Annals of Economics and Finance*, 19(1): 1-47.

**Mendoza, E. G. 2002.** "Credit, Prices, and Crashes: Business Cycles with a Sudden Stop," NBER Working Paper, 10641.

**Mendoza, E. G. 2010.** "Sudden Stops, Financial Crises, and Leverage," *American Economic Review*, 100(5): 1941-1966.

**Morgan, P. J., P. J. Regis, and N. Salike. 2019.** "LTV Policy as a Macroprudential Tool and its Effects on Residential Mortgage Loans," *Journal of Financial Intermediation*, 37(C): 89-103.

**Neely, C. J. 1999.** "An Introduction to Capital Controls," *Federal Reserve Bank of St. Louis Review*, 81(C): 13-30.

**Norring, A. 2022.** "Taming the Tides of Capital: Review of Capital Controls and Macroprudential Policy in Emerging Economies," Working Paper, Bank of Finland.

**Oh, F. D. 2022.** "Central Bank Transparency and Contagious Currency Crises," Working Paper, Korea Advanced Institute of Science and Technology.

**Ono, A., H. Uchida, G. F. Udell, and I. Uesugi. 2021.** "Lending Pro-cyclicality and Macroprudential Policy: Evidence from Japanese LTV Ratios," *Journal of Financial Stability*, 53(C), 100819.

**Ostry, J. D., A. R. Ghosh, M. Chamon, and M. S. Qureshi. 2012.** "Tools for Managing Financial-stability Risks from Capital Inflows," *Journal of International Economics*, 88(2): 407-421.

**Ostry, J. D., A. R. Ghosh, K. Habermeier, M. Chamon, M. S. Qureshi, and D. Reinhardt. 2010.** "Capital Inflows: the Role of Controls," Working Paper, International Monetary Fund.

**Pasricha, G. K., M. Falagiarda, M. Bijsterbosch, and J. Aizenman. 2018.** "Domestic and Multilateral Effects of Capital Controls in Emerging Markets," *Journal of International Economics,* 115(C): 48-58.

**Punzi, M. T. and K. Rabitsch. 2018.** "Effectiveness of Macroprudential Policies under Borrower Heterogeneity," *Journal of International Money and Finance*, 85(C): 251-261.

**Rebucci, A. and C. Ma. 2020.** "Capital Controls: a Survey of the New Literature," NBER Working Paper 26558.

**Rey, H. 2015.** "Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence," Working Paper, National Bureau of Economic Research.

**Schmitt-Grohé, S. and M. Uribe. 2016.** "Downward Nominal Wage Rigidity, Currency Pegs, and Involuntary Unemployment," *Journal of Political Economy*, 124(5): 1466-1514.

**Tarashev, N. A., C. E. Borio, and K. Tsatsaronis. 2010.** "Attributing Systemic Risk to Individual Institutions," Working Paper, Bank for International Settlements.

**Tavman, Y. 2015.** "A Comparative Analysis of Macroprudential Policies," Oxford Economic Papers 67(2): 334-355.

**Wong, T. C., T. Fong, K. F. Li, and H. Choi. 2011.** "Loan-to-value Ratio as a Macroprudential tool-Hong Kong's Experience and Cross-country Evidence," Working Paper, Hong Kong Monetary Authority.

**Yun, Y. 2022.** "Cross-border Bank Flows through Foreign Branches and the Effect of a Macroprudential Policy," *Pacific Economic Review*, 27(2): 83-104.

**Zeev, N. B. 2017.** "Capital Controls as Shock Absorbers," *Journal of International Economics*, 109(C): 43-67.

*KDI Journal of Economic Policy 2023, 45(4):23-56*
*https://dx.doi.org/10.23895/kdijep.2023.45.4.23*

# From Miracle to Mediocrity? Explaining the Growth Slowdown of the Korean Economy

*By* DUYONG KANG AND SUNGKEUN PARK*

*To investigate the causes of Korea's growth slowdown over the past thirty years, we estimate the contributions of major developmental factors, including i) demographic factors (changes in population growth and workforce age due to the demographic transition), ii) quality-of-life-related choice factors (changes in working hours, education, and the female employment rate), iii) structural change, and iv) the effects of productivity catch-up. Our estimates show that these four groups of factors account for approximately 90 percent of the growth slowdown, with demographic factors contributing approximately 30 percent and the other three groups of factors each contributing about 20 percent. We also show that the same factors explain most of Korea's high growth in the 1980s. These results suggest that Korea's growth slowdown is basically a consequence of its successful economic development and that the high growth and subsequent slowdown can be regarded as a single process. In addition, given that the factors examined here exhibit similar patterns of change in the course of economic development of most countries, we think that our estimation results of the relationship between economic development and changes in economic growth trends could have more general implications that go beyond Korea's experience.*

Key Words: Economic Growth, Slowdown, Korean Economy, Economic Development
JEL Code: O47, O11, O53

## I. Introduction

During the thirty years from 1960 to 1990, the Korean economy grew at an average annual rate of 9.5 percent. However, since the early 1990s, a growth

* Kang: Senior Research Fellow, Korea Institute for Industrial Economics and Trade (First author, E-mail: dykang@kiet.re.kr); Park: Research Fellow, Korea Institute for Industrial Economics and Trade (E-mail: sungpark@kiet.re.kr)
* Received: 2023. 5. 30.
* Referee Process Started: 2023. 6. 5.
* Referee Reports Completed: 2023. 8. 6.

slowdown began to manifest, and the trend growth rate has continued to decline. During the 1980s, the peak of high growth, the Korean economy grew at an average annual rate of 10.0 percent. Thirty years later, in the 2010s, the average annual GDP growth rate of the Korean economy was 2.6 percent. That is, the growth rate of the Korean economy has decreased by approximately 7 percentage points over the past 30 years. Even the per capita GDP growth rate fell by more than 6 percentage points from 8.7 to 2.1 percent during the same period. The growth slowdown of the Korean economy is as impressive as its high growth in terms of scale.

Many in Korea are concerned about this sharp growth slowdown, considering it a growth crisis.[1] Although such concerns are understandable, as high growth has a developmental background, growth slowdown from high growth seems inevitable to some extent as the economy develops. Accordingly, before considering the growth slowdown as a crisis, it is necessary to ascertain how much of the slowdown is attributable to socioeconomic maturation stemming from economic development, through detailed research on the causes of the growth slowdown.

Such a study would be meaningful not just from a practical or policy point of view. Although many studies have examined the high growth of East Asian economies, including Korea, there is relatively less interest in and research on growth slowdowns in these economies after the end of their high growth.[2] However, looking into the causes of growth slowdown after high growth may provide new perspectives and information pertaining to factors that made the high growth possible. Additionally, the growth slowdown in Korea (and in East Asia's high-growth economies) is worth studying as the most dramatic case of the convergence of economic growth and a productivity slowdown observed in advanced economies since the 1970s. Given that the scale of the slowdown is much greater, such a study provides an opportunity to examine these phenomena as if looking through a magnifying glass. Therefore, examining the background of the slowdown in the Korean economy can contribute to broadening our understanding of such phenomena. Doing so may also help others to predict the future of an economy that is currently industrializing or is in the early stage of a growth slowdown, such as the Chinese economy.

[1]See, for example, Kim (2016).

[2]Studies focusing on growth slowdowns in high-growth economies include the following. First, Eichengreen *et al*. (2012a, 2012b, and 2016) examined the relationship between growth slowdowns and income levels. They did not investigate the causes of the growth slowdown, but they pointed out that the slowdown is highly correlated with several factors such as the demographic structure, consumption rate, exchange rate, education level, and product structure of exports. Next, regarding studies of the growth slowdown in the Japanese economy, Yoshikawa (1992) examined the end of high growth in the 1970s, and Hayashi and Prescott (2003) investigated the causes of the slowdown in the 1990s. The causes of the slowdown were discussed in terms of a Lewis turning point and the maturation of durable goods consumption in Yoshikawa (1992) and in terms of the slowdown in TFP growth in Hayashi and Prescott (2003). As for studies of Korea's growth slowdown, Han and Shin (2008) and Seok and Lee (2021) examined the causes of the slowdown using growth accounting, while Eichengreen *et al*. (2012) and Han and Lee (2020) also analyzed Korean economic growth mainly through growth accounting, taking into account the slowdown. Kang (2001 and 2009) investigated the role of structural change during the 1990s slowdown, and Kim (2016) argued that stagnation of human capital and technological progress were the causes of the growth slowdown. On the other hand, although not focusing on high-growth economies, there are studies of productivity slowdowns of advanced economies in the 1970s (Maddison 1987, Nordhaus 2004), studies of the US growth slowdown (Gordon 2016, Antolin-Diaz *et al*, 2016), and theoretical studies deriving the possibility of a long-term growth slowdown from multi-sector models (Baumol 1967, Echevarria 1997, and Duernecker *et al*. 2021). Convergence is also linked to growth slowdowns, but it appears that this subject is approached more often from the perspective of cross-sectional differences in economic growth than from the perspective of temporal changes in economic growth.

For such purposes, we examine in this study the causes of the growth slowdown in the Korean economy, focusing on the developmental aspects of long-term growth changes. Considering the purpose of this study, instead of growth accounting, commonly used in similar studies, we choose an approach that focuses on changes that are widely observed over the course of the economic development of most countries and that are expected to have distinct temporal trends. We then estimate the contribution of these changes (factors) to the growth slowdown in the Korean economy. We believe that this method can provide a more fundamental explanation of the causes of growth slowdown than, for example, an analysis that relies on growth accounting.[3]

The factors focused on here fall into four main categories: demographic factors, quality-of-life-related choice factors, structural change, and the effects of the productivity catch-up.

First, with industrialization and economic development, most countries undergo demographic changes, referred to as a demographic transition. A demographic transition refers to a phenomenon in which both fertility and death rates fall, with the population growth rate therefore temporarily rising and then gradually decreasing and with life expectancy increasing.[4] Such demographic changes can cause a slowdown in economic growth by slowing population growth and leading to an aging workforce.

Second, with industrialization and its attendant income growth, working hours tend to decrease and both years of education and the employment rate (particularly for women) increase. An increase in the number of years of education or an increase in the employment rate of women can contribute to economic growth, but because these factors have an obvious upper limit, they can also factor into a slowing growth rate. We group these three factors and refer to them as quality-of-life-related choice factors.

Third, most countries undergo structural changes in a similar pattern over the course of their industrialization: the employment share of agriculture decreases, the share of service increases, and the manufacturing share exhibits an inverted U-shaped change. Additionally, in a form common to most countries, cross-sectoral differences in productivity levels (especially between agricultural and nonagricultural sectors) and productivity growth rates (especially between services and goods production sectors) are observed. Through these differences in sectoral productivity levels and growth rates, structural change affects the aggregate productivity growth rate. Because East Asian countries, including Korea, have experienced what has been termed compressed industrialization, it is highly likely that the impact of structural changes on economic growth was much greater in these countries as they industrialized.

Finally, we note that latecomers' productivity growth slows as these countries catch up in terms of productivity with advanced economies. Industrialization latecomers tend to demonstrate faster productivity growth than advanced economies

[3]The reason for choosing this method and the specifics of our analysis method will be explained in Section II-A.

[4]According to Smil (2019), "the demographic transition was conceptualized by Warren Thompson (1929), called first a "demographic transition" by Landry (1934), and received its standard formulations from Notestein (1945) and Davis (1945)." (Smil (2019), p.317.)

due to the advantage of backwardness. However, once the latecomer catches up with the advanced economies, the advantage of backwardness fades, and productivity growth slows. Korea is a representative example of this productivity catch-up. In the 1960s, wigs and plywood were the main export items, but it has now transformed into an economy with world-class technological prowess in high-tech fields such as semiconductors.

Of the four categories of factors, demographic factors and quality-of-life-related choice factors affect economic growth through changes in the quantity and quality of labor input, and structural changes and the productivity catch-up effect affect economic growth through labor productivity. In this study, we estimate the effects of these factors on the growth slowdown of the Korean economy. In addition, as an application of this estimation, we also investigate the roles of related factors in the high growth of the Korean economy.

The organization of this paper is as follows. In Section II, we explain the main methodology, the data, and the analysis period. Section III examines changes in labor input and the contributions of related factors, and Sections IV and V estimate the contributions of structural change and the productivity catch-up effect, respectively. Section VI is a brief discussion of the residuals. Section VII summarizes the main results from Sections III to VI and examines the role of the same factors in Korea's high growth using the same method. Finally, we conclude the paper in Section VIII.

## II. Methodology, Data, and Analysis Period

### A. *Methodology*

This subsection describes the background against which the analytical method used in this paper was considered, as well as the specifics of the method itself.

Research into the causes of changes in economic growth can be conducted by estimating the contributions of factors assumed to be the causes. Potential candidates would include changes in the factors constituting the production function, and a representative method related to this is growth accounting. The decomposition of economic growth into the contributions of inputs and productivity through growth accounting is the most common method used in empirical studies of (changes in) economic growth. While this form of decomposition provides useful information, it has a significant limitation as an explanation of the causes of (changes in) economic growth. Because growth accounting is "a mechanical decomposition of the growth of output into growth of inputs and growth of TFP" and "does not attempt to explain how the changes in inputs and the improvements in TFP relate to elements that can be reasonably viewed as fundamentals" (Barro and Sala-i-Martin (1995), p.352), it "is not explaining the underlying causes of growth" (OECD (2001), p.21).

For example, if the growth slowdown of the Korean economy over the past thirty years is analyzed using growth accounting, it is estimated that the growth rate of labor input slowed by 3.8 percentage points, the growth rate of capital input slowed by 7.6 percentage points, and the growth rate of TFP decreased by 1.4 percentage points, with these figures accounting for the 6.8 percentage point slowdown in

economic growth.[5] However, this is hardly a satisfactory explanation of the causes of the growth slowdown. Explaining the growth slowdown through the slowdown in production factors and productivity is similar to explaining the cause of a patient's weight change through the change in the weight of each component of the body. While such an explanation provides some useful information, it is certainly not an explanation of the underlying cause of the phenomenon. The most satisfying explanation of the cause of a phenomenon, or the most fundamental explanation, would be one that leaves no questions requiring further elucidation.

The above description of the growth slowdown begs the question as to why the Korean economy experienced such a slowdown in labor, capital, and TFP growth. In that sense, a method that focuses on developmental factors can provide a more fundamental explanation. First, as will be seen later, the developmental factors investigated here explain the slowdown in factor input or productivity to a considerable extent. In addition, developmental factors such as a demographic transition, changes in education and working hours, changes in industrial structure due to industrialization, and a slowdown in productivity growth due to catch-up effects have been empirically confirmed through the experience of economic development of many countries, and the reasons for why they occur are well understood. Therefore, if it is shown that such developmental factors account for a significant part of the growth slowdown in the Korean economy, this would offer a more fundamental explanation that minimizes unexplained questions. Against this backdrop, we chose a method that focuses on developmental factors and estimated the contribution of these factors to the growth slowdown in the Korean economy.

Meanwhile, given that developmental factors affect economic growth through changes in factor input or productivity, it is necessary first to decompose economic growth into production factors and productivity in order to estimate the contributions of developmental factors. To this end, we chose here a decomposition process based on the neoclassical growth theory, which decomposes economic growth into labor input growth and productivity growth. Although growth accounting can also be considered as a decomposition method, we judged that decomposition based on growth theory is more appropriate for estimating the contribution of developmental factors for the following reasons.

First, growth accounting does not consider the endogeneity of capital and has the weakness of overestimating the contribution of capital and underestimating the contribution of productivity when technological progress is not Hicks-neutral but labor-augmenting.[6] This issue can be a greater weakness in the type of estimation

[5]As will be explained in Section II-C, we investigate the growth slowdown by comparing the average growth from 1980 to 1990 with the average growth from 2008 to 2018. Korea's economic growth rate slowed from an annual average of 10 percent in the 1980s to an annual average of 3.2 percent from 2008 to 2018. During the same period, the labor input growth rate slowed from 4.1 percent to 0.3 percent, capital input slowed from 11.4 percent to 3.8 percent, and the TFP growth rate fell from 2.6 percent to 1.2 percent. Labor input is based on efficiency units, and the estimation method is explained in Section III. For capital input, Bank of Korea data on productive capital stock was used. For the factor income share used in calculating TFP, Bank of Korea data on domestic factor income was used. The factor income share was obtained excluding mixed income, and for years in which there is no mixed income data, mixed income was estimated by applying the ratio of mixed income to household operating surplus for the nearest year for which data exist.

[6]Since "growth accounting treats all capital formation as a wholly exogenous explanatory factor, it tends to overstate the role of capital and understate the role of innovation in the growth process" (Hulten 2000, p.34). See also "Limitations of Growth Accounting" in Barro and Sala-i-Martin (1995), p.352. Rhymes (1971) and Hulten

discussed here. Because this study deals with a relatively long-term growth change over thirty years and attempts to explain the changes in factor input and productivity in terms of developmental factors, consideration of the endogeneity of capital[7] or the possibility of labor-augmenting technological progress[8] is important. If the purpose of the analysis is to obtain information about the contribution of capital or TFP, decomposition based on growth accounting may be reasonable despite such limitations. However, our ultimate concern is information about the contributions of developmental factors, and the decomposition of economic growth into the growth of factor inputs is just an intermediary analysis to estimate the contributions of developmental factors. In addition, if the analysis is accurate, the estimated results of the contributions of developmental factors should be the same regardless of which decomposition method is selected. Accordingly, there is no reason to choose decomposition based on growth accounting, which has the weaknesses described above and which is relatively more complicated.

Second, the relationship between developmental factors and production factors or productivity is clearer in the decomposition based on growth theory than in decomposition based on growth accounting. It is obvious that the demographic transition and changes in education and working hours affect labor input, while structural change and the productivity catch-up effect affect labor productivity. Thus, with regard to decomposition based on growth theory, the relationship between developmental factors and the factors of economic growth is straightforwardly evident. On the other hand, for decomposition based on growth accounting, labor productivity growth is further decomposed into capital deepening and TFP growth. In this case, it is far less clear how structural change and the productivity catch-up effect relate to capital deepening and TFP, respectively. It is likely that both structural change and the productivity catch-up effect will affect both capital deepening and TFP. However, finding an appropriate way to estimate their relationship would likely prove very difficult. Even if an appropriate method can be determined, the estimation will be much more complex than the estimation of the contributions of structural change and the productivity catch-up effect to labor productivity growth. As mentioned above, if the analysis is correct, the estimated contributions of developmental factors to economic growth will be identical regardless of which decomposition method is chosen. Therefore, it is reasonable to choose decomposition based on growth theory, which has a clearer logical basis and is easier to perform.

Next, we explain how we specifically decompose economic growth to estimate the contributions of developmental factors to the growth slowdown. More detailed explanations pertaining to the method of estimation will be given again in the

(1975) also addressed the same issue. This underestimation problem can be more serious in the case of East Asian high growth, where capital growth rate and capital income share are significantly higher than other economies. For example, according to Hulten and Srinivasan (1999), the growth contribution of technological progress in East Asian growth is estimated to be 1.5 times larger when assuming Harrod neutral technological progress than the conventional TFP estimation assuming Hicks neutral technological progress.

[7]Unlike labor, because capital is "a produced factor of production" (Samuelson and Nordhaus (2005), p.33), it has strong endogeneity.

[8]Kaldor's stylized facts of economic growth and steady-state growth are compatible with Harrod-neutral technological progress, not Hicks-neutral technological progress.

sections dealing with the estimation of each factor.

As mentioned above, decomposition of economic growth used here is based on the neoclassical growth model, in which the long-term economic growth rate is determined by the labor input growth rate and exogenously determined technological progress, with capital input growth endogenously determined by these two factors. First, changes in the effective labor input are decomposed into changes in labor quantity and changes in labor quality. The measurement of labor quality is based on the Mincer equation in Mincer (1974), where the quality of labor is determined by education and skill (experience), and the skill level of workers is expressed as a function of the age structure of the workers. Thus, the quality of labor is measured here using the effect of education and the effect of the workers' age structure, and the rate of change in the quality of labor is decomposed as follows:

(1) the rate of change in the quality of labor = the contribution of education effect + the contribution of the workers' age effect.

Meanwhile, the growth rate of labor quantity is the sum of the growth rate of the number of workers and the rate of change in the average working hours, and the former is in turn the sum of the growth rate of the working-age population and the rate of change in the employment rate. Thus, the labor quantity change is decomposed as follows:

(2) the rate of change in the quantity of labor = the working age population growth rate + the rate of change in the employment rate + the rate of change in the average working hours.

Therefore, the effective labor input growth rate is decomposed into the working-age population growth rate, the rate of change in the employment rate, the rate of change in the average working hours, the effect of changes in education, and the effect of changes in the age structure of workers. Here, we will refer to the changes in working-age population growth and the age structure of workers as demographic factors, and the remainder (that is, changes in employment rate, working hours, and education) as quality-of-life-related choice factors.

Regarding the factors that affect labor productivity growth, we focus on structural change and the productivity catch-up effect (or changes in the advantage-of-backwardness effect), considering their relevance to economic development. Because the structural change effect only affects aggregate productivity, with the productivity of individual industries given,[9] and the productivity catch-up effect is defined here as the effects on the productivity of individual industries, the two effects are independent of each other.

Therefore, the labor productivity growth rate is decomposed into the structural change effect, the advantage-of-backwardness effect, and a residual not explained by these two factors. As will be explained in Section IV, the structural change effect again consists of the Baumol effect and the Denison effect.

[9]See equations (10) and (11) in Section IV.

To summarize, the above decomposition can be expressed as the following equation (3):

(3) Economic growth rate = effective labor input growth rate + productivity growth rate = quantitative labor input growth rate + qualitative labor input growth rate + structural change effect + advantage-of-backwardness effect + residual = working-age population growth rate + rate of change in employment rate + rate of change in working hours + contribution of education effect + contribution of workers' age effect + Baumol effect + Denison effect + advantage-of-backwardness effect + residual

We reconstruct equation (3) according to the four categories of factors mentioned in the introduction and obtain equation (4).

(4) $\Delta$ economic growth rate = [ $\Delta$ working-age population growth rate + $\Delta$ contribution of workers' age effect] + [ $\Delta$ rate of change in employment rate + $\Delta$ rate of change in working hours + $\Delta$ contribution of education effect] + [ $\Delta$ Baumol effect + $\Delta$ Denison effect] + $\Delta$ advantage-of-backwardness effect + $\Delta$ residual (where $\Delta$ denotes the difference operator) = contribution of demographic changes + contribution of quality-of-life-related choice factors + contribution of structural change + contribution of productivity catch-up effect + residual.

Equations (3) and (4) are the decomposition equations of economic growth (or growth change) focusing on the developmental aspect of economic growth. Based on equation (4), we will estimate the contribution of each factor to the growth slowdown of the Korean economy.

## B. *Data*

We mainly use Korean data in this paper, as we investigate the Korean economy. The Korean data used in this paper are primarily those of the Bank of Korea (ECOS) and the National Statistical Office (Statistics Korea). Additionally, OECD, Conference Board, and Penn World Table 10.0 data were also used for some international comparisons.

First, the national account data of the Bank of Korea were used for Korea's GDP and value-added by industry. Data from the Economically Active Population Survey of the National Statistical Office (hereinafter referred to as "EAPS") were used for the number of workers, working hours, the number of years of education, and the age composition of workers. Regarding the number of years of education and the age structure of workers, as only data on the overall industry average exist in EAPS, we assumed that education and the age of workers in each industry would be identical to the overall industry average. For working hours by industry, given that only data after 2000 exist in EAPS, we calculated pre-2000 working hours by industry from data on working hours by industry in 2000, the average working hours of the entire economy each year, and the number of workers by industry for each year. For this,

we assumed that the annual rate of change of average working hours by industry before 2000 would be identical in all industries and calculated the common annual rate of change which makes, for example, the weighted average of the product of working hours by industry in 2000 and the common rate of change weighted by the number of workers by industry in 1999 equal to the average working hours of the entire economy in 1999. Although there is some time-series break in the data on the number of workers by industry in EAPS, because the difference is insignificant in the industry classification and in the time period covered in this study, these differences were disregarded.

In the estimation of the productivity catch-up effect, because an international comparison of productivity by industry is required, we used OECD STAN data, the Conference Board's international comparison data for manufacturing productivity, and Penn World Table data (PWT 10.0). For manufacturing productivity, the Conference Board data were mainly used as this dataset provides the longest time series. For productivity in other industries, OECD STAN data were used, and for labor quality (education) data, PWT data were used. A detailed explanation of the data used to estimate the productivity catch-up effect by industry is given in the appendix.

### C. *Analysis Period*

To examine the growth slowdown, it is necessary to compare the trend growth rates at two points in time. Here, we use a ten-year average growth rate as the trend growth rate. The HP filter seems inappropriate in our study due to its end point bias problem.

Given that this study addresses a growth slowdown, it would be better to compare the peak of the past growth trend or the trend growth rate just before the start of a significant slowdown with the most recent trend growth rate.

As of the time of the writing of this paper, data on the annual GDP of the Korean economy are available from 1953 to 2020 and data on the number of workers by industry are available from 1963 to 2020. Therefore, data for per-worker GDP exist from 1963 to 2020. Looking at the trend growth rate of per-worker GDP during this period, we find that it exhibits a pattern close to an inverted U-shape, peaking in the 1980s and then showing a downward trend (see Table 1). Based on the ten-year average growth rate, the per-worker GDP growth rate peaked (7.3 percent) between 1981 and 1991 and has since shown a downward trend. The per capita GDP growth rate was highest (9.2 percent) between 1967 and 1977 and second highest (9.1 percent) between 1981 and 1991 and has since been on the decline. For reference, the average growth rate from 1980 to 1990 is 8.7 percent in terms of per capita GDP and 7.0 percent in terms of per worker GDP. In short, both the per capita GDP growth rate and the per worker GDP growth rate peaked during the period from 1980 to the early 1990s and then continued to decline.

Therefore, we compare the average growth rate of the period from 1980 to 1990 with a more recent trend growth rate. For the latter, we choose the average growth rate of the period from 2008 to 2018 for the following three reasons. First, 2020 can be regarded as an outlier in that during that year a severe economic recession occurred due to the COVID-19 pandemic. Second, in a similar context, the period

from 2009 to 2019 is also inappropriate given that 2009 featured another recession due to the global financial crisis.[10] Third, it was taken into account that most of the OECD, Conference Board, and PWT data include data up to 2018.

TABLE 1—GROWTH RATES OF THE KOREAN ECONOMY

(Annual Average, %)

| | 1960~70 | 1970~80 | 1980~90 | 1990~00 | 2000~10 | 2010~20 |
|---|---|---|---|---|---|---|
| GDP | 9.5 | 9.3 | 10.0 | 7.1 | 4.7 | 2.6 |
| Per capita GDP | 6.8 | 7.4 | 8.7 | 6.1 | 4.1 | 2.1 |
| Per worker GDP | 7.0* | 5.5 | 7.0 | 5.4 | 3.4 | 1.4 |

*Note*: * 1963~70 annual average growth rate.

*Source*: The Bank of Korea ECOS, National Statistical Office KOSIS.

## III. Changes in Labor Input Growth and Causes

For starters, let us look at the quantitative labor input growth of Korea. As explained in the previous section, quantitative labor input growth is decomposed into the working-age population growth, the rate of change in the employment rate, and the rate of change in average working hours.

The annual growth rate of the working-age population in Korea exceeded 3 percent in the mid-1970s, but since then it has continued to decline. Korea currently has the lowest fertility rate in the world, and the working-age population is decreasing. The downward trend in the growth rate of the working-age population is due to the demographic transition, as explained in the introduction to this paper.

On the other hand, the employment rate in Korea continues to rise. The rise in the employment rate is mainly due to the rise of women's participation in economic activities. During the last forty years, the employment rate for women in Korea rose by about 20 percentage points. Meanwhile, average working hours in Korea are decreasing, and the speed of the decrease is accelerating.

Next, let us look at the qualitative change in labor input. As mentioned above, many empirical studies estimating qualitative changes in labor are based on Jacob Mincer's (1974) human capital earning function, which holds that differences in labor quality are reflected in wage differences in the labor market. This function is expressed in the form below,

$$\log I = a + bS + cX + dX^2 + e, \tag{5}$$

where I, S, and X denote per hour earnings, education, and work experience, respectively.

[10]The Korean economy showed a sharp drop in its growth rate in 2009 due to the impact of the global financial crisis and the Great Recession, rebounding sharply in 2010 and regaining the previous trend. (While Korea's average annual growth rate between 2000 and 2010 was 4.7 percent, the economic growth rate was 0.8 percent in 2009 and 6.8 percent in 2010.) Therefore, the average annual growth rate for 2009~19 is highly likely to overestimate the trend growth rate, as the base year 2009 was a year of severe economic recession.

In the estimation of equation (5), the number of years of education and the age of workers are used respectively as indicators of the education level and worker experience. We also follow this tradition and assume that the quality of labor is determined as in equation (6),

$$\text{(6)} \qquad Quality\ of\ labor = e^{\phi(S)+\zeta(X)},$$

where S and X denote the number of years of education and the worker's age, respectively.

First, for the specific functional form of $\phi$, we follow the formula of Psacharopoulos (1994), which is also used in the Penn World Table. The equation presented by Psacharopoulos (1994) is shown below.

$$\text{(7)} \qquad \phi(S) = \begin{cases} 0.134\ S & if\ S \le 4 \\ 0.134 \times 4 + 0.101(S-4) & if\ 4 < S \le 8 \\ 0.134 \times 4 + 0.101 \times 4 + 0.068(S-8) & if\ S > 8 \end{cases}$$

This equation reflects the empirical evidence that primary education makes a greater difference in the quality of work than higher education. In our estimation, S was obtained from data on the number of employed persons by level of education in the EAPS data.

On the other hand, regarding the functional form of $\zeta$ that reflects the skill level from age, there is no formula widely used among researchers, unlike in the case of education, and estimation results vary depending on the research.[11] Here, we refer to the estimates of four previous studies with respect to $\zeta$ : Vollrath (2020), Heckman *et al*. (2003), Feyer (2008), and Aiyar *et al*. (2016).

Vollrath (2020) and Heckman *et al*. (2003) assume a quadratic functional form for $\zeta$, following Mincer (1974). In the case of Vollrath (2020), equation (8) is presented for ζ.

(8) $\zeta(X_i) = 0.05X_i - 0.0007X_i^2$, where $X_i$ denotes the average age of age group i.

The effective labor input (quality of labor) from experience is calculated as $e^{\zeta} = \frac{\sum_i \omega_i e^{\zeta(X_i)}}{\sum_i \omega_i}$, where $\omega_i$ denotes the proportion of age group $i$ among all workers.[12]

[11]For example, work by Murphy and Welch (1990) argues that a quartic function fits the data better than Mincer's quadratic function. Meanwhile, Burtless (2013) maintains that there is little evidence that aging has hurt productivity, unlike other studies mentioned here.

[12]We used data for ten age groups in the EAPS data, with the midpoint age of each group used as $X_i$.

Because the quadratic coefficient in equation (8) has a negative value, productivity (the quality of labor) decreases as workers age. In the case of estimation based on Heckman *et al*. (2003), we use the average of the estimates presented in Table 2 of the paper and take 0.107 and -0.0017 for the linear coefficient and the quadratic coefficient, respectively.[13]

Meanwhile, Feyer (2008) and Aiyar *et al*. (2016) used a method that directly estimates the relationship between the age group and productivity. Feyer (2008) found that workers in their 40s exhibited the highest productivity, and Aiyar *et al*. (2019) found that the greater the proportion of workers aged 55 and older, the lower the productivity, both suggesting that worker aging has a negative effect on productivity.[14]

TABLE 2—EFFECTS OF CHANGES IN THE WORKFORCE AGE STRUCTURE ON KOREA'S EFFECTIVE LABOR INPUT GROWTH AND GROWTH SLOWDOWN

| | 1980~90 (A) | 2008~18 (B) | A – B (%p) |
|---|---|---|---|
| Vollrath (2020) | 0 | -0.4 | 0.4 |
| Heckman *et al*. (2003) | -0.1 | -1 | 0.9 |
| Feyer (2008) | -0.1 | -0.5 | 0.4 |
| Aiyar *et al*. (2016) | -0.1 | -0.2 | 0.1 |

Table 2 shows the contribution of changes in the age structure of the workforce to the Korean economy's effective labor input growth as calculated from the estimates of the four aforementioned studies. The contribution to growth slowdown is estimated to be between 0.1 and 0.9 percentage points. Among these estimates, we choose the estimate based on Vollrath (2020), which is the median value of the four estimates, and hereinafter use this value to represent the contribution of worker aging to the growth slowdown.

The trend of labor quality in the Korean economy from 1980 to 2018 as obtained from equations (6) to (8) shows that while the education effect has continued to increase, with the rate of increase slowing, the skill effect decreases after the 1990s, reflecting workforce aging (Korea is currently one of the most rapidly aging countries). Because the effect of skill (age) is smaller than that of education, the overall quality of labor, combining the two factors, shows an upward trend, with the rate of increase decelerating.

Multiplying the above estimate of qualitative change by the quantitative change yields the change in the total effective labor input. Table 3 summarizes the change in labor input growth for our analysis period. The rate of increase of effective labor inputs fell from an average of 4.1 percent in 1980 to 1990 to 0.3 percent between 2008 and 2018, a decrease of 3.8 percentage points during our analysis period. It is estimated that 1.6 percentage points can be attributed to the slowdown in the growth

[13]Heckman *et al*. (2003) provides 12 estimates (6 for US whites and 6 for blacks) based on six decennial census datasets from 1940 to 1990. We used the average of 12 estimates.

[14]We used the estimates in column 1 of Table 1 in Feyer (2008). With regard to Aiyar (2016), we used the sum of capital deepening estimates and the TFP estimates in Table 4 of the paper.

rate of the number of workers, 1.0 percentage points can be attributed to the reduction in working hours, and 1.1 percentage points can be attributed to the slowdown in the growth rate of labor quality (mainly due to the slowdown in the growth of education levels). The slowdown in the growth rate of the number of workers is almost entirely attributable to the slowdown in the growth of the working-age population. It appears that changes in the employment rate did not factor into the growth slowdown, as the employment rate has remained on an upward trend, similar to that in the high-growth era.

Table 4 is a reorganization of Table 3 according to the category of factors mentioned in equation (4). As shown in Table 4, the contribution of the demographic factors to the slowdown in total effective labor input growth is slightly larger than that of the quality-of-life-related choice factors. The division of changes in working hours into broad and narrow terms is due to the effect of changes in working hours caused by the structural change. Because there are considerably fewer working hours in the agricultural sector compared to those in other industries, the labor shift out of agriculture during industrialization has the effect of increasing the average working hours of the economy. 'Working hours' in a broad sense includes the effect of such a structural change, and 'working hours' in the narrow sense reflects only the change in working hours in individual industries, excluding the effect of the structural change.

Table 5 presents a comparison of the slowdowns in GDP growth and labor productivity growth. Approximately three-fifths of the slowdown in Korea's economic growth during our analysis period is attributed to the slowdown in effective labor input growth, and approximately two-fifths is attributed to the slowdown in labor productivity growth. The discrepancy between the GDP growth rate and the sum of the growth rate of labor input and the growth rate of labor productivity is due to the calculation of the growth rate being based on discrete time.

TABLE 3—CHANGES IN LABOR INPUT

(Average Annual Growth Rate)

| | 1980~90 (A) (%) | 2008~18 (B) (%) | A – B (%p) |
|---|---|---|---|
| Number of Workers | 2.8 | 1.2 | 1.6 |
| Working Age Population | 2.3 | 0.6 | 1.7 |
| Employment Rate | 0.5 | 0.6 | -0.1 |
| (Women's Employment Rate) | (0.5) | (0.4) | (0.1) |
| Working Hours | 0.0 | -1.0 | 1.0 |
| Quality of Labor | 1.2 | 0.1 | 1.1 |
| Education | 1.2 | 0.5 | 0.7 |
| Skill (age) | 0.0 | -0.4 | 0.4 |
| Effective Labor Input | 4.1 | 0.3 | 3.8 |

*Note*: Figures for the employment rate and quality of labor represent the contributions to labor input growth.

TABLE 4—CONTRIBUTION OF EACH FACTOR TO (CHANGES IN) LABOR INPUT GROWTH

| | | | 1980~90 (F, %) | 2008~18 (G, %) | F – G (%p) |
|---|---|---|---|---|---|
| Demographic Factors | Working Age Population Growth (A) | | 2.3 | 0.6 | 1.7 |
| | Workforce Aging (B) | | -0.0 | -0.4 | 0.4 |
| Quality-of-life-related Choice Factors | Employment Rate (C) | | 0.5 | 0.6 | -0.1 |
| | Working Hours | Broad (D) | -0.0 | -1.0 | 1.0 |
| | | Narrow | -0.3 | -1.0 | 0.7 |
| | Education (E) | | 1.2 | 0.5 | 0.7 |
| Quantitative Change (A+C+D) | | | 2.8 | 0.2 | 2.6 |
| Qualitative Change (B+E) | | | 1.2 | 0.1 | 1.1 |
| Total Effective Labor Input | | | 4.1 | 0.3 | 3.8 |

TABLE 5—COMPARISON OF GROWTH SLOWDOWNS

| | 1980~90 (A) (%) | 2008~18 (B) (%) | A – B (%p) |
|---|---|---|---|
| GDP | 10.0 | 3.2 | 6.8 |
| Per Capita GDP | 8.7 | 2.7 | 6.1 |
| Per Worker GDP | 7.0 | 2.0 | 5.0 |
| Per Hour GDP | 6.9 | 3.0 | 3.9 |
| Per Effective Labor GDP | 5.6 | 2.9 | 2.7 |

## IV. The Contribution of Structural Change to the Slowdown of Aggregate Productivity Growth

### A. *Relationship between Structural Change and Economic Growth*

The following equation represents the relationship between the economic growth rate and the growth rates of individual sectors:

$$y = \sum_i \theta_i y_i = \sum_i \theta_i q_i + \sum_i \theta_i l_i \,. \tag{9}$$

Here, $y$ denotes the economic growth rate and $\theta_i$, $y_i$, $q_i$, and $l_i$ represent the output share, output growth rate, labor productivity growth rate, and the labor input growth rate of sector i, respectively.

In equation (9), $\theta_i$ represents the real share of sector i when GDP is based on a fixed weight method, and the nominal share when GDP is based on a chain-weight method. After SNA93, the real GDP in most countries, including Korea, has been compiled using a chain-weight method. Hereinafter, we will discuss GDP with a

chain-weight method in mind.

In Equation (9), if total labor input is fixed at 1, then y and $l_i$ represent the growth rate of aggregate labor productivity and the rate of change in the employment (labor input) share of sector $i$, respectively. In this case, the following relationship is derived:

$$
\begin{aligned}
y &= \sum_i \theta_i q_i + \sum_i \theta_i l_i \\
&= \sum_i \theta_i q_i + \sum_i \frac{Y_i / L_i}{Y / L} \frac{L_i}{L} l_i \\
&= \sum_i \theta_i q_i + \sum_i \frac{Q_i}{Q} \Delta L_i \quad (\because L = 1) \\
&= \sum_i \theta_{iB} q_i + \sum_i \Delta\theta_i q_i + \sum_i \frac{Q_i}{Q} \Delta L_i ,
\end{aligned}
\tag{10}
$$

where $\theta_{iB}$ denotes $\theta_i$ at the base period, and $Y_i, L_i, Q_i$ and $l_i$ represent the nominal output, employment share, nominal productivity level, and the growth rate of the employment share of sector i, respectively.

Structural change refers to the case where $\Delta\theta_i, \Delta L_i \neq 0$ in equation (10). We can see in equation (10) that if either $q_i$ (the productivity growth rate of sector i) or $Q_i$ (the nominal productivity level of sector i) is different for each sector,[15] structural change causes a difference in the aggregate productivity growth rate. In other words, structural change affects the aggregate productivity growth rate through intersectoral differences in productivity growth rates or productivity levels. The second term of equation (10) refers to the effect of structural change on aggregate productivity growth through intersectoral differences in productivity growth rates, and the third term of equation (10) refers to the effect of structural change through intersectoral differences in nominal productivity levels. Following Nordhaus (2001), we refer to the former aspect as the Baumol effect and the latter aspect as the Denison effect. The scale or the sign of the Baumol effect or the Denison effect varies depending on the pattern of structural change and the patterns of intersectoral productivity differences.

Meanwhile, structural change and intersectoral productivity differences exhibit similar patterns in most countries. First, structural change due to industrialization exhibits a stylized pattern where the employment share of agriculture decreases, the share of services rises, and the share of manufacturing shows an inverted U-shaped change (see Figure 1 in Herrendorf *et al*. 2013). Second, the productivity level of agriculture tends to be significantly lower than those of the non-agricultural sectors. This phenomenon is presumed to stem from the facts that since agriculture is sensitive to seasonal and climatic factors, productivity is inevitably low for a considerable period of the year, and that the proportion of nonmarket production for

[15]If wages are identical across industries and relative prices are determined by the unit labor cost, then the inter-industry ratio of nominal productivity remains constant.

self-consumption is relatively high in agriculture. Third, productivity growth in services tends to be significantly slower than in the goods-producing sectors. This seems to be due to the nature of the services sector, in which automation is relatively difficult and measuring quality improvements also poses challenges.

From these common patterns, we can expect that structural changes in most countries will affect economic growth in a similar fashion. First, the Denison effect will be positive during industrialization, and its size will vary according to the scale of the labor shift out of agriculture. Because the employment share of agriculture decreases with industrialization, the labor shift out of agriculture and accordingly the size of the Denison effect will increase at the initial stage of industrialization and decrease after a certain point. Second, the Baumol effect is likely to have a negative value, and this effect will appear more prominently during deindustrialization, when labor shifts to services from manufacturing as well as agriculture.

In general, since the Denison effect is much larger than the Baumol effect (in absolute value) in the early stage of industrialization, the effect of structural change on economic growth tends to have a positive value in the early stage of industrialization, decrease toward the latter stage of industrialization, and have a negative value in the deindustrialization stage.

## B. *The Contribution of Structural Change to the Aggregate Productivity Growth Slowdown*

The Korean economy also exhibits the same patterns of structural change and intersectoral productivity differences mentioned above. In the Korean economy, peak industrialization (the peak of the share of manufacturing employment) appeared in 1989. The share of agricultural employment fell from 63 percent in 1963 to 5 percent in 2018, the share of services employment increased from 25.8 percent to 69.8 percent in the same period, and the share of manufacturing employment rose from 7.9 percent in 1963 to 27.8 percent in 1989 before falling to 16.8 percent by 2018. Meanwhile, the patterns of the intersectoral productivity differences in Korea are shown in Table 6. In terms of per-worker nominal value-added, the productivity of agriculture is about a quarter of that of manufacturing, and less than half that of services. The real productivity growth rate of services is approximately half that of agriculture and manufacturing.

TABLE 6—STRUCTURE OF INTERSECTORAL PRODUCTIVITY DIFFERENCES IN KOREA

| | Nominal Productivity Level (Average of 1980~2018, Agriculture=1) | | Effective Labor Productivity Growth (Average of 1980~2018) | |
|---|---|---|---|---|
| | Per Worker | Per Hour (per effective labor) | Annual Growth Rate (%) | Sectoral Difference (services = 1) |
| Total (average) | 2.5 | 2.1 | 4.4 | 1.6 |
| Agriculture | 1 | 1 | 5.3 | 1.9 |
| Manufacturing | 3.9 | 3.3 | 6.5 | 2.3 |
| Services | 2.3 | 1.9 | 2.8 | 1 |
| Other sectors | 2.7 | 2.3 | 0.5 | 0.2 |

From equation (10) and considering the Korean data, we can estimate the effect of structural change on aggregate productivity growth. For this estimation, we divide the economy into four sectors: agriculture (including forestry and fisheries), manufacturing, services, and other sectors.[16] The 'other sectors' include mining, utilities (electricity, gas, and water), and construction. Table 7 shows the estimation result of the Denison effect. (Because the Baumol effect is derived only as a comparison between two time points, as shown in equation (10), it cannot be demonstrated in the form shown in Table 7.) The 'broad' and the 'narrow' effects refer to effects with and without a change in average working hours due to structural change, respectively. The (broad) Denison effect in the Korean economy reached an average of 1.2 to 1.4 percentage points per year in the 1970s and 1980s, demonstrating its contribution to Korea's high growth. On the other hand, the Denison effect in the 2010s was almost zero, suggesting that (the change in) the Denison effect also played an important role in the growth slowdown after the end of high growth.

TABLE 7—DENISON EFFECT IN THE KOREAN ECONOMY

(Annual Average, %p)

| | 1970~80 | 1980~90 | 1990~2000 | 2000~10 | 2010~20 |
|---|---|---|---|---|---|
| Denison Effect (Broad) | 1.35 | 1.16 | 0.36 | 0.06 | 0.01 |
| Denison Effect (Narrow) | n.a. | 0.88 | 0.23 | 0.04 | 0.04 |

Next, let us look at the contribution of the effect of structural change to the growth slowdown during our analysis period. Equation (11) can be derived from Equation (10) to estimate the contribution of structural change to the change in the aggregate productivity growth rate between two points in time.

[16]In general, the more subdivided the industry classification, the more precisely the effect of structural change can be estimated. However, the more detailed the industry classification, the greater the data constraints and the higher the complexity of the analysis. In this regard, there is a tradeoff relationship between the precision of estimation results and the cost of estimation, and the level of industry classification should be selected considering this relationship. There are two main reasons for selecting the industry classification used in this study to estimate the structural change effect. First, the industry classification adopted in this study is conventionally used in studies dealing with structural change, and we followed this practice. Second, and more importantly, we are interested in a specific structural change in this study, not all structural changes. Given that the purpose of this study is to examine the role of developmental factors in the growth slowdown of the Korean economy, we are interested in only structural changes with clear developmental implications. In other words, the object of our analysis is such structural changes that appear generally in the process of the economic development of most countries and have stylized patterns. Previous studies and data show that such structural changes are observed at the same level of industry classification as ours.

$$
\begin{aligned}
y_t - y_k &= \left( \sum_i \theta_{it}\, q_{it} + \sum_i \theta_{it}\, l_{it} \right) - \left( \sum_i \theta_{ik}\, q_{ik} + \sum_i \theta_{ik}\, l_{ik} \right) \\
&= \frac{1}{2}\left[ \left( \textstyle\sum_i \theta_{it}\, q_{it} - \sum_i \theta_{it}\, q_{ik} \right) + \left( \sum_i \theta_{ik}\, q_{it} - \sum_i \theta_{ik}\, q_{ik} \right) \right] \\
&\quad : \textit{sectoral productivity effect} \\
&\quad + \frac{1}{2}\left[ \left( \textstyle\sum_i \theta_{it}\, q_{it} - \sum_i \theta_{ik}\, q_{it} \right) + \left( \sum_i \theta_{it}\, q_{ik} - \sum_i \theta_{ik}\, q_{ik} \right) \right] \\
&\quad : \left(\textit{changes in}\right) \textit{ the Baumol effect} \\
&\quad + \left( \textstyle\sum_i \theta_{it}\, l_{it} - \sum_i \theta_{ik}\, l_{ik} \right) : \left(\textit{changes in}\right) \textit{ the Denison effect}
\end{aligned}
\tag{11}
$$

That is, the change in the aggregate productivity growth rate between two time points, t and k, can be decomposed into (the change in) the Baumol effect, (the change in) the Denison effect, and the effect of changes in sectoral productivity growth rates. In our case, because we compare average growth rates for the years 1980-90 and 2008-18—not single-year growth rates—the two sides of the equation above do not match exactly but are instead approximated with some errors (the discrepancy is no greater than 0.1 percentage points).

We used the arithmetic mean of the 2008 nominal share and the 2017 nominal share $\left( \frac{\theta_{i08} + \theta_{i17}}{2} \right)$ for $\theta_{it}$ and the arithmetic mean of the 1980 nominal share and the 1989 nominal share $\left( \frac{\theta_{i80} + \theta_{i89}}{2} \right)$ for $\theta_{ik}$ in the estimation of equation (11). Given that the Denison effect can be estimated annually, the average of the annual Denison effect for the period was used (e.g., the Denison effect for the period from 1980 to 1990 is the average of the Denison effect for each year from 1980 to 1990).

The results estimated in this way are shown in Table 8. For per worker productivity (upper table in Table 8), the contribution of (broad) structural change to the growth slowdown is 1.3 percentage points per year on average, which explains approximately 26 percent of the slowdown in aggregate productivity growth during our analysis period. For effective labor productivity, the contribution of (narrow) structural change to the growth slowdown is 0.9 percentage points per year on average, which explains approximately 36 percent of the slowdown in aggregate productivity growth. In both cases, the contribution of the Denison effect is much greater than that of the Baumol effect.[17]

[17]Unlike this case of Korea, the Baumol effect is greater than the Denison effect in terms of absolute value in countries where deindustrialization has progressed significantly, such as the present-day US.

TABLE 8—DECOMPOSITION OF THE GROWTH SLOWDOWN IN AGGREGATE PRODUCTIVITY
(BASED ON PER WORKER PRODUCTIVITY AND THE BROAD DENISON EFFECT)

| | Actual Growth Rates | | | Decomposition of Growth Slowdown | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1980~90 (A) | 2008~18 (B) | A – B | Sectoral Productivity Effect | Effect of Structural Change | | | Total |
| | | | | | Baumol Effect | Denison Effect | Sub-total | |
| Contribution to Slowdown (%, %p) | 6.9 | 2.0 | 4.9 | 3.5 | 0.2 | 1.0 | 1.3 | 4.8 |
| Contribution Share (%) | | | | 73.7 | 4.6 | 21.7 | 26.3 | 100.0 |

(BASED ON PER EFFECTIVE LABOR PRODUCTIVITY AND THE NARROW DENISON EFFECT)

| | Actual Growth Rates | | | Decomposition of Growth Slowdown | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1980~90 (A) | 2008~18 (B) | A – B | Sectoral Productivity Effect | Effect of Structural Change | | | Total |
| | | | | | Baumol Effect | Denison Effect | Sub-total | |
| Contribution to Slowdown (%, %p) | 5.6 | 2.9 | 2.7 | 1.7 | 0.2 | 0.7 | 0.9 | 2.6 |
| Contribution Share (%) | | | | 64.5 | 7.8 | 27.7 | 35.5 | 100.0 |

## V. Contribution of the Productivity Catch-up Effect to the Slowdowns in Sectoral Productivity Growth and Economic Growth

As shown in equation (11), the portion of the change in the aggregate productivity growth rate that is not explained by the structural change effect is caused by the change in the productivity growth rates of individual sectors. When productivity growth rates in several industries show a declining trend, a productivity catch-up effect based on the 'advantage of backwardness' can be seen as one of the most likely causes, particularly in latecomer industrializers such as Korea.

In this section, we estimate the contribution of the productivity catch-up effect to the slowdowns in sectoral productivity growth and economic growth in the Korean economy. The industries to be analyzed are agriculture, manufacturing, and services, as examined in the previous section. The 'other industries' category is excluded from the estimation, as these industries are composed of sectors with different characteristics and account for only a small proportion of the total economy in Korea. We estimate the productivity catch-up effect in the aforementioned three sectors and then calculate the contribution of the productivity catch-up effect to the slowdown in economic growth based on the assumption that the proportion of the contribution of the effects of the three sectors to the slowdown of the three-sector aggregate productivity growth is identical to the proportion of the contribution of the productivity catch-up effect to the slowdown of aggregate productivity growth of the entire economy.

Specifically, we estimate the effect here based on the convergence equation derived from the technology diffusion (or technology leader/follower) model. This model explains the tendency of technology followers to grow faster than technology

leaders based on the fact that imitation costs less than innovation. However, if the productivity of a follower catches up to that of the leader, there is less room for imitation; consequently, the follower's productivity growth rate slows and ultimately converges to that of the leader. From this logic, the following convergence equation is derived:[18]

$$q_i = q_1 - \mu \log\left(\frac{Q_i}{Q_1}\right) + \mu \log\left(\frac{Q_i}{Q_1}\right)^{*}, \tag{12}$$

where $q_i$ and $Q_i$ denote the productivity growth rate and productivity level of a follower country $i$, respectively, $q_1$ and $Q_1$ denote the productivity growth rate and productivity level of a leading country, respectively, and $\left(\frac{Q_i}{Q_1}\right)^{*}$ denotes $\left(\frac{Q_i}{Q_1}\right)$ in a steady state.

Assuming that $\left(\frac{Q_i}{Q_1}\right)^{*}$ is constant, we can calculate the productivity catch-up effect by estimating $\mu$ in equation (12).

From equation (12), we obtain

$$g_i \equiv q_i - q_1 = a - \mu \log\left(\frac{Q_i}{Q_1}\right) \ (\mu > 0). \tag{13}$$

Because $g_i$ is the growth rate of $\left(\frac{Q_i}{Q_1}\right)$, we also obtain from equation (13)

$$\left(\frac{Q_i}{Q_1}\right)_t = \left(\frac{Q_i}{Q_1}\right)_{t-1} e^{g_{i(t-1).}}. \tag{14}$$

Taking the logarithm of both sides of equation (14), we obtain

$$\log\left(\frac{Q_i}{Q_1}\right)_t = \log\left(\frac{Q_i}{Q_1}\right)_{t-1} + g_{i(t-1)} = \log\left(\frac{Q_i}{Q_1}\right)_{t-1} + a - \mu \log\left(\frac{Q_i}{Q_1}\right)_{t-1}. \tag{15}$$

Therefore,

[18]For the derivation of the equation, see Barro and Sala-i-Martin (1995), pp. 265-275.

$$\log\left(\frac{Q_i}{Q_1}\right)_t = a + (1-\mu)\log\left(\frac{Q_i}{Q_1}\right)_{t-1} \quad . \tag{16}$$

We can also estimate μ from equation (16). While in a conventional convergence estimation, the goal is to estimate the speed of convergence common to many countries, the purpose of our estimation is to estimate the speed of convergence of Korean industries. Thus, if possible, it would be meaningful to estimate the convergence speed based only on Korean data. Because equation (16) uses the relative productivity level, which is much less volatile than the growth rate, significant estimation results can be obtained using annual data instead of the five- or ten-year average data generally used in convergence estimations based on growth rate data. Therefore, we can estimate equation (16) with Korean annual productivity data.

Here, we estimate μ from the following four equations:

(Estimation 1) $$q_i = a_1 + b_1 \log\left(\frac{Q_i}{Q_1}\right) + c_1 q_1 + \varepsilon$$

(Estimation 2) $$g_i \left(\equiv q_i - q_1\right) = a_2 + b_2 \log\left(\frac{Q_i}{Q_1}\right) + \varepsilon$$

(Estimation 3) $$\log\left(\frac{Q_{Korea}}{Q_1}\right)_t = a_3 + b_3 \log\left(\frac{Q_{Korea}}{Q_1}\right)_{t-1} + \varepsilon$$

(Estimation 4) $$\log\left(\frac{Q_{Korea}}{Q_1}\right)_t = a_4 + b_4 \log\left(\frac{Q_{Korea}}{Q_1}\right)_{t-1} + c_2 \Delta u_{Korea\,t} + \varepsilon$$

While Estimations 3 and 4 are based on equation (16), in Estimation 4, the change in Korea's unemployment rate from the previous year was added as an explanatory variable to control the effects of business cycles. We used the farmhouse unemployment rate for agriculture and the unemployment rate of the entire economy for manufacturing and services.

In Estimations 1 and 2, the values obtained by multiplying the regression coefficients ($b_1$ and $b_2$) by (-1) correspond to the estimated value of μ in equation (12), and in Estimations 3 and 4, the values of (1-$b_i$) correspond to the estimated value of $\mu$.[19] The coefficients $b_1$ and $b_2$ are expected to have negative values, $b_3$ and $b_4$ are expected to have positive values of less than 1, and $c_1$ and $c_2$ are expected to have a positive value and a negative value, respectively. In Estimations 1 and 2, we used the panel fixed effect model[20] based on multi-country panel data

[19]Because percentage values were used for the growth rates in Estimations 1 and 2, in the case of Estimations 3 and 4, strictly speaking, $(1-b_i)\times 100$ corresponds to μ.

[20]Given that we want to estimate the convergence speed of Korean industries, we used a model with a country

and used a five-year average growth rate for the productivity growth rate. Estimations 3 and 4 were estimated with an autoregressive model using annual data from 1970 to 2018 on Korea's relative productivity level compared to a technology leader.

US industries were assumed to be the technology leader in all three industries. For manufacturing, Conference Board data were used, as these data provide the longest time series that is internationally comparable, and for agriculture and services, OECD STAN data were used. Countries where the time series were too short, some data did not exist, or no catch-up phenomenon was observed were excluded. For the exchange rate to compare productivity levels, we used the market exchange rate for manufacturing and agriculture and the purchasing power parity exchange rate for services, which are mainly non-tradable. Details of the data used for the estimation are explained in Appendix 1.

The results of Estimations 1 to 4 are shown in the tables in Appendix 2. Table 9 summarizes the estimated μ values ($\widehat{\mu_i}$) obtained from the estimation results. For reference, Rodrik (2012) estimated the convergence coefficient for manufacturing productivity using methods similar to ours, and the estimated coefficients were 1.6 (unconditional convergence: a model without a country fixed effect) to 6.0 (conditional convergence: a model with a country fixed effect). Our $\widehat{\mu_i}$ for manufacturing (1.9 to 5.8) is not much different from Rodrik's estimates.

TABLE 9—ESTIMATION RESULTS OF $\widehat{\mu_i}$

| | Estimation 1 | Estimation 2 | Estimation 3 | Estimation 4 |
|---|---|---|---|---|
| Agriculture | 4.04 | 12.98 | 7.62 | 7.11 |
| Manufacturing | 4.04 | 5.79 | 2.66 | 1.89 |
| Services | 3.35 | 5.05 | 4.42 | 4.28 |

We take the smaller of the actual slowdown and the value obtained from equation (12) and $\widehat{\mu_i}$ in Table 9 as the productivity catch-up effect, as in equation (17).[21]

The effect of catch-up on the productivity growth slowdown in sector *i* between period t and k

$$= Min\left[\widehat{\mu_i}\left(\log\left(\frac{Q_{Korea,i,t}}{Q_{1i,t}}\right)-\log\left(\frac{Q_{Korea,i,k}}{Q_{1i,t}}\right)\right),\left(q_{it}-q_{ik}\right)\right], \tag{17}$$

where $Q_{Korea,i,t}$ and $q_{it}$ denote the productivity level and the productivity growth rate of Korean sector *i* at period t, respectively, and $Q_{1i,t}$ denotes the productivity level of US sector *i*.

fixed effect. However, according to Barro (2012), the convergence coefficient tends to be overestimated with Hurwicz-Nickell bias when using a model with a country fixed effect and data with short time series.

[21] As shown in Table 10, in the services sector, in which the scale of the growth slowdown was relatively small during our analysis period, all estimation results were larger than the actual slowdown. Hence, we used the actual slowdown as the catch-up effect.

The contribution of the productivity catch-up effect to the aggregate productivity growth slowdown between periods t and k is obtained from equation (18).

Productivity catch-up effect on the aggregate productivity growth slowdown between t and k

$$(18) \quad = \frac{\sum_i^{a,m,s} \frac{(\theta_{it}+\theta_{ik})}{2} Min\left[\hat{\mu}_l\left(\log\left(\frac{Q_{Korea,i,t}}{Q_{1i,t}}\right)-\log\left(\frac{Q_{Korea,i,k}}{Q_{1i,k}}\right)\right),(q_{it}-q_{ik})\right]}{\sum_i^{a,m,s} \frac{(\theta_{it}+\theta_{ik})}{2}(q_{it}-q_{ik})} \sum_i^{all} \frac{(\theta_{it}+\theta_{ik})}{2}(q_{it}-q_{ik})$$

where *a*, *m*, and *s* represent agriculture, manufacturing and services, respectively.

The productivity catch-up effects between 1980-90 and 2008-18 obtained in this way are summarized in Table 10. It is estimated that the productivity catch-up effect contributed between 0.82 and 1.65 percentage points to the slowdown in aggregate productivity growth in Korea between 1980-90 and 2008-18.

TABLE 10—EFFECTS OF PRODUCTIVITY CATCH-UP ON THE GROWTH SLOWDOWN OF KOREA

| | Estimation 1 | Estimation 2 | Estimation 3 | Estimation 4 | Actual slowdown |
|---|---|---|---|---|---|
| Agriculture | 1.12 | 2.91 | 2.11 | 1.97 | 2.91 |
| Manufacturing | 1.98 | 2.84 | 1.30 | 0.93 | 2.93 |
| Services | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 |
| Total sector | 1.14 | 1.65 | 0.98 | 0.82 | 1.68* |

*Note*: * (actual slowdown of total sector) = $\sum_i^{all} \frac{(\theta_{i80\sim90}+\theta_{i08\sim18})}{2}(q_{i80\sim90}-q_{i08\sim18})$.

## VI. Residual and the Global Productivity Slowdown

According to our estimations in Sections IV and V, approximately 0.9 percentage points of the 2.7 percentage-point slowdown in productivity growth between 1980-90 and 2008-18 can be attributed to structural change (narrow), and 0.8 to 1.7 percentage points can be attributed to the productivity catch-up effect. Therefore, the slowdown in productivity growth of Korea that is not explained by these two factors is 0.1 to 1.0 percentage points. A decrease in innovation or reduced efficiency may have caused this unexplained productivity slowdown.

Meanwhile, we know that the productivity growth rate decreased not only in Korea but also in most advanced countries during our analysis period. For convenience, let us call this the global productivity slowdown. The global productivity slowdown could be a result of a slowdown in the pace of global technological progress in related industries. Thus, it is highly likely that the global productivity slowdown has also affected the productivity growth rate of Korean industries. However, because in the estimation of the productivity catch-up effect we estimated the changes in the effect of the advantage of backwardness, or the changes in relative productivity growth rates of Korean industries compared to the technology

leader, this aspect may not be properly reflected in the estimation in Section V. Accordingly, we can presume that part of the unexplained productivity slowdown mentioned above may be due to the global productivity slowdown.

In this case, it is difficult to know how much the global productivity slowdown has affected the industrial productivity slowdown in Korea. However, as a reference indicator, we can examine how much change in the aggregate productivity growth rate of Korea would appear if Korean industries had experienced the same slowdown in the productivity growth rate as the corresponding industries in the technology leader country. This is, so to speak, an estimate of the slowdown in economic growth assuming that the global productivity slowdown would have had an equal impact on the productivity growth rate of the corresponding industry in Korea. This value can be calculated from the industrial structure of Korea and the magnitude of the productivity growth slowdown by sector in the technology leader. The estimate is 0.8 percentage points in the case of the US as the technology leader and 1.5 percentage points if using the average of G7 countries as the technology leader.[22]

## VII. Summary and Application

### A. *Summary of the Analyses*

Table 11 summarizes the results of our analyses in Sections III to VI. As shown in the table, the four categories of factors we investigated account for between 85 and 98 percent of the growth slowdown. In other words, most of the slowdown in Korea's GDP growth over the past thirty years can be attributed to demographic changes (the slowdown in population growth and aging of the labor force), the accelerated reduction in working hours, the slowdown in the extension of education, the effect of the structural change, and productivity catch-up effects in major industries. Among the four categories of factors, the demographic factor accounts for approximately 32 percent of the growth slowdown, with each of the other three factors (quality-of-life-related choice factors, structural change, and productivity catch-up effect) accounting for approximately 20 percent. Only 2 to 15 percent of the growth slowdown is not accounted for by these four categories of factors. In addition, considering the effect of the global productivity slowdown mentioned in Section VI, it appears that proportion of the growth slowdown not explained by the factors considered here is very small.

These estimation results suggest that the growth slowdown of the Korean economy is basically a consequence of its successful economic development,[23] or a case of rapid convergence. In other words, our estimates do not support the growth

[22]The slowdown in productivity growth was examined for six sectors (agriculture, manufacturing, services, mining, utility, and construction), and the Korean industrial structure was calculated from the average of the sectoral share of nominal value-added in 1980 and 2017.

[23]Korea after the mid-20th century is the most representative example of successful economic development. In 2021, UNCTAD changed Korea's status from a developing country to a developed country, the first time it had done so for a country in its 57-year history. In the aftermath of the Korean War, Korea was one of the poorest countries in the world, but it has surpassed the UK, Italy, and Japan in per adult PPP income, according to World Inequality Report 2022.

crisis hypothesis that Korea's growth slowdown is mainly the result of failures in innovation or policies.[24]

TABLE 11—CAUSES OF THE GROWTH SLOWDOWN IN THE KOREAN ECONOMY

| | | | Contribution to Slowdown (%p) | Contribution Share (%) |
|---|---|---|---|---|
| GDP | | | 6.8 | |
| Causes of Growth Slowdown | Demographic Factors (A) (the demographic transition) | Sub-total | 2.1 | 32.1 |
| | | Working Age Population Growth Slowdown | 1.7 | 26.5 |
| | | Workforce Aging | 0.4 | 5.6 |
| | Quality-of-life-related choice factors (B) | Sub-total | 1.4 | 21.2 |
| | | Changes in Employment Rate | -0.1 | -1.6 |
| | | Working Hours Reduction (narrow) | 0.7 | 10.7 |
| | | Changes in Education | 0.8 | 12.1 |
| | Structural Change (C) (broad) | Sub-total | 1.2 | 19.1 |
| | | Denison Effect (broad) | 1.0 | 16.0 |
| | | Baumol Effect | 0.2 | 3.2 |
| | Productivity Catch-up Effect (D) | | 0.8 ~ 1.7 | 12.6 ~ 25.4 |
| | **< Sub-total of four factors (A, B, C, D) >** | | **5.5 ~ 6.4** | **85.0 ~ 97.8** |
| | Residual | Sub-total | 0.1 ~ 1.0 | 2.2 ~ 15.0 |
| | | (Global productivity slowdown) | (0.8* ~ 1.5**) | (12.6 ~ 22.9) |
| | < Total > | | 6.5 | 100 |
| Discrepancy from Discrete Time Growth Rate | | | 0.4 | |

*Note*: *based on US productivity.
** based on G7 productivity.

## B. *Application: Explaining the Korean High Growth*

Some of the developmental factors that we examined as the causes of the slowdown in economic growth are those that themselves exhibited a growth slowdown or a decreasing trend during our analysis period. This suggests that the same factors before such a slowdown or a decreasing trend may have played an important role in the Korean high growth as well.

Such factors will include high population growth in the early phase of the demographic transition, a substantial rise in women's employment rate, a rapid increase in years of education, a large Denison effect due to the compressed

[24]Other evidence not consistent with the growth crisis hypothesis is that Korea's productivity growth rate is still significantly higher than those of other developed countries, despite the fact that its productivity level is close to those of major developed countries. While Korea's per hour GDP level in 2018 (based on the market exchange rate) is 68 percent of the average of G7 excluding the US, Korea's average annual per-hour GDP growth rate between 2008 and 2018 (3.0 percent) is about five times higher than the corresponding G7 average, excluding the US (0.6 percent).

industrialization, and high growth of industrial productivity owing to the advantage of backwardness. Using equation (3) explained in Section II, we examined the contribution of these factors to the Korean economic growth from 1980 to 1990, the peak of the high growth period. Table 12 summarizes the results.[25]

TABLE 12—CONTRIBUTIONS OF MAJOR FACTORS TO KOREA'S HIGH GROWTH IN THE 1980S

| | Contribution to GDP Growth (%p) | Contribution Share (%) |
|---|---|---|
| GDP Growth Rate (A) | 10.0 | |
| Effective Labor Input Growth Rate (B) | 4.1 | 42.2 |
| Working Age Population Growth (C) | 2.3 | 23.7 |
| Rise of Employment Rate | 0.5 | 5.7 |
| (Rise of Women's Employment Rate) (D) | (0.5) | (5.1) |
| Increase of Education (E) | 1.2 | 12.8 |
| Productivity Growth Rate (F) | 5.6 | 57.8 |
| Denison Effect (narrow) (G) | 0.9 | 9.2 |
| Advantage-of-backwardness Effect (H) | 1.5~2.3 | 15.5~23.4 |
| World Productivity Growth (I) | 1.9*~2.0** | 19.8~20.3 |
| Major Developmental Factors (J) (= C+D+E+G+H) | 6.4~7.2 | 66.3~74.2 |
| Sub-total of Major Factors (= I+J) | 8.3~9.2 | 86.1~94.5 |
| Total (K) (= B+F) | 9.6 | 100.0 |
| Discrepancy*** (= A – K) | 0.4 | |

*Notes*: * Figure based on US productivity.
** Figure based on G7 average productivity.
*** Discrepancy due to growth rate based on discrete time.

Some explanation will be necessary concerning the method used to estimate the productivity growth effect due to the advantage of backwardness (H in Table 12). Although the estimation here also uses the model and the regression results from Section V, while we estimated the change in the effect of the advantage of backwardness during our analysis period in Section V, we estimate here the average size of the effect of the advantage of backwardness in the period from 1980 to 1990. The size of the effect of the advantage of backwardness is regarded as the estimated relative productivity growth rates of Korean industries compared to US industries (that is, the estimated differences in industrial productivity growth rates between two countries) when Korean industries' productivity levels relative to those of US industries are given. For relative productivity levels, a ten-year average (1980 to 1989) was used, and by substituting the relative productivity levels and the estimated coefficient values into each estimation equation, estimates of Korean industries' relative productivity growth rates were obtained. For Estimations 1 and 2, estimated

[25]Because the contributions of changes in working hours, the worker age effect, and the Baumol effect are negligible, they are omitted in Table 12.

values of the Korean dummy coefficients were also applied. As in Section V, the smaller of the estimated result and the actual productivity growth rate gap between Korean industries and US industries was adopted as the sectoral 'advantage of backwardness' effect, and the aggregate effect was obtained by equation (19) below, similarly to equation (18) in Section V.

(19) Advantage-of-backwardness effect =

$$\frac{\sum_i^{a,m,s} \theta_i \, Min\left[\widehat{g_i}, \left(q_{Korea\,i} - q_{US\,i}\right)\right]}{\sum_i^{a,m,s} \theta_i \left(q_{Korea\,i} - q_{US\,i}\right)} \sum_i^{all} \theta_i \left(q_{Korea\,i} - q_{US\,i}\right),$$

Where $\widehat{g_i}$ denotes the estimated relative productivity growth rate in Korean sector *i*.

As shown in Table 12, during the high growth of the Korean economy from 1980 to 1990, about 70 percent of the growth is accounted for by the five developmental factors mentioned above. Add to this the average productivity growth rate of the technology leader (designated as the 'world productivity growth rate' in the eleventh row of Table 12),[26] and the five developmental factors and world productivity growth account for about 90 percent of Korea's high growth during this period.

The high growth of East Asian countries, including Korea, was called the Asian miracle. However, if a miracle refers to a phenomenon that is difficult to explain, according to the estimation results above, Korea's high growth was not a miracle. The estimation above demonstrates that Korea's relatively high growth compared to the growth in other economies can also be mostly explained by developmental factors[27] — that is, it was made possible by factors that are likely to appear at a specific stage of economic development and have a temporary nature. The rapid increases in populations, years of education, and women's employment rate, the large Denison effect, and the advantage-of-backwardness effect are all unsustainable, and most of them (growth rates or levels) are bound to converge to zero. Thus, it can be said that the factors that made high growth possible also made the subsequent large growth slowdown inevitable.

## VIII. Concluding Remarks

In this study, we have demonstrated that the growth slowdown of the Korean economy over the past thirty years is mostly explained by factors associated with

[26]The world productivity growth rate was obtained by applying the productivity growth rate of six industries in the US or G7 countries and Korea's industrial structure in the 1980s, as in the estimation of the global productivity slowdown in Section VI.

[27]Of course, not all countries that have undergone the same economic development process show compressed industrialization or economic growth as fast as those in Korea. In that sense, high growth is also a phenomenon with cross-sectional specificity. In order to understand East Asian high growth properly, both the temporal and cross-sectional characteristics need to be explained. However, it seems methodologically desirable to approach these two issues separately. The discussion in this paper is about the former.

economic development, and that the high growth of the 1980s can also be largely attributed to the same factors. This suggests that Korea's high growth and the subsequent large slowdown in growth can basically be regarded as a single process of a rapid convergence or a rapid catch-up.

The contribution of this study is in its empirical and methodological aspects. This study defines the role of developmental factors in Korea's growth slowdown through an estimation of their contributions, thus providing a different perspective from previous studies mainly based on growth accounting. In terms of methodology, decomposition of economic growth focusing on developmental factors or estimation methods of the effects of structural change can be seen as new attempts.

Although this study focuses on the Korean economy, because the factors examined here exhibit similar patterns of change over the course of economic development of most countries, we think that the estimation results of this study can have more general implications. The acceleration and deceleration of economic growth and the role of developmental factors in these growth changes, as found in Korea's economic development experience, are highly likely to appear with similar patterns in the economic development of many countries. Indeed, the long-term economic growth of East Asian countries shows distinct temporal patterns that are similar to each other.[28] Similar patterns are also observed in many other economies, albeit with some differences in scale.[29]

Studies of the relationship between economic growth and economic development can broaden our understanding of long-term growth changes and help predict future growth in industrializing economies. As more latecomers are industrialized and their experiences accumulate, more empirical studies will be possible. The estimation results and methodology used here can provide a reference for such studies.

[28]For instance, both Japan and Taiwan exhibit patterns of high growth followed by subsequent periods of slowdown, similar to that of the Korean economy. Referring to data from PWT 10.0, Japan experienced an average annual economic growth rate of 9.2 percent during its high-growth era (1955-73), subsequently slowing to 0.6 percent between 2008 and 2018. Similarly, Taiwan's economic growth rate decreased from 9.6 percent in the high-growth phase (1960-90) to 3.1 percent between 2008 and 2018.

[29]Based on the GGDC (Groningen Growth and Development Center) 10-Sector Database, the Penn World Table, Maddison project data, and long-term productivity data from Bergeaud *et al*. (2016), Kang and Park (2019) demonstrates that the long-term per-worker GDP growth trends of major industrialized economies exhibit patterns similar to an inverted U-shape, and their peak growths tend to appear close to peak industrializations in terms of timing.

# APPENDIX 1.
# DATA AND COUNTRIES ANALYZED IN THE ESTIMATION OF THE PRODUCTIVITY CATCH-UP EFFECT

## *Manufacturing*

We used manufacturing productivity data from the Conference Board to estimate the productivity catch-up effect in manufacturing. This source provides data on nominal and real value-added, the number of workers, average working hours, and exchange rates by country from 1950 to 2018 (the length of the time series varies from country to country). Given that we wanted to estimate labor productivity in an efficiency unit, we additionally used education (human capital) data provided by PWT 10.0. Education data in PWT are only the average of the overall economy, and there are no sectoral data; therefore, the same data were applied to all industries. While a five-year average growth rate was used for the productivity growth rate, because the last period ends in 2018, a three-year average growth rate was used for 2015 to 2018. The relative (nominal) productivity level was obtained from the value of the first year of the five-year average growth rate; i.e., the productivity growth rate of 1950 to 1955 corresponds to the relative productivity level of 1950 in the regression analysis. Countries were selected with the criteria that the variables required for analysis exist for at least 20 years and a significant productivity catch-up (significant upward trend in the productivity level relative to that of the US) is observed. The selected countries were Korea, the USA, Australia, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Mexico, Netherlands, Norway, Portugal, Singapore, Spain, Sweden, the UK, and Taiwan, for a total of 24 countries.

## *Agriculture and Services*

OECD STAN data (ISIC rev.4, SNA 08, 2020 ed.) were used for agriculture and services. These data provide statistics on nominal and real value-added, the number of workers, and working hours from 1970 to 2019 (the length of the time series varies from country to country). Because data from the United States, which we assume to be the technology leader, are available until 2018, we used only data up to 2018. In many countries, the time series for working hours by industry in the STAN DB is either very short or not available. However, as time-series and cross-country comparisons of productivity are required, it is necessary to secure as long a time series as possible while applying the same criterion for each country. Considering this problem and the fact that long time-series data are available for most countries for average working hours in the overall economy, we applied data on average working hours in the overall economy to both agriculture and services. The method of calculating the effective labor input, the productivity growth rate or relative productivity level is identical to that of manufacturing. The sample criteria are the same as those used for manufacturing. The selected countries were Korea, the USA,

Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, and the UK, for a total of 23 countries.

# APPENDIX 2. RESULTS OF REGRESSION ANALYSIS IN SECTION V

TABLE A1—AGRICULTURE

| | Estimation 1 | Estimation 2 | Estimation 3 | Estimation 4 |
|---|---|---|---|---|
| Dependent Variable | Productivity Growth Rate | Relative Productivity Growth Rate | Relative Productivity Level | Relative Productivity Level |
| Relative Productivity Level | -4.042*** (1.33) | -12.977*** (2.31) | | |
| US Productivity Growth Rate | 0.156** (0.06) | | | |
| Relative Productivity Level (t-1) | | | 0.924*** (0.05) | 0.929*** (0.05) |
| Change in Korean Unemployment Rate | | | | -0.038 (0.042) |
| Intercept | 1.127** (0.456) | -3.809*** (0.581) | -0.055 (0.048) | -0.051 (0.048) |
| R-squared | 0.447 | 0.182 | 0.873 | 0.875 |
| Number of Countries | 22 | 22 | 1 | 1 |
| Number of Observation | 178 | 178 | 48 | 48 |

*Note*: 1) Figures in ( ) represent robust standard errors.
2) ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

TABLE A2—MANUFACTURING

| | Estimation 1 | Estimation 2 | Estimation 3 | Estimation 4 |
|---|---|---|---|---|
| Dependent Variable | Productivity Growth Rate | Relative Productivity Growth Rate | Relative Productivity Level | Relative Productivity Level |
| Relative Productivity Level | -4.042*** (0.83) | -5.793*** (0.86) | | |
| US Productivity Growth Rate | 0.184* (0.10) | | | |
| Relative Productivity Level (t-1) | | | 0.973*** (0.03) | 0.981*** (0.02) |
| Change in Korean Unemployment Rate | | | | -0.024*** (0.007) |
| Intercept | 1.551*** (0.364) | -1.036*** (0.203) | -0.001 (0.017) | 0.004 (0.016) |
| R-squared | 0.705 | 0.313 | 0.968 | 0.974 |
| Number of Countries | 23 | 23 | 1 | 1 |
| Number of Observation | 274 | 274 | 48 | 48 |

TABLE A3—SERVICES

| | Estimation 1 | Estimation 2 | Estimation 3 | Estimation 4 |
|---|---|---|---|---|
| Dependent Variable | Productivity Growth Rate | Relative Productivity Growth Rate | Relative Productivity Level | Relative Productivity Level |
| Relative Productivity Level | -3.347*<br>(1.87) | -5.047***<br>(2.12) | | |
| US Productivity Growth Rate | 0.121<br>(0.89) | | | |
| Relative Productivity Level (t-1) | | | 0.956***<br>(0.16) | 0.957***<br>(0.02) |
| Change in Korean Unemployment Rate | | | | -0.003<br>(0.002) |
| Intercept | 0.515***<br>(0.094) | -0.317***<br>(0.057) | -0.011<br>(0.007) | -0.010<br>(0.007) |
| R-squared | 0.515 | 0.300 | 0.986 | 0.987 |
| Number of Countries | 22 | 22 | 1 | 1 |
| Number of Observation | 175 | 175 | 48 | 48 |

## REFERENCES


**Aiyar, S., C. Ebeke, and X. Shao.** 2016. "The Impact of Workforce Aging on European Productivity," *IMF Working Paper* 16/238.

**Antolin-Diaz, J., T. Drechsel, and I. Petrella.** 2016. "Tracking the Slowdown in Long-Run GDP Growth," *Review of Economics and Statistics*, 99(2), pp.343-356.

**Barro, R. and Xavier Sala-i-Martin.** 1992. "Convergence," *Journal of Political Economy*, 100, April, pp.223-251.

**Barro, R. and Xavier Sala-i-Martin.** 1995. *Economic Growth*, McGraw Hill.

**Barro, R.** 2012. "Convergence and modernization revisited," *NBER Working Paper 18295*.

**Baumol, W.** 1967. "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *American Economic Review,* 57(3), pp.415-426.

**Baumol, W.** 1986. "Productivity Growth, Convergence, and Welfare: What the Long Run Data Show," *American Economic Review*, 76, December, pp.1072-1085.

**Bergeaud, A. *et al*.** 2016. "Productivity Trends in Advanced Countries between 1890 and 2012," *Review of Income and Wealth*, 62(3).

**Burtless, G.** 2013. "The Impact of Population Aging and Delayed Retirement on Workforce Productivity," Working Paper 2013-11, Center for Retirement Research at Boston College.

**Davis, K.** 1945. "The World Demographic Transition," *Annals of the American Academy of Political and Social Science*, 237, pp.1-11.

**Duernecker, G., B. Herrendorf, and A. Valentinyi.** 2021. "The Productivity Growth Slowdown and Kaldor's Growth Facts," *Journal of Economic Dynamics and Control*, 130, pp.1-20.

**Echevarria, C.** 1997. "Changes in Sectoral Composition Associated with Economic Growth," *International Economic Review*, 38, pp.431-452.

**Eichengreen, B., D. Park, and K. Shin.** 2012a. "When Fast Growing Economies Slow Down: International Evidence and Implications for China," *Asian Economic Papers*, 11(1), pp.42-87.

**Eichengreen, B., D. Perkins, and K. Shin.** 2012b. *From Miracle to Maturity: The Growth of the Korean Economy*, Harvard Univ. Press.

**Eichengreen, B., D. Park, and K. Shin.** 2016. "Growth Slowdown Redux," *Japan and the World Economy*, 32, pp.65-84.

**Feyer, J.** 2008. "Aggregate Evidence on the Link between Age Structure and Productivity," *Population and Development Review*, pp.78-99.

**Gordon, R.** 2016. *The Rise and Fall of American Growth*, Princeton Univ. Press.

**Han, J. and S. Shin.** 2008. "Empirical Assessment of Growth Slowdown of the Korean Economy after Financial Crisis," KDI Policy Forum 201(2008-13), Korea Development Institute (in Korean).

**Han, J. and J. Lee.** 2020. "Demographic Change, Human Capital, and Economic Growth in Korea," *Japan and the World Economy*, 32, 100984.

**Hayashi, F. and E. Prescott.** 2003. "The 1990s in Japan: A Lost Decade," *Review of Economic Dynamics*, 5(1), pp.206-235.

**Heckman, J., L. Lochner, and P. Todd.** 2003. *Fifty Years of Mincer Earnings Regression*, *NBER Working Paper* 9732.

**Herrendorf, B., R. Rogerson, and A. Valentinyi.** 2013. "Growth and Structural Transformation," *NBER Working Paper* 18996.

**Hulten, C.** 1975. "Technical Change and the Reproducibility of Capital," *American Economic Review*, 63(5), pp.956-965.

**Hulten, C.** 2000. "Total Factor Productivity: A Short Biography," *NBER Working Paper* 7471.

**Hulten, C. and S. Srinivasan.** 1999. "Indian Manufacturing Industry: Elephant or Tiger," University of Maryland, Oct.

**Kang, D.** 2001. "The End of High Growth in Korea: the Role of Change in Inter-sectoral Shifts of Labor," *Economic Analysis*, 7(3), The Bank of Korea, pp.134-163 (in Korean).

**Kang, D.** 2009. "Korean Economy's Growth Slowdown and Socioeconomic Maturity Factors," *Kukje Kyungje Yongu*, 15(3), The Korea International Economic Association (in Korean).

**Kang, D. and S. Park.** 2019. *A Study on the Patterns of Changes in Industrial Structure and Long-run Aggregate Productivity Growth*, Korea Institute for Industrial Economics and Trade (in Korean).
**Kim, S.** 2016. "The Fall of Growth and Structural Reform in Korea," *Kyungje Ronjip,* 55(1), Seoul National University, pp.3-27 (in Korean).
**Landry, A.** 1934. *La Revolution Demographique: Etudes et Essais sur les Problemes de la Population*, Paris: INED-Presses Universitaires de France.
**Maddison, A.** 1987. "Growth and Slowdown in Advanced Capitalist Economies: Techniques of Quantitative Assessment," *Journal of Economic Literature*, 25(2), pp.649-698.
**Mincer, J.** 1974. *Schooling, Experience and Earnings*, Columbia Univ. Press.
**Murphy, K. and F. Welch.** 1990. "Empirical Age-Earnings Profiles," *Journal of Labor Economics*, 8(2), pp.202-229.
**Nordhaus, W.** 2001. "Alternative Methods for Measuring Productivity Growth," *NBER Working Paper* 8095.
**Nordhaus, W.** 2004. "Retrospective on the 1970s Productivity Slowdown," *NBER Working Paper 1*0950.
**Notestein, F.** 1945. "Population – The Long View," in T.W. Schultz (ed.), *Food for the World*, University of Chicago Press, pp.36-57.
**OECD.** 2001. *Measuring Productivity: OECD Manual*.
**Psacharopoulos, G.** 1994. "Returns to Investment in Education: A Global Update," *World Development*, 22(9), pp.1325-1343.
**Rodrik, D.** 2012. "Unconditional Convergence in Manufacturing," *Quarterly Journal of Economics*, 128(1) pp.165-204.
**Rhymes, T.** 1971. *On Concepts of Capital and Technical Change*, Cambridge Univ. Press.
**Samuelson, P. and W. Nordhaus.** 2005. *Economics*, 18th edition, McGraw-Hill.
**Smil, V.** 2019. *Growth: from Microorganisms to Megacities*, MIT Univ. Press.
**Seok, B. and N. Lee.** 2021. "A Slowdown in GDP Trend Growth in Korea," *BOK Kyungje Yongu* 2021-2, The Bank of Korea (in Korean).
**Thompson, W.** 1929. "Population," *American Journal of Sociology*, 34, pp.959-975.
**Vollrath, D.** 2020. *Fully Grown*, University of Chicago Press.
**World Inequality Report.** 2022.
**Yoshikawa, H. 1992.** *Japanese Economy and Macroeconomics*, Toyokeizaishinboshya (in Japanese). (吉川洋,『日本經濟とマクロ經濟學』, 東洋經濟新報社.)

## LITERATURE IN KOREAN

**강두용.** 2001.「노동이동의 소진과 고도성장의 종료」,『경제분석』, 7권 3호, 한국은행.
**강두용.** 2009.「한국경제의 성장둔화와 경제성숙화 요인」,『국제경제연구』, 15(3), 국제경제학회.
**강두용 · 박성근.** 2019.『산업구조 변화와 집계 생산성 추세의 장기 패턴에 관한 연구』, 산업연구원.
**김세직.** 2016.「한국경제: 성장 위기와 구조개혁」,『경제논집』, 55(1), 서울대학교 경제연구소.
**석병훈 · 이남강.** 2021.「한국경제의 추세 성장률 하락과 원인」,『BOK 경제연구』, 2021-2호, 한국은행.
**한진희 · 신석하.** 2008.「경제위기 이후 한국경제의 성장둔화에 대한 실증적 평가」, KDI 정책포럼 201호.

*KDI Journal of Economic Policy, 2023, 45(4):57-77*
*https://dx.doi.org/10.23895/kdijep.2023.45.4.57*

# 전세가격의 비용화와 소비자물가지수: 소비자물가지수 자가주거비 반영을 중심으로

오지윤*

*한국 소비자물가지수에서 전세지수는 단일 품목으로 최대 가중치(5.4%)를 차지하고 있으며, 전세가격 자체의 변화는 그대로 주거비 변화로 반영되고 있다. 전세는 주거서비스 비용을 자본화한 가격으로 일차적으로 월세 변화에 연동되지만, 실질적 비용인 월세와 무관하게 금리 변동에 의해서도 영향을 받는다. 따라서 전세가격을 그대로 소비자물가지수에 반영하면, 주거서비스 가격 변화 이외의 부분에 대해서도 비용 변화로 인식될 수 있다. 소비자물가지수 전세지수와 월세지수의 장기시계열을 살펴본 결과, 전세지수는 연평균 2.3% 상승하고 있으나 월세지수는 0.9% 상승하고 있어 추세적인 격차가 나타났다. 우리 경제의 금리가 서서히 하락하면서 자본화된 전세지수가 월세지수보다 더 빠르게 상승한 것으로 판단된다. 주거서비스 비용 변화를 반영할 수 있도록 전세지수의 대체 변수를 사용하여 소비자물가지수를 작성한 결과, 전반적으로 새로운 CPI는 기존의 CPI보다 물가상승률이 낮게 추정되었으며, 자가주거비를 포함하면 이러한 효과가 두드러지게 확대되었다.*

Key Word: 소비자물가지수, 전세, 주거비
JEL Code: E3, F4

* 명지대학교 경제학과 조교수(E-mail: oh.jiyoon@gmail.com)
* Received: 2023. 8. 31.
* Referee Process Started: 2023. 9. 7.
* Referee Reports Completed: 2023. 11. 14.

# I. 서 론

주택 매매가격과 전세가격 상승이 가파른 시기마다 학계 및 언론에서는 소비자물가지수에 자가주거비가 포함되지 않아 가계의 실질적인 부담을 반영하지 못하고 인플레이션이 과소평가되어 완화적 통화정책 여건이 조성되는 점에 대하여 비판해왔다. 실제로 우리나라 소비자물가지수에서 주거비 비중은 9.83%로, 자가주거비가 포함된 미국 소비자물가지수 주거비 비중인 32%에 비해 낮은 편이다. 소비자물가지수에 자가주거비를 반영하자는 논의는 활발해지고 있으나, 한국의 여건에서 자가주거비를 어떻게 반영할 것인가에 대한 방법론적 논의는 아직까지 부족한 편이다.

주요국에서는 소비자물가지수에 자가주거비를 반영할 때 '임대료 상당액', '사용자 비용 방식', 그리고 '순취득 접근방식'을 사용하고 있는데,[1] 경제학적 기회비용 개념에 가장 근접한 방식은 자가 주택을 임대했을 때 기대할 수 있는 '임대료 상당액' 접근법이다. 이 방식은 미국, 일본, 영국, 노르웨이에서 자가주거비를 계상할 때 사용되고 있으며, 우리나라 통계청에서도 자가주거비 반영 소비자물가지수를 보조적으로 산정할 때에도 적용되고 있다. 문제는 통계청에서 사용하고 있는 집세지수에 전세가격 변화가 그대로 반영된다는 점이다. 더욱이 통계청은 1995년 시계열부터 전월세지수로 자가주거비를 추산하는데, 전세지수는 주거서비스에 대한 비용 변화 이외에 금리 등의 요인에도 영향을 받을 수 있어 그대로 반영하는 것은 바람직하지 않다.

이러한 문제는 전세를 월세와 비교해보면 더욱 명확히 드러난다. 월세는 임차인이 임대인에게 일정 기간 동안 주택 사용의 대가로 매기 지불하는 유량(flow) 개념의 비용(cost)이다. 반면, 전세는 임차인이 임대인에게 일정 기간 맡겼다가 되찾아가는 저량(stock) 개념의 보증금으로, 전세가격 자체의 변화는 다른 소비재가격 변화와 동일한 유량 개념의 '비용' 변화가 아니다. 전세에 대한 실질적인 비용은 전세 보증금을 조달하는 데 따른 조달비용 또는 전세 보증금을 다른 데 사용했을 때의 기회비용이며, 전세는 이러한 주거서비스 비용을 자본화한 가격(capitalized price)으로 볼 수 있다. 더욱이 전세가격은 주거서비스 가격인 월세가격에 의해서도 변화하지만, 월세가격과 무관하게 금리 변동에 의해서도 영향을 받는다. 시중 금리의 변동은 조달비용 또는 기회비용에 직접적인 영향을 주는 요인으로, 금리가 상승하는 경우에는 주거서비스의 가격(월세)이 변하지 않더라도 전세가격이 내려가고, 금리가 하락하는 경우에는 전세가격이 상승한다. 따라서 전세가격 자체의 등락을 소비자물가지수에 그대로 반영하면, 주거서비스 가격에 변화가 없음에도 불구하고 자본화된 가격 변화를 비용 변화로 인식하게 되고, 자가주거비를 포함하면 임대료에 대한 가중치가 커지면서 상당한 왜곡이 발생할 수 있다.

본 연구에서는 소비자물가지수에서 전세지수 자체를 주거비에 그대로 반영하면서 발생하

[1]이정익・강재훈(2021)에 의하면 사용자비용 접근법(user cost approach)은 차입자금의 이자비용, 자기자본의 기회비용, 감가상각비, 세금 등 기타 부대비용을 합산하고 주택가격 상승(하락)에 따른 자본이득(손실)을 차감하여 측정하는 방식이다. 순취득 접근법(net acquisitions approach)은 가계부문이 신규로 취득한 주택가격(토지 제외)을 반영하여 자가주거비를 추정하는 방식이다.

는 괴리를 정량적으로 살펴본다. 먼저, 본 연구는 우리나라 전세지수와 월세지수 간에 장기적인 괴리가 존재하는지 실증적으로 검토하였다. 소비자물가지수의 하위 품목인 전세와 월세는 물가조사를 통하여 장기시계열이 축적되어 있다. 소비자물가지수 전세지수와 월세지수를 비교한 결과, 1995년 이후 현재까지 전세지수는 연평균 2.3% 상승하고 있으나 월세지수는 0.9% 상승하는 데 그쳐 양자 간의 장기추세에 큰 격차가 있는 것으로 나타났다. 즉, 전세지수가 상승하는 만큼 월세지수가 상승하지 못한 것이며, 이는 장기적으로 금리가 하락추세를 보이는 데 기인하는 것으로 판단된다. 한편, 2020년 이후 금리 인하와 금리 인상이 짧은 기간에 일어나면서 전세가격이 월세가격보다 큰 폭의 변동성을 보이기도 하였다.

이어서 본 연구는 현재 소비자물가지수에서 그대로 반영되고 있는 전세지수를 월세지수로 전환하거나 전월세전환율을 통하여 직접 월세상당액으로 전환한 후, 이를 토대로 새로운 소비자물가지수를 작성하고 기존 소비자물가지수와 비교·분석하였다. 전세가격의 상승률을 소비자물가지수 주거비에 고스란히 반영한다면 자본화된 전세가격의 변동요인, 특히 금리 변동에 의한 영향이 반영될 수 있다. 전세를 가격 그대로 반영하고 있는 현재의 산출 방식을 주택으로부터의 서비스 비용을 측정하는 방식으로 교정하여 소비자물가지수를 시산한 결과, 새로운 CPI는 기존의 CPI보다 오히려 추세적으로 느리게 상승하는 것으로 나타났다. 특히 자가주거비를 포함한 새로운 CPI는 자가주거비를 포함하지 않은 기존 CPI보다 연평균 상승률이 0.76%p 낮았다.

본고의 결과는 소비자물가지수에 자가주거비를 포함하면 물가상승률이 높아질 것이라는 예상과 상반된다. 자가주거비를 '임대료 상당액' 방식으로 측정하게 되면 전세가격과 월세가격이 중요한데, 월세가 전세에 비해 오랜 기간 낮은 상승률을 보임에 따라 전세를 월세화하거나 비용화하면 오히려 물가상승률이 전반적으로 하락하는 것이다.

본 연구는 두 가지 연구주제와 관련이 있다. 첫째는 자가주거비를 포함시킬 때 CPI 상승률과 관련이 있다. Dias and Duarte(2019)는 미국의 경우 집세지수(shelter index)를 포함시키지 않은 CPI가 자가주거비를 포함하고 있는 공식 CPI보다 물가상승률이 낮음을 보였다. 미국의 경우 집세지수의 장기적 상승률이 비집세지수에 비해 높으므로 집세지수를 제외하면 물가상승률이 낮아진다. 국내 연구로는 서재용·장용성(2022)이 소비자물가지수에 자가주거비를 포함하면 2020년부터 2021년 사이 소비자물가지수가 1.62%p 높아질 수 있음을 보였다. 서재용·장용성(2022)에서는 소비자물가지수에서 조사하는 전세지수가 KB금융 전세지수보다 최근 상승률이 낮다는 데 주목하였고, 소비자물가지수 전세지수를 KB금융 전세지수로 대체한 후 임대료 상당액 방식으로 자가주거비를 포함시키면 2020~21년 물가상승률이 높아짐을 발견하였다. 반면, 본 연구는 자가주거비 산출 시 전세지수를 비용화하여 반영하는 문제에 초점을 두고 있으며, 1995~2023년 장기간의 물가상승률에 대하여 주목하고 있다는 점에서 차이가 있다.

둘째, 본고의 내용은 전세와 월세 관계 연구와 밀접하게 연관되어 있다. '전세'라는 임대차 계약 형태가 경제 규모가 갖춰진 주요국에서 한국에만 존재하기 때문에, 전세와 매매 관계 연구는 상당히 축적되어 있으나, 전·월세 관계에 대한 국내 연구는 거의 없다고 볼 수 있다. 전·월세 관계에 대한 선행연구가 축적되지 않은 까닭은 우리나라 월세지수 시계열이

공표된 지 얼마 되지 않았기 때문이다. 한국 주택가격동향조사는 KB금융(舊 한국주택은행)과 한국부동산원(舊 한국감정원)에서 실시하고 있는데, 월세지수는 KB금융에서 2015년부터 수도권 아파트만을 대상으로 지수화하고 있으며 부동산원에서도 2015년부터 순수 월세지수를 공표하고 있다. 본고에서는 소비자물가지수 품목 조사에서 전세와 월세 지수를 끌어내어 장기시계열을 비교하고, 양자 간에 추세적 격차가 있음을 발견하였다는 점에서 추가적인 의의가 있다.

본고는 아래와 같이 구성된다. Ⅰ장은 서론이다. Ⅱ장에서는 전·월세 지수의 추세적 격차에 대하여 살펴보고, Ⅲ장에서는 전·월세 관계에 대하여 간단히 검토한다. Ⅳ장에서는 전세지수의 대체재로 월세지수를 사용하거나 전월세전환율을 이용하여 직접 월세 상당액 지수를 산출한 후, 이러한 대체 지표를 이용하여 소비자물가지수를 산출하고 기존 지표와 비교한다. Ⅴ장은 결론이다.

## Ⅱ. 전세와 월세의 장기 추이

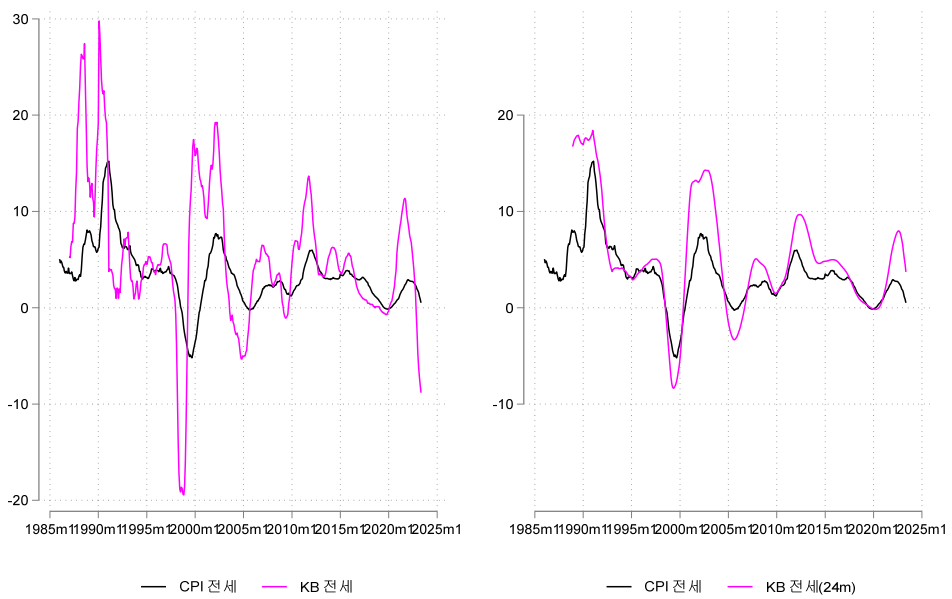
우리나라는 전세 위주의 임대차 계약으로 전세가격지수가 임대가격지수의 역할을 수행해왔다. 전세는 금리를 매개로 월세를 자본화한 가격(식 (1))이라서 월세 변동이 없더라도 금리가 내려가면 전세가격이 올라간다. 이 경우 임차인의 기회비용에는 변화가 없으나, 사회적으로는 전세가격 상승을 모두 비용 상승으로 받아들이는 경향이 있었다. 전세가격 변화를 모두 주거서비스 비용 변화로 인식해왔던 것이다. 이는 우리나라의 임대가격지수가 주로 전세지수로 편제된 데 기인한다. 전세가격지수는 KB금융에서 1986년부터 편제해왔고, 한국부동산원에서도 2003년부터 발표하고 있으나, 월세가격지수는 한국부동산원에서 2015년부터, KB금융에서는 수도권 아파트만을 대상으로 2015년부터 편제하고 있다.

본 연구에서는 소비자물가조사에서 집세 품목으로 존재하는 전세와 월세의 장기시계열을 사용하여 연구를 진행한다. 한국 소비자물가지수에서 집세는 전체 가중치의 9.83%로 이 중에서 전세와 월세는 각각 5.4%와 4.43%를 차지하며, 전세는 소비자물가지수 단일 품목 중에서 가장 큰 가중치[2]를 가진다. 소비자물가지수에서의 전·월세 지수는 현재 전세나 월세로 거주하는 가구의 계약 가격을 조사하고 있으므로 신규 가격을 조사하는 주택동향조사의 전·월세 지수와 시차가 존재한다. 전세의 법적 계약기간이 2년임을 감안하면 소비자물가지수의 전세지수는 약 23개월 전의 신규 가격부터 현시점의 신규 가격까지의 이동평균과 유사할 것으로 기대된다. 실제로 Figure 1에서 소비자물가지수 전세지수는 KB금융 전세지수의 24개월 이동평균과 유사한 방향성을 보인다. Figure 2는 소비자물가지수 전세지수와 한국부동산원의 전세지수 추이를 비교한 자료이다. 한국부동산원 전세지수가 편제되기 시작한 2003년 11월을 1로 표준화하여 비교한 결과, 소비자물가지수 전세지수와 주택동향조사 전세지수는 단기적으로는 상승 속도 면에서 차이가 발생하였으나, 장기적으로는 유사한

[2] 2020년을 기준으로 소비자물가지수를 개편한 결과이며, 현재 전월세 가격조사는 11,000가구를 대상으로 하고 있다.

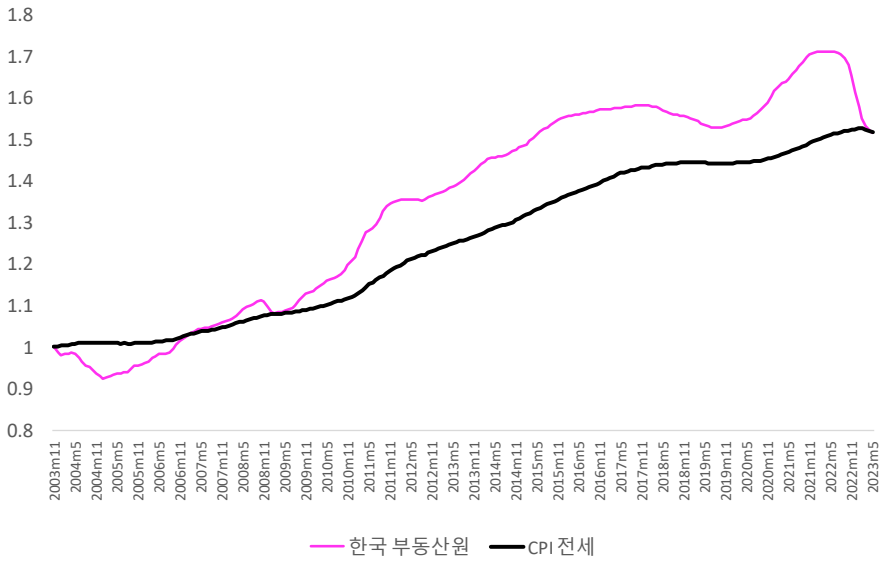
추세를 공유함을 알 수 있다. 2023년 5월 기준 소비자물가지수 전세지수는 2003년 11월 대비 51.7% 상승하였고, 한국부동산원 전세지수는 51.9% 상승하였다.

소비자물가지수 전세지수와 월세지수를 살펴본 결과, 양자 간의 추세는 큰 차이를 보이고 있었다. Figure 3은 1995년 이후 소비자물가지수 전세와 월세 지수 시계열이다. 1995년 1월 대비 2023년 5월 전세지수는 89.0% 상승하였으나 월세지수는 27.3% 상승한 데 그쳤다. 이를 증가율로 환산하면 1995년 1월부터 2023년 5월 중 전세는 평균적으로 전월 대비 0.188%(연율 2.28%) 상승하였으나, 월세는 전월 대비 0.071%(연율 0.855%) 상승하여 양자 간의 장기적 격차가 결코 적지 않다. 동 기간 중 집세는 전세와 월세의 가중 평균치인 전월 대비 0.148%(연율 1.79%) 상승하였다. 헤드라인 소비자물가지수가 동 기간 중 전월 대비 0.231%(연율 2.80%)로 상승한 점을 고려하면 소비자물가지수에서 단일 품목으로 최대 가중치를 가지는 전세와 월세 상승률의 현격한 격차는 소비자물가지수에 장기적으로 큰 영향을 줄 수 있다.



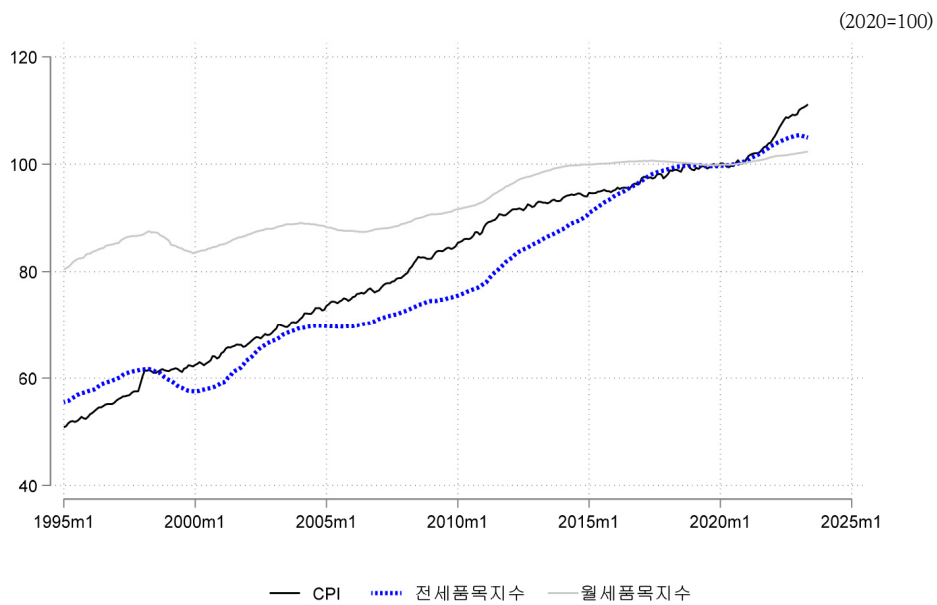

*Source*: 통계청 소비자물가지수, KB부동산통계.

Figure 1. CPI Chonsei Index and KB Chonsei Index




*Source*: 통계청 소비자물가지수, 한국부동산원.

Figure 2. CPI Chonsei Index and REB (Korea Real Estate Board) Chonsei Index

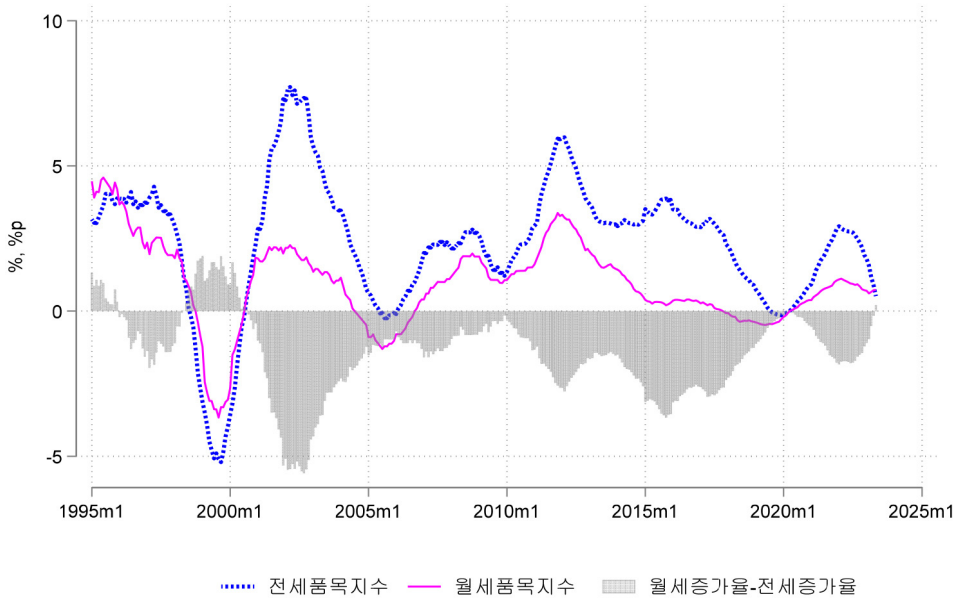



*Note*: 소비자물가지수 품목별 지수 중에서 집세 하위 항목인 전세와 월세 지수임.

*Source*: 통계청 소비자물가지수.

Figure 3. CPI Chonsei Index and Rent Index

Figure 4는 소비자물가지수 전세지수와 월세지수의 전년 동기 대비 증가율이다. 2000년 이후 월세 증가율은 전세 증가율보다 언제나 낮게 유지되고 있으며, 이는 Figure 3과 같이 전세와 월세 지수의 추세적 격차로 누증되어 왔다. 전월세 상승률의 격차는 특정 시기의 일시적 현상이 아니라 30년이 조금 못 미치는 기간 동안 꾸준히 발생한 현상임을 알 수 있다. Figure 4에서 월세 증가율에서 전세 증가율을 차감한 격차는 2000년부터 2005년 사이, 2012년부터 2019년 사이에 크게 벌어졌다. 특히 2014년부터 2016년 기간은 월세 증가율이 둔화하였으나 전세 증가율은 오히려 높아지고 있었다. 일반적으로는 전·월세의 정성적 방향은 동조적이지만, 동 기간에는 전세가격에 영향을 주는 다른 요인으로 인하여 전·월세의 방향성마저 달라진 것으로 이해할 수 있다.




*Note*: 소비자물가지수 전세지수와 월세지수의 전년동기대비 증가율임.
*Source*: 통계청 소비자물가지수.

Figure 4. CPI Chonsei Index and Rent Index (year over year growth)

## Ⅲ. 전·월세 관계와 금리

본 장에서는 전·월세의 장기 추이에 영향을 주는 요인을 파악하기 위하여 전세와 월세 관계에 대하여 살펴보고 간단한 상관관계 분석을 진행한다.

전세는 금리를 매개로 월세 흐름을 자본화한 가격이며, 월세는 시점별 수요와 공급에 따라 결정되는 주거서비스의 가격이다. 전세가격은 실물자본인 주택에서 $R$(월세×12)의 가치가 지속되고 이자율도 균제상태와 같이 $i$로 일정하여 미래에도 변하지 않는다고 가정할 때

식 (1)과 같이 표현된다.[3] 식 (1)을 전개하면 전세가격 $J$와 연세 $R$은 연금산식(annuity formular)과 같은 식 (2)로 정리된다.

$$J=\frac{R}{1+i}+\frac{R}{(1+i)^2}+\frac{R}{(1+i)^3}\cdots \tag{1}$$

$$R_t=i_tJ_t \tag{2}$$

식 (2)는 동일한 주택에 대한 전세 또는 월세 임대계약의 기회비용이 동일함을 의미하는 재정거래조건(arbitrage condition)으로도 해석할 수 있다. 임차인에게는 전세 계약을 통한 기회비용인 $i_tJ_t$와 연간 지출 비용인 $R_t$가 동일하고, 임대인에게는 전세금에 대한 기대수익률 $i_t$에 전세금을 곱한 값과 $R_t$가 동일해야 한다. 임차인과 임대인이 월세 또는 전세 계약의 재정거래조건이 성립하지 않는다면 현재 임대차시장에서의 전세・준전세・반전세・월세 등 다양한 형태의 계약이 균형에서 동시에 존재하기 어렵다. 다만, 전세 수요와 전세 공급, 월세 수요와 월세 공급 간에는 위험(risk)에 있어서 차이가 있다. 전세는 임차인이 임대인에게 금융자본을 맡기고 실물자본으로부터 매기 주거서비스를 받는 계약이므로 채무불이행에 대한 위험이 임대인에게 있다. 반면, 월세는 임대인이 매기에 임차인으로부터 주거서비스 비용을 받아야 하므로 채무불이행에 대한 위험이 임차인에게 있다. 따라서 거시적으로 '$i_t$'라는 하나의 이자율을 상정한 상태에서라면 식 (2)가 성립하지만, 구체적으로는 임대차계약의 형태에 따라서 위험을 반영한 이자율은 달라질 수 있다.

흔히 임차인에게 전세가 월세보다 유리하다는 것은 임차인이 금융중개기관을 통해 차입한 이자율 $i_t$가 전세보증금을 월세로 전환할 때의 전환 비율인 '전월세전환율'보다 낮기 때문이다. 특히 전세자금대출 금리는 한국주택금융공사, 주택도시보증공사, SGI서울보증에서 임대인 채무불이행에 대한 공적 보증을 제공하기 때문에 주택담보대출보다도 평균적으로 낮은 수준이다. 반면, 전월세전환율은 채무불이행에 대한 위험이 임차인에게 있어 금융중개기관에서 차입하는 이자율에 위험 프리미엄이 추가될 수 있다. 시장이자율과 실제 임대시장에서 사용되는 전월세전환율 간의 차이를 $\alpha$라고 하면, 식 (3)으로 표현된다.

$$R_t=(i_t+\alpha)J_t \tag{3}$$

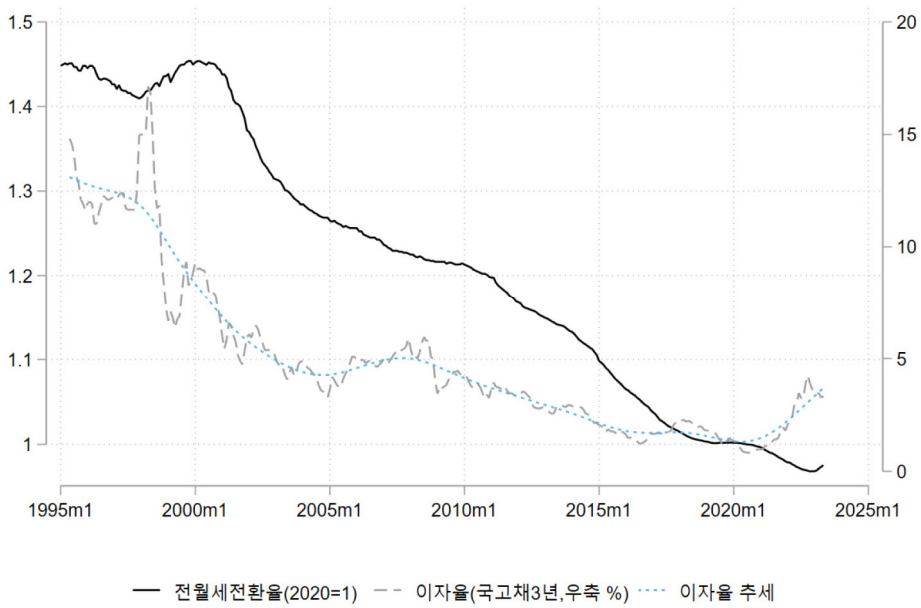
식 (4)는 식 (3)의 로그 차분 형태로 전세가격 변화($dJ$)는 월세가격 변화($dR$)에 비례하고 이자율 변화($di=i_t-i_{t-1}$)에 반비례함을 보여준다. 이 식에 의하면 금리가 하락하면 주거서비스 가격 변화 없이도 전세가 상승할 수 있음을 시사한다. 시장 금리 $i$와 전월세전환율 간의 차이 또는 그 밖에 임차인과 임대인의 기회비용이나 수익률 차이($\alpha$)가 시간에 따라 변하지 않는다면, 이러한 격차는 전세와 월세 간의 추세적 차이에 크게 영향을 미치는 요소로 작용하지 않을 것이다.

[3]반면, 주택가격은 현재 시점에서 경제주체가 기대하는 미래 월세의 변화($E_t(R_k)$) 및 이자율 변화($E_t(i_k)$)를 포함한 현재가치이다.

$$dJ_t = dR_t - \frac{i_t - i_{t-1}}{i_{t-1} + \alpha} \quad (4)$$

Figure 3에서 전세는 월세에 비하여 2000년 이후 빠르게 상승하면서 장기 추세에서 큰 격차를 보여왔다. 이러한 격차는 다양한 원인에 의하여 발생할 수 있으나, 본고에서는 우리 경제의 금리가 꾸준히 하락한 데 주목한다. 식 (4)에서 전세와 월세의 장기적 추세 또는 특정 기간에 상반된 움직임을 보이는 것은 대체로 금리와 연관이 있다. 금리가 추세적으로 하락할 경우 $dJ$는 $dR$에 비하여 더 빠른 상승률을 나타낼 것이며, $dR$이 하락하는 기간에 $di$의 하락폭이 더 크다면 $dJ$는 오히려 상승할 수도 있는 것이다.

Figure 5는 소비자물가지수 전국 월세지수와 전세지수를 통하여 전월세전환율[4] 추세와 시중금리(국고채 3년물)를 비교한 자료이다. 전월세전환율은 장기간 하락하고 있으며, 이러한 추세는 2022년 중반 이후 시중금리의 급격한 인상 시기를 제외하면 대체로 금리의 장기 추세에 후행[5]하면서 따라가는 모습이다. Figure 3에서 전세 증가율이 월세 증가율에 비해 꾸준히 높았던 것은 이와 같은 금리의 추세적 하락이 큰 영향을 미쳤으리라고 추론할 수 있다.




*Note*: 국고채 3년물 금리 추이는 HP filter($\lambda$=14,400)를 통하여 산출함.
*Source*: 통계청 소비자물가지수, 한국은행 시중금리.

Figure 5. Interest Rate and Chonsei to Monthly Rent Conversion Rate

[4]부동산원 전월세전환율은 2011년부터 조사되어 시계열이 짧다. 전월세전환율의 장기 추이를 살펴보기 위하여 본 연구에서는 소비자물가지수 전세지수와 월세지수를 이용하여 전월세전환율 지수를 작성하였다.

[5]본고에서 중점적으로 사용하고 있는 전세지수와 월세지수는 소비자물가지수 하위 품목 지수로서 앞서 설명한 바와 같이 신규 계약 시세인 주택가격동향지수보다는 후행하며 이동평균되어 단기 변동성이 크지 않은 특성을 가진다. 따라서 전월세전환율 지수 역시 이동평균된 월세지수와 전세지수 간의 비율이기 때문에 시점별 금리보다는 후행한다.

금리는 장기적으로 전월세전환율과 연동되어 있을 뿐만 아니라 단기적으로도 전세가격 증가율과 음의 연관성을 보인다. Table 1은 식 (5)의 회귀분석 결과로, 2001년 1월부터 2023년 5월 중 전세와 월세, 그리고 금리 간의 상관관계를 보여준다. 이 결과는 전세를 월세 및 금리의 영향력으로 설명하는 것이 아니라 세 변수 간의 상관성을 실증적으로 파악하기 위함이다. $dJ_t(=\ln J_t - \ln J_{t-12})$와 $dR_t(=\ln R_t - \ln R_{t-12})$는 각각 로그 지수의 12개월 차분값이다. 이자율은 12개월 차분한 $di$를 사용하였다.

(5) $$dJ_t = \alpha + \beta dR_t + \gamma di_t + \epsilon_t$$

전세 증가율은 월세 증가율이 1%p 증가할 때 약 1.3%p 상승하고, 금리가 1%p 하락할 때 전세가격 증가율은 0.16%p 높아졌다. 해당 시점의 금리가 약 24개월 이동평균한 전세 증가율에 영향을 미치기 때문에 상대적으로 정량적 크기가 크게 나타나지 않는 것으로 보인다.

Table 1. Relationship between Monthly Rent, Interest Rate, and Chonsei

| | $dJ$ | | |
|---|---|---|---|
| $dR$ | 1.345*** | | 1.316*** |
| | (19.55) | | (19.04) |
| $di$ | | -0.372*** | -0.164** |
| | | (-3.81) | (-2.54) |
| $R^2$ | 0.587 | 0.048 | 0.596 |
| N | 268 | 268 | 268 |

*Note*: *, **, ***는 각각 10%, 5%, 1% 수준에서 유의함을 의미함.
*Source*: 통계청, 한국은행.

금리와 전세가격이 역관계를 보이므로 소비자물가지수에서 전세가격의 변화를 그대로 지수화하여 반영하는 것은 바람직하지 않다. 이론적으로 전세가격의 변화가 소비되어 사용되는 비용 변화가 아니라는 점에서도 전세지수 자체 반영이 바람직하지 않으며, 실증적으로 Figure 3, Figure 4와 같이 전세와 월세 지수가 장기적으로 동일한 추세를 공유하지 않고 지수 간 격차가 확대되고 있으므로 이 또한 소비자물가지수의 왜곡 요인이 될 수 있다.

# Ⅳ. 소비자물가지수 시산(試算)

본 장에서는 ① 전세지수를 월세지수로 대체하여 계산한 소비자물가지수와 ② 전세지수를 전월세전환율을 통하여 월세화했을 경우의 소비자물가지수를 기존 소비자물가지수와 정량적으로 비교하고자 한다.

## 1. 전세지수를 월세지수로 대체하여 사용하는 경우

① 전세지수는 자본화된 가격으로 실질적인 주거비 변동 외에 금리 등 거시변수에 의해서도 가격 변화가 나타날 수 있다. 이러한 변동 가운데 매기 주거비 변화만을 추출하기란 쉽지 않으므로 기존의 월세지수를 전세지수의 대체재로 고려할 수 있다. 전세 계약 주택의 주거서비스 비용과 월세 계약 주택의 월세가격이 거시적으로 동조화되어 있다는 가정 아래 소비자물가지수 전세지수를 소비자물가지수 월세지수로 대체할 수 있다.

(6) $$CPI_t = (1-w_{jt}-w_{rt})CPI_{other,t} + w_{jt}J_t + w_{rt}R_t$$

식 (6)에서 기존 소비자물가지수 $CPI_t$는 집세 이외 품목인 $CPI_{other,t}$, 전세지수 $J_t$, 그리고 월세지수 $R_t$을 각각의 가중치인 $1-w_{jt}-w_{rt}$, $w_{jt}$, $w_{rt}$로 합산한 결과이다. 전세지수 $J_t$를 $R_t$로 변경하여 계산한 소비자물가지수 $CPI_t^R$은 식 (7)과 같이 월세지수 $R_t$에 집세에 해당하는 모든 가중치가 적용된다.

(7) $$CPI_t^R = (1-w_{jt}-w_{rt})CPI_{other,t} + (w_{jt}+w_{rt})R_t$$

Figure 6은 $CPI_t$와 $CPI_t^R$의 전년 동기 대비 증가율이다. Figure 4에서 전세 증가율과 월세 증가율의 격차는 2000년대 초반과 2010년대에 두드러지게 나타난다. 그러나 전세지수의 가중치 $w_{jt}$가 2000년 이후 하락하면서 2010년 이후부터는 전세지수 자체를 반영한 기존 소비자물가지수와 전세지수를 월세지수로 교체한 소비자물가지수 간의 차이가 거의 없는 편이다. 1996년 1월부터 2023년 5월 공식 소비자물가지수는 재계산된 소비자물가지수에 비하여 0.17%p 높아 상향 편의가 크지 않다. 전세가격과 월세가격의 추세적 격차가 크지만, 전세지수의 가중치를 적용하면 소비자물가지수에 미치는 영향이 크지 않다. 다만, 2000~05년 중 전세지수 가중치가 9.35%로 높았던 기간에는 새로운 CPI의 증가율이 기존 CPI에 비하여 평균 0.33%p 낮았고, 2005년 1월에는 무려 0.83%p에 달하는 격차가 발생하기도 하였다.


*Source*: 통계청 소비자물가지수.

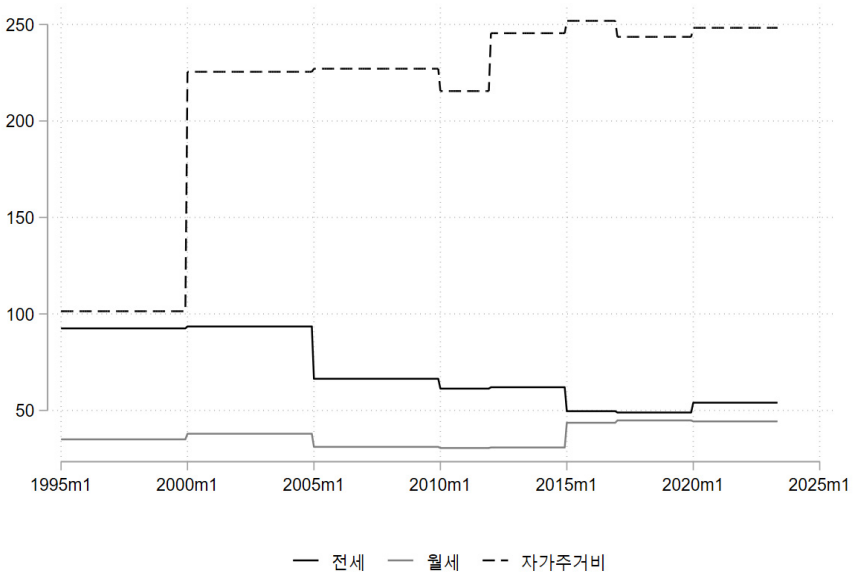
Figure 6. Official CPI and Revised CPI

통계청에서는 1995년 기준 지수부터 자기소유주택 주거비용을 귀속임대료 방식으로 물가지수에 포함하는 자가주거비 포함 지수를 작성하여 보조지표로 활용하고 있다. 귀속임대료 방식은 자가주거비를 반영하는 여러 방식 중 '임대료 상당액' 접근법에 속하며, 미국, 일본 등에서 사용하는 방식이다. 통계청은 귀속임대료로 전세지수와 월세지수의 가중평균인 집세지수(식 (8))를 그대로 사용하고 있다. 2020년 소비자물가지수 개편 이후 자가주거비는 248.3의 가중치를 가지며, 자가주거비 가중치(Figure 7)는 2000년 개편부터 큰 폭으로 증가한 후 꾸준히 상승하는 추세를 보인다. 소비자물가지수에서 자가주거비 가중치는 가계동향조사 자가거주 가구의 임대료 상당액을 토대로 산출되는데, 자가주거비의 가중치가 19.89%(=248.3/(1000+248.3))로 높다 보니 자가주거비 포함 소비자물가지수에서 집세 $H_t$의 움직임은 영향력이 큰 편이다. 통계청의 자가주거비 포함 소비자물가지수 $CPI_t^H$는 식 (9)와 같이 계산되고, 본 연구에서 $J_t$를 $R_t$로 대체한 소비자물가지수 $CPI_t^{HR}$는 식 (10)이다. 여기서 $w_{ot}$는 통계청에서 공표하고 있는 자가주거비 가중치이다.

(8) $$H_t = \frac{w_{jt}}{w_{jt}+w_{rt}} J_t + \frac{w_{jt}}{w_{jt}+w_{rt}} R_t$$

(9) $$CPI_t^H = \frac{1-w_{jt}-w_{rt}}{1+w_{ot}} CPI_{other,t} + \frac{w_{jt}}{1+w_{ot}} J_t + \frac{w_{rt}}{1+w_{ot}} R_t + \frac{w_{ot}}{1+w_{ot}} H_t$$

(10) $$CPI_t^{HR} = \frac{1-w_{jt}-w_{rt}}{1+w_{ot}} CPI_{other,t} + \frac{w_{jt}+w_{rt}+w_{ot}}{1+w_{ot}} R_t$$




*Note*: y축 값은 1000을 기준의 품목별 가중치임.

*Source*: 2022년 통계청 소비자물가지수 연보 해설자료 1.

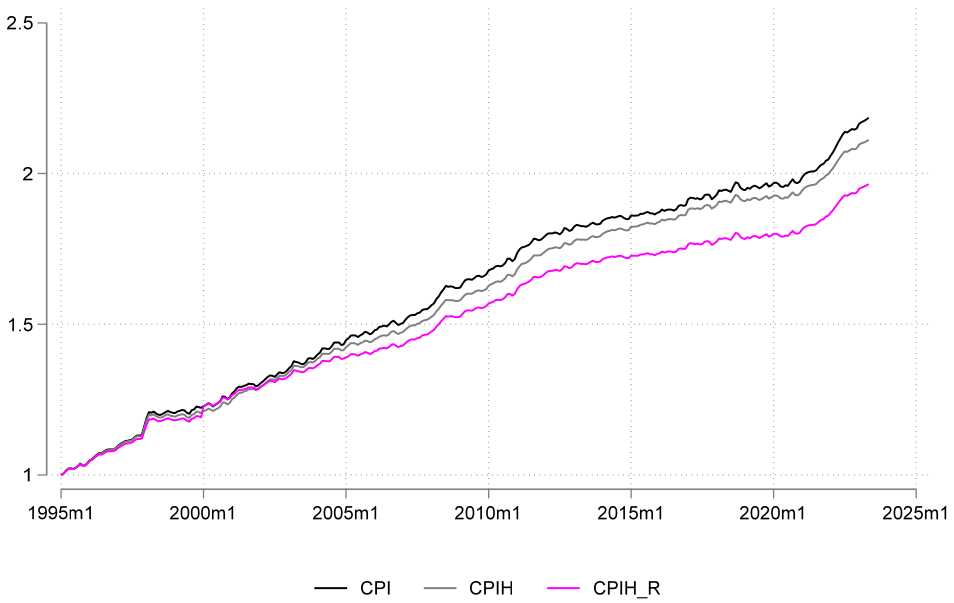
FIgure 7. Weights of Chonsei, Monthly Rent, and Owners' Equivalent Rent of Residences in CPI

소비자물가지수에 자가주거비를 포함하면 전세지수가 소비자물가지수에 미치는 영향은 15.3%로 상승하기 때문에 전세지수 가격 자체를 그대로 반영하는 데 따른 왜곡이 확대된다. Figure 8은 통계청의 소비자물가지수($CPI_t$), 자가주거비 포함 소비자물가지수($CPI_t^H$), 그리고 전세지수를 월세지수로 대체하여 계산한 자가주거비 포함 소비자물가지수($CPI_t^{HR}$)이다. 1995년 1월을 1로 표준화하여 상승 속도를 비교하면, 소비자물가지수는 자가주거비를 포함하지 않을 때 더 빠르게 상승하였다. 이는 집세지수가 그 외 품목에 비하여 평균 상승률이 높지 않았기 때문이다. 정량적으로 살펴보면 1995년 1월 대비 2023년 5월 공식 CPI와 통계청에서 보조적으로 발표하는 CPI(자가주거비 포함)는 각각 118.6%와 111.2% 상승하였으며 동 기간 중 전체 격차가 7.4%p로 크지 않다. 그러나 전세지수를 월세지수로 대체한 CPI(자가주거비 포함)는 동 기간 중 96.5% 상승하여 공식 CPI 대비 22.1%p 낮았다. 대체 지수를 사용한 CPI(자가주거비 포함)가 매년 공식 CPI 대비 0.76%p 덜 상승한 것으로 해석할 수 있다.

Figure 9는 $CPI_t$, $CPI_t^H$, $CPI_t^{HR}$의 전년 동기 대비 증가율이며, 막대 그래프는 $CPI_t^{HR}$의 증가율에서 $CPI_t$의 증가율을 차감한 값이다. 자가주거비를 포함한 소비자물가지수는 전세지수를 월세지수로 치환하여 재계산할 경우 공식 소비자물가지수보다 증가율이 낮았으며, 이러한 격차는 금리 변화가 컸던 2020년부터 2023년 중에 잘 드러난다. 2020년 1월부터 2023년 5월 중 공식 CPI는 재계산된 CPI(자가주거비 포함)보다 평균적으로 0.5%p 높게 나타나 집세 및 자가주거비 이외 품목의 인플레이션이 월세 인플레이션에 비하여 높았음을

보이고 있다.

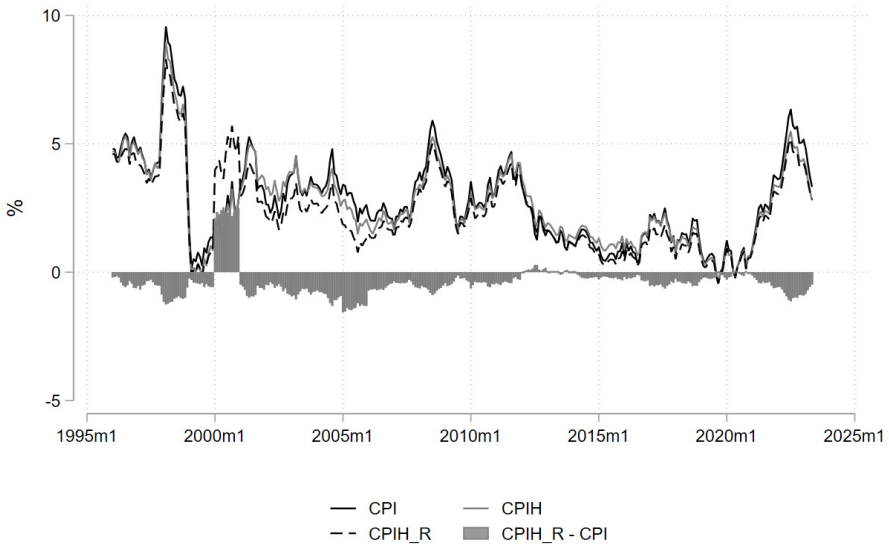
2020년 이후 자가주거비 포함 $CPI_t^{HR}$가 공식 $CPI_t$에 비해 더디게 상승하는 것은 항간의 인식과 다소 다르다. 2020년 이후 전세 및 매매 가격이 전국적으로 가파르게 상승하는 동안 소비자물가지수에 자가주거비를 반영하지 않아 CPI 상승률이 저평가되고 있다는 우려가 존재[6]해 왔다. 그런데 전세가격은 주거서비스의 가격 변화 외에 금리 변화의 영향을 받는다. 2020년부터 2023년 중 시중금리는 정책금리의 인하와 인상으로 그 어느 때보다도 높은 변동성을 보여주고 있다. 2020년에는 경기둔화를 방어하기 위하여 금리가 인하되면서 전국 아파트 실거래 전세가격은 2020년 1월~2021년 8월 중 19.42% 상승하였다가 2021년 8월부터는 금리가 인상되면서 2021년 8월~2023년 4월 중 10.57% 하락하였다. 금리효과가 상대적으로 배제된 월세지수를 전세지수의 대체 지수로 이용하면 2020년 이후에도 자가주거비 포함 소비자물가지수는 기존 CPI에 비하여 0.49%p 낮았다. 2022년 7월 CPI 물가상승률이 6.3%로 근래 가장 높았던 시점에서 $CPI_t^{HR}$는 5.2%로 양자 간의 격차는 무려 1.1%p까지 벌어지기도 하였다.




*Source*: 통계청 소비자물가지수, 저자 계산.

Figure 8. $CPI_t$, $CPI_t^H$, $CPI_t^{HR}$

[6]통계청의 언론보도설명 물가편에서는 급등하는 전세가격이 소비자물가지수에 제대로 반영되지 못하고 있다거나 자가주거비를 포함하지 않고 있어 소비자물가지수가 저평가되었다는 언론사 보도에 대하여 2021.1.7., 2021.9.13., 2021.12.22., 22.4.21., 2022.4.25.에 걸쳐 설명자료를 배포하였다. 이처럼 전세 및 매매 가격 상승이 소비자물가지수에 제대로 반영되지 못하거나 자가주거비에 포함되지 못하여 소비자물가지수 하향 편의를 불러일으킨다는 여론들이 많았다.




*Source*: 통계청 소비자물가지수, 저자 계산.

Figure 9. CPI, CPIH, CPIHR (year over year growth)

## 2. 전세지수를 전월세변환율을 이용해 월세화하는 경우

임대차 계약에서 전세는 주택 유형이 아파트일수록, 중형 이상 크기일수록 그 비중이 높아진다. 이는 전세 대상 주택과 월세 대상 주택이 이질적이어서, 전세계약의 월세 상당액과 월세지수 사이의 동조적 관계가 지지되지 않을 가능성을 내포한다. 본 절에서는 전세지수를 전월세전환율을 통하여 월세상당액 지수로 전환하고, 이를 토대로 작성한 소비자물가지수와 기존 소비자물가지수를 정량적으로 비교하고자 한다.

소비자물가지수 전세지수는 해당 시점의 신규 계약가격이 아니라 조사 대상 가구의 전세가격을 조사한 지수이므로 주택동향조사 전세지수의 이동평균 값과 유사하다. 따라서 소비자물가지수 전세지수에 해당 시점의 전월세전환율을 그대로 적용하기가 어렵다.[7] 대신 전세지수를 월세화하기 위하여 한국부동산원 종합주택 전세가격지수를 동 기관의 전월세전환율을 이용하여 변환하였다.

식 (11)은 한국부동산원의 전세지수 $h_t$와 전월세전환율 $x_t$를 곱한 후 전세를 월세화한 지수 $H_t$의 산식이다. 소비자물가지수는 현재 계약 중인 가격을 사용하므로 $H_t$는 $h_t x_t$의 24개월 이동평균 값으로 표현된다. 식 (12)는 소비자물가지수 전세지수인 $J_t$ 대신에 $H_t$의 24개

[7] $t$ 시점의 전월세전환율을 $x_t$라고 하자. 소비자물가지수의 전세지수 $J_t$는 REB 또는 KB 전세지수의 n기 이동평균 값으로 볼 수 있고, REB 또는 KB 전세지수를 $j_t$라고 하면 $J_t = \frac{1}{n}\sum_{k=0}^{n-1} j_{t-k}$이다. 소비자물가지수 전세지수 $J_t$에 전월세전환율 $x_t$를 적용하면 $x_t J_t = \frac{1}{n}\sum_{k=0}^{n-1} x_t \times j_{t-k}$가 되어 적절한 변환이 이루어지기 어렵다.

월 이동평균 값을 적용한 식이다.

$$H_t = \sum_{k=0}^{23} \frac{h_{t-k} x_{t-k}}{24} \tag{11}$$

$$CPI_t^X = (1 - w_{jt} - w_{rt}) CPI_{other,t} + w_{jt} H_t + w_{rt} R_t \tag{12}$$

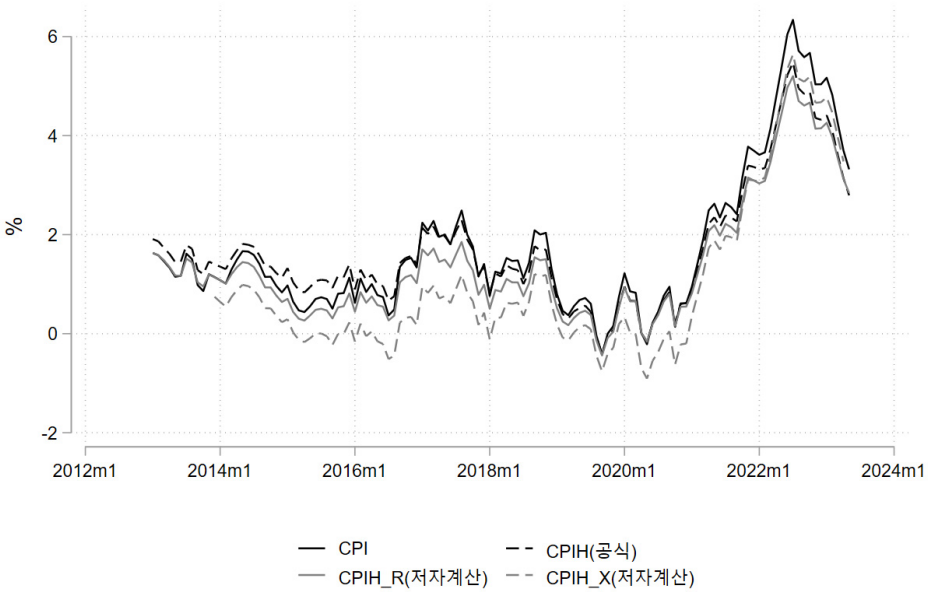
Figure 10은 공식 $CPI_t$, 식 (5)에서 구한 $CPI_t^R$, 그리고 식 (12)의 $CPI_t^X$의 전년 동기 대비 증가율이다. 전세지수 대신 월세지수를 사용한 $CPI_t^R$은 공식 $CPI_t$와 큰 차이를 보이지 않았으나, 전세지수를 전월세전환율로 변환한 후 작성한 $CPI_t^X$와 기존 $CPI_t$ 간의 격차는 전·월세 증가율 간의 편차가 크게 발생했던 2014~17년에 더 확대된 모습이다. 2015년 전후 전세가격은 상승세가 지속되었으나 월세가격 증가율은 둔화되는데, 이러한 격차는 전세가격과 전월세전환율을 이용할 때 더 확대된다. 한편, 2020년 이후 전세가격의 변동성이 커졌으나 전월세전환율의 변화는 이에 못 미쳤기에 $CPI_t^X$ 증가율의 표준편차가 $CPI_t$ 및 $CPI_t^R$보다 더 크게 나타난다.


*Source*: 통계청 소비자물가지수, 저자 계산.

Figure 10. $CPI_t$, $CPI_t^R$, $CPI_t^X$

$CPI_t$와 $CPI_t^X$의 격차는 자가주거비를 포함할 때 더 커진다. Figure 11은 기존 자가주거비를 포함한 소비자물가지수 $CPI_t^H$, 전세가격을 월세로 대체한 $CPI_t^{HR}$, 전세가격을 전월세전환율로 변환하여 산출한 $CPI_t^{HX}$의 그래프이다. 소비자물가지수에서 자가주거비를 포함하면 임대료 상당액의 준거가 되는 집세의 영향력이 확대된다. 전세지수를 대체한 월세상당액지수 $H_t$는 전세지수 $J_t$보다 낮은 상승률을 보이므로 $CPI_t^{HX}$는 $CPI_t$, $CPI_t^{HR}$ 대비 낮은 상승률을 보인다. 2014년 1월 대비 2023년 4월[8] $CPI_t$, $CPI_t^H$, $CPI_t^{HR}$, $CPI_t^{HX}$는 각각 18.2%, 17.0%, 14.2%, 11.7% 상승하였는데, $CPI_t$와 $CPI_t^{HX}$의 격차는 동 기간 중 6.6%p이며, 이는 연평균 각각 1.75%, 1.68%, 1.39%, 1.11% 상승한 것으로 볼 수 있다. $CPI_t^{HX}$가 $CPI_t$에 비하여 월평균 전년 동기 대비 약 0.64%p 낮은 상승률을 보인 것으로 해석된다.

IV-2의 결과는 전세지수의 대체 변수를 구하는 것이 상당히 어려울 수 있음을 시사한다. $J_t$를 전월세전환율을 이용하여 $H_t$로 대체한 결과, 2015년 소비자물가지수($CPI_t^X$) 및 자가주거비 포함 소비자물가지수($CPI_t^{HX}$)는 공식 $CPI_t$와 달리 디플레이션 구간이 나타났으며, 2019년까지 해당 지수들은 0 근처의 낮은 증가율을 보여주었다.




*Source*: 통계청 소비자물가지수, 저자 계산.

Figure 11. $CPI_t$, $CPI_t^H$, $CPI_t^{HR}$, $CPI_t^{HX}$

[8]한국 부동산원의 전월세전환율이 2011년부터 제공되어 계산된 시계열이 짧다.

# V. 결 론

본 연구에서는 소비자물가지수 주거비 산출 시 전세지수를 그대로 사용할 때 발생할 수 있는 물가지수 왜곡 현상에 대하여 실증적으로 분석하였다. 전세제도는 우리나라에서 주로 행해지는 임대차 계약의 일환이며, 전세보증금은 임차인이 실물자본인 주택을 사용하는 대가로 계약기간 중 임대인에게 제공하는 금융자본이다. 전세가격은 매기 금융자본의 기회비용인 월세 상당액의 변화뿐만 아니라 금리에 의해서도 영향을 많이 받는다. 따라서 전세가격 변동을 고스란히 반영하고 있는 소비자물가지수 주거비 산정방식은 전세보증금의 '비용'을 반영하는 방식으로 수정될 필요가 있다. 우리나라 소비자물가지수에서 자산가격을 반영하지 않는 것과 같이 전세가격의 변동을 그대로 반영하는 것은 '비용'을 반영해야 하는 물가지수 조사에 부합하지 않는다.

소비자물가지수에서 조사된 전세지수는 1995년 이후 2023년까지 연평균 2.28% 상승하여 동 조사의 월세지수(연평균 0.855%)와 추세적인 격차를 보여왔다. 한국은 월세의 장기시계열이 존재하지 않아, 전세와 월세의 비교가 어려웠는데, 본고에서는 CPI의 품목에서 최초로 장기시계열을 꺼내어 추세적 격차가 존재함을 밝힘으로써 비용 측면의 임대료와 자본화된 가격인 전세 간의 격차를 보였다는 점에서도 의의가 있다. 전세지수와 월세지수 간의 격차는 특정 시기에 한두 번 나타난 현상이 아니며, 분석기간 내내 꾸준히 지속되었다. 이러한 현상은 우리나라의 금리가 추세적으로 낮아지고 있는 데 기인하는 것으로 추측되며, 전월세전환율도 최근 급격한 금리 상승기를 제외하면 시중금리 추세를 좇아 장기간 하락한 점도 이를 뒷받침하고 있다. 월세와 전세의 장기적 상승률이 금리의 추세적 하락에 가장 큰 영향을 받을 것으로 추정되지만, 그 외의 다른 요인들에 의해서도 영향을 받을 수 있으므로 추가적인 연구가 필요한 부분이라 하겠다.

소비자물가지수에 자가주거비를 포함할 경우 통화정책 측면에서 전세지수를 적절하게 대체하는 작업은 중요한 이슈가 될 수 있다. 본고에서는 전세지수를 기존의 월세지수로 대리하거나, 전월세전환율을 이용하여 월세상당액 지수를 직접 편제하여 사용하였다. 그 결과 새로운 *CPI*는 기존 *CPI*에 비하여 소폭 낮은 증가율을 보였으나, 전세지수의 가중치가 5% 내외로 크지 않기 때문에 정량적으로 눈에 띄는 차이를 보이지는 않았다. 그러나 자가주거비를 포함한 *CPI*에서는 전세지수의 가중치가 15% 내외까지 증가하면서 전세지수를 대체하는 데 따른 정량적 크기가 확대되었다. 전세지수를 월세지수로 대체하여 계산한 *CPI*(자가주거비 포함)는 공식 *CPI*에 비하여 연평균 0.76%p 덜 상승하였는데, 이는 인플레이션 타기팅 수준이 2%임을 감안할 때 적지 않은 차이이다.

전세는 주거서비스 자체의 가격인 월세와 달리 금리 변화에 예민하게 반응하는 자본화된 가격이다. 따라서 소비자물가지수 집세 항목에서도 전세가격을 비용화할 수 있는 여러가지 방식을 모색하여야 한다. 그러나 아쉽게도 주거비 산출 시 전세지수를 그대로 반영하는 데 대한 비판적 검토가 이루어지지 않고 있다. 주요국에서는 전세제도가 없으므로 관련 연구가 없고, 국내에서는 전세지수와 주거서비스 비용을 분리하여 접근한 연구가 드물다. 본 연구

는 전세지수와 월세지수 상승률의 장기적 격차를 보이고, 전세지수를 대체한 물가상승률이 낮아질 수 있음을 제시하였다는 데에서 연구의 의의가 있다. 소비자물가지수에 공식적으로 자가주거비를 포함하면 물가상승률이 더 낮아질 수 있으므로, 한국 소비자물가지수에서 집세지수를 산출하는 방식에 대한 후속 연구가 긴요하다고 판단된다.

# 참고문헌

**서재용 · 장용성.** 2022.「소비자 물가상승률 통계의 잠재적 괴리 요인」,『경제학연구』, Vol. 70, No. 2: 37~59.

**이정익 · 강재훈.** 2021.「자가주거비와 소비자물가」, BOK이슈노트, 한국은행, 제2021-25호.

**Dias, D. A. and J. B. Duarte.** 2019. "Monetary Policy, Housing Rents, and Inflation Dynamics," Journal of Applied Econometrics, 34: 673~687.

**통계청,** https://kostat.go.kr/board.es?mid=a10304040000&bid=11536.

# The Conversion of Chonsei into Monetary Costs and its Relationship with the Consumer Price Index

*By* JIYOON OH*

*The Chonsei component holds the highest level of weight (5.4%) in the composition of the Korean consumer price index (CPI). The variations in Chonsei prices are directly reflected in the CPI as a representation of cost swings. The Chonsei refers to a deposit that accumulates the costs related to housing services and is mostly affected by variations in rental rates. Nevertheless, it is important to note that Chonsei prices are also susceptible to fluctuations in interest rates, regardless of the rent prices. Therefore, if Chonsei were directly and one-to-one indexed to the CPI, they could include changes other than residential service prices. After analyzing the time series data of the Chonsei index and rent index inside the CPI, it becomes apparent that the Chonsei index displays an average annual growth rate of 2.3%, whilst the rent index reveals a growth rate of 0.9%. The observed disparity in growth rates indicates a divergence in trends between the two indices. It is posited that the Chonsei index, when capitalized, has had a more rapid increase compared to the rental index, owing to the gradual drop in interest rates. To effectively reflect fluctuations in the housing service costs, proxies for the Chonsei index were utilized in the construction of a consumer price index. The findings of our study suggest that, overall, the newly developed CPI demonstrates a comparatively lower rate of inflation when compared to the official CPI. Furthermore, the inclusion of imputed rents for owner-occupied housing in CPI amplifies this effect.*

Key Word: Consumer Price Index, Chonsei, Long Term Deposit Rent, Housing Expenses
JEL Code: E3, F4

* Professor, Department of Economics, Myongji Uneversity (E-mail: oh.jiyoon@gmail.com)
* Received: 2023. 8. 31.
* Referee Process Started: 2023. 9. 7.
* Referee Reports Completed: 2023. 11. 14.

# KDI Book Membership Information

## Exclusive Offer (Members-Only)

- All KDI publications, with the exception of those classified as confidential or limited, are to be mailed to members
- Preferential invitations to special events hosted by KDI including seminars, policy discussion forums, public hearings, etc., are to be mailed.
- A 10% discount on the online purchases of additional copies of the published research monographs (printed-only) from the KDI homepage.

## KDI Publications

- Publications include books, research monographs, policy studies, KDI policy forums, KDI FOCUS, research papers and policy-information materials.
- Three types of periodicals are available:
  - Monthly: KDI Monthly Economic Trends, KDI Review of the North Korean Economy, Economic Bulletin, Narakyungje
  - Quarterly: KDI Journal of Economic Policy
  - Biannual: KDI Economic Outlook

## Annual Fees

- Individual Purchase: 100,000 KRW
- Institutional Purchase: 300,000 KRW

## Sign-Up

- You may sign up for membership via KDI homepage. Please register on the homepage by completing and submitting the registration form. Possible payment methods are as follows:
  - Bank-Transfer: Woori Bank, 254-012362-13-145 (account holder name: Korea Development Institute)
  - GIRO System: No. 6961017 (Credit Card and Mobile Payments available)
  - Direct Payment to the Research Outcome Dissemination Unit of KDI Division of External Affairs.

## Contact

- Publication personnel in charge: Research Outcome Dissemination Unit, Division of External Affairs, KDI.
  - Tel: 82-44-550-4346 / Fax: 82-44-550-4950 / E-mail: book@kdi.re.kr
- Sales Distributors
  - Kyobo Bookstore (Gwanghwamun Branch: Government Publications Section)
    Tel: 82-2-397-3628
  - Yongpoong Bookstore (Jongno Branch: Policy & Economy Section)
    Tel: 82-2-399-5632

*KDI Journal of Economic Policy*
韓國開發硏究

Registration Number 세종 바00002호
Printed on November, 30, 2023
Published on November, 27, 2023
Published by Dongchul Cho, President of KDI
Printed by Good Idea Good Peoples

Price : 3,000 KRW

Registered on March, 13, 1979

KDI
Korea Development Institute
263, Namsejongro, Sejong-Si, Korea I **TEL** 82-44-550-4114
**FAX** 82-44-550-4310 I www.kdi.re.kr

34
9 772586 299000
ISSN 2586-2995