August 2025 Vol.47, No.3

KDI Journal of Economic Policy

Contract Type Selection in Korea's Large-Scale Retail Sector
····· Jinkook Lee · Myeongsik Seo

On the Effects of National Debt on the Distribution of Household Assets
····· Seung-Ryong Shin

The Macroeconomic Effects of Structural Oil Price Shocks: An International GVAR Analysis
····· Sora Chon

Efficiency Effects of Regulations on Unfair Subcontracting Behaviors
····· Yong Hyeon Yang

Sharing Economic Rents with Workers? Evidence from Matched Employer-Employee Data in Vietnam
····· Nobuaki Yamashita

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

Editor-in-Chief:	Shin, Kwanho	(Professor at Korea University) khshin@korea.ac.kr
Managing Editor:	KIM, Minjung	(Fellow at KDI) mjkim@kdi.re.kr
Editors:	JEONG, Daehee	(Fellow at KDI) dhjeong@kdi.re.kr
	Lee, Jongyearn	(Professor at KDI School) jonlee@kdischool.ac.kr
	Chun, Hyunbae	(Professor at Sogang University) hchun@sogang.ac.kr
	Hahn, Chinhee	(Professor at Gachon University) chhahn@gachon.ac.kr
	Chung, Wankyo	(Professor at Seoul National University) wankyo@snu.ac.kr
	Chun, Youngjun	(Professor at Kyunghee University) choiy@khu.ac.kr
	Choi, Yongseok	(Professor at Kyunghee University) choiy@khu.ac.kr
	Kim, Kwangho	(Professor at Hanyang University) kwanghokim@hanyang.ac.kr
	KIM, Duol	(Professor at Myongji University) duolkim@mju.ac.kr
	Oh, Hyungna	(Professor at Kyunghee University) h.oh@khu.ac.kr
	Park, Sunyoung	(Professor at Dongguk University) sunyoungpark@dongguk.edu
	Choi, Sangyup	(Professor at Yonsei University) sangyupchoi@yonsei.ac.kr
	Kim, Seik	(Professor at Korea University) seikkim@korea.ac.kr
	Rhee, Keeyoung	(Professor at Sungkyunkwan University) keeyoungrhee@g.skku.edu
	Yun, Youngjin	(Professor at Hanyang University) youngjinyun@hanyang.ac.kr
	Park, Woongyong	(Professor at Seoul National University) Park, Woongyong
	Barry Eichengreen	(Professor at UC Berkeley)
	Charles Horioka	(Professor at Kobe University)
	Ippei Fujiwara	(Professor at Keio University)
	Jaewoo Lee	(Deputy Division Chief at IMF)
	Steven Davis	(Professor at Stanford University)
Administration:	Han, Jaehee	(Research Associate at KDI) kdijournal@kdi.re.kr

KDI Journal of Economic Policy

August 2025 VOL. 47, NO. 3

Articles

Contract Type Selection in Korea's Large-Scale Retail Sector
Jinkook Lee · Myoungshik Seo 1

On the Effects of National Debt
on the Distribution of Household Assets
Seung-Ryong Shin 31

The Macroeconomic Effects of Structural Oil Price Shocks:
An International GVAR Analysis
Sora Chon 69

Efficiency Effects of Regulations
on Unfair Subcontracting Behaviors
Yong Hyeon Yang 89

Sharing Economic Rents with Workers?
Evidence from Matched Employer-Employee Data in Vietnam
Nobuaki Yamashita 115

KDI Journal of Economic Policy 2025, 47(3):1-29
https://dx.doi.org/10.23895/kdijep.2025.47.3.1

Contract Type Selection in Korea's Large-Scale Retail Sector†

By JINKOOK LEE · MYOUNGSHIK SEO*

"Using firm-level data on 7,000 suppliers transacting with 26 major South Korean retailers, this study analyzes how contract types, referring to direct purchase, special contract, consignment, and store lease types, are determined and how they affect supplier performance. Contract choice varies systematically by retail format and product category, shaped by transaction costs and asset specificity.

Regression results show that direct purchases are positively associated with advanced retailer procurement systems, high supplier trust in the retailer, and stronger supplier bargaining power, while special contracts are more prevalent when supplier-specific investments are required. Instrumental variable estimates indicate that a 1 percentage point increase in the special contract share reduces supplier revenue by approximately KRW 259 million.

Regulatory enforcement data reveal that over 75% of unfair trade practices occur in direct and special contract transactions, with special contracts showing the highest violation rate per transaction. These findings suggest that contract type is a key channel through which bargaining asymmetries affect economic outcomes. Policy implications include enhancing supplier bargaining power and improving the oversight of contract-specific risks."

Key Words: Contract type selection, Large-scale retailer, Supplier performance, Unfair trade practices, Bargaining power, Transaction costs

JEL Codes: L81, D23, D43, K21

* Jinkook Lee: Senior Fellow, PIMAC, Korea Development Institute (E-mail: ljk@kdi.re.kr); Myoungshik Seo: Senior Research Associate, PIMAC, Korea Development Institute (E-mail: msseo@kdi.re.kr)

* Received: 2025. 4. 25
* Referee Process Started: 2025. 4. 28
* Referee Reports Completed: 2025. 6. 4

† We sincerely express my gratitude to the editor two anonymous referees for their helpful comments and suggestions. All remaining errors are ours.

I. Introduction

Transactions between retailers and suppliers typically fall into one of four categories. As presented in Table 1, in a direct purchase transaction, the retaileracquires products from the supplier and sells them at a markup. Given that ownership of the goods is transferred upon purchase, the retailer assumes full responsibility for setting the final consumer price, managing sales operations, and handling inventory.

In contrast, consignment transactions involve no purchase by the retailer, and product ownership remains with the supplier. Unsold inventory is returned and managed by the supplier. The retailer sells the products on the supplier's behalf and receives either a fixed fee or a share of the sales revenue, with the remainder paid to the supplier.

In store lease transactions, the retailer's roles and responsibilities are significantly more limited than in the previous two transaction types. The retailer does not purchase the products, nor do they engage in sales activities, which are instead handled by the tenant businesses. In return for leasing a portion of the store space, tenant businesses pay either a fixed fee or a percentage of their sales revenue as rent.

Finally, a special contract purchase transaction can be regarded as a hybrid of the three previously described transaction types. In this arrangement, the retailer acquires products from the supplier on credit and, after deducting a fixed fee or a percentage of the sales revenue as a commission, pays the remaining balance to the supplier.

Contract types between retailers and suppliers result in significant differences in product ownership, sales responsibility, payment terms, and inventory management. This raises key questions: How are these transaction types distributed in the domestic retail market? What factors influence contract selection, and how do they affect economic outcomes for both parties?

TABLE 1—COMPARISON OF RETAIL TRANSACTION TYPES

Category	Direct Purchase	Consignment	Store Lease	Special Contract purchase
Purchase of Goods	Purchase	None	None	Credit Purchase
Ownership of Goods During Sales Phase	Retailer	Supplier	Tenant	Retailer
Agent for Sales Activities	Retailer	Retailer	Tenant	Supplier
Payment for Goods	After Purchase	After Sale (deducting sales commission)	None	After Sale (deducting sales commission)
Sales Title	Retailer	Retailer	Tenant	Retailer
Return Policy	No Returns	Not Applicable	Not Applicable	Returns Possible
Inventory Burden	Retailer	Supplier	Tenant	Supplier
Major Retail Formats	Supermarkets, SSM, Convenience Stores	TV Home Shopping, Online Shopping	Department Stores, Outlets	Department Stores

Source: Korea Fair Trade Commission Press Release (July 11, 2014) and the Author's Understanding of Retail Contract Types.

Understanding transaction types is essential when analyzing contractual structures, economic impacts, and patterns of unfair trade practices in an increasingly oligopolistic retail market. However, limited data availability has hindered empirical research, as even basic statistics on transaction types remain scarce. To address this gap, this study examines transaction patterns in Korea's retail industry using micro-level data on direct purchase, special contract purchase, consignment, and store lease transactions.

Existing studies often lack comprehensive insight due to limited industry coverage or insufficient firm- and product-level data. This study addresses these limitations by utilizing the List of Suppliers for the Written Survey on the Retail Sector (Korea Fair Trade Commission, 2018), which offers broad industry coverage and detailed transaction-level information.

First, we examine the factors influencing transaction type selection and the corresponding causal relationships. While contracts are mutually agreed upon, they are shaped by market conditions, interfirm dynamics, product characteristics, and consumer demand. Using supplier survey data, we focus on identifying the drivers of direct purchases, a type both widely used and actively demanded by suppliers.

Second, we assess how transaction types affect supplier performance. Even when supplying the same product in equal volumes, suppliers may face different conditions depending on the transaction type—such as different payment timings, return policies, or cost burdens—all of which can impact profitability. In particular, special contract purchase contracts often involve practices such as shifting promotional costs to suppliers or requiring the use of supplier staff, which may harm performance. This study empirically analyzes these effects to offer objective insights into these practices.

Third, we analyze the frequency and nature of unfair trade practices across transaction types. The large-scale retail sector is prone to power imbalances, yet the connection between contract type and legal violations remains understudied. By reviewing Korea Fair Trade Commission (KFTC) rulings from 1998 to 2018, we identify patterns of violations by transaction type to inform more targeted and effective regulatory policies.

This study proceeds as follows: Section 2 reviews relevant domestic and international literature and outlines the study's contributions. Section 3 presents trends in transaction types using KFTC data. Section 4 explores influencing factors based on supplier surveys. Section 5 evaluates the impact of different transaction types on supplier performance outcomes. Section 6 analyzes the link between unfair practices and transaction types through regulatory cases. Finally, Section 7 offers policy recommendations for fair trade, sustainable growth, and collaborative industry development.

II. Related Literature

This section reviews prior domestic and international research on transaction types and highlights this study's contribution. Lim and Lee (2013) analyzed the evolution of transaction types in the department store industry. Until the 1970s, rental agreements dominated due to underdeveloped procurement systems. As department

stores expanded in the 1980s, they adopted sales-based purchasing, which later evolved into special contract purchase transactions with the introduction of the VAT in the 1990s. The study finds that over 70% of department store sales are conducted through special contract purchase transactions, attributing their dominance to cost advantages—particularly lower fixed costs compared to direct purchasing.

Yoon (2004) analyzed the market environment of department stores, noting their focus on high-value fashion goods and service competitiveness over low prices and standardized products. This leads to a limited product variety sold in small quantities, making it difficult to develop in-house merchandisers (MDs) for each category. As a result, he argues that special contract purchase transactions, which utilize supplier sales representatives, are more efficient under such conditions.

Facing growing economic and social pressure to increase direct purchasing over special contract purchase transactions, Pyeon *et al*. (2009) analyzed the key factors influencing this shift in domestic department stores. To examine this, they surveyed 112 buyers from the top four domestic department stores. A correlation analysis revealed that direct purchasing increases when demand volatility is low, transaction-specific investments are high, and managerial support is strong.

Existing domestic studies have primarily focused on explaining the prevalence of special contract purchase transactions in department stores and identifying conditions that facilitate the expansion of direct purchasing. However, empirical research on other retail formats remains scarce. Given the rapid expansion of TV home shopping and online retail channels, a broader, cross-sectoral analysis is needed to capture the evolving landscape of transaction types across the industry. As transaction structures differ significantly by sector, it is essential to consider both the overall market trends and the specific characteristics of each retail format. This study differs from prior research in that it provides a comprehensive industry-level analysis while offering a detailed examination of sector-specific transaction patterns and their implications.

International research has predominantly examined supplier channel strategies through the lens of transaction cost theory. For example, John and Weitz (1988) found that higher asset specificity increases the likelihood of direct sales. Similarly, Anderson and Schmittlein (1984) demonstrated that in the electronic components industry, suppliers tend to choose direct channels when facing greater transaction uncertainty or specificity.

Building on this foundation, more recent studies in operations research have focused on indirect sales models. Adida and Ratisoontorn (2011) compared fixed-fee consignment, revenue-sharing, and wholesale contracts, concluding that fixed-fee consignment yields the highest retailer profits. They also emphasized that suppliers' optimal contract choices depend on the degree of retailer differentiation.

Further refining the analysis of consignment structures, Ru and Wang (2010) explored two models: retailer-managed consignment inventory (RMCI) and vendor-managed consignment inventory (VMCI). Their theoretical model suggests that VMCI leads to higher profits for both retailers and suppliers, whereas RMCI can cause over-ordering and inefficiencies due to information asymmetry and double marginalization effects.

From an empirical industrial organization (IO) perspective, Li and Moul (2015) investigated the performance implications of a transaction model shift in the Chinese mobile handset retail market. A department store initially operating under retailer-

managed retailing with linear pricing switched to supplier-managed retailing with a revenue-sharing contract in 2011. Using transaction-level data and a BLP model (Berry, Levinsohn, and Pakes, 1995), the study found that this shift enhanced both consumer welfare and producer surplus—primarily through lower prices, improved service quality, and greater supply chain efficiency.

International research has primarily examined (1) the determinants of supplier's vertical integration, (2) comparative supply chain performance across transaction types, and (3) consumer and producer welfare using empirical industrial organization (IO) approaches.

Our study extends the scope of transaction cost theory by shifting the focus from direct sales decisions by suppliers to a diverse range of indirect sales models involving retailers. It contributes to both the academic discourse and policy development by empirically assessing whether key findings from the international literature—such as the effects of different transaction types on retailer and supplier performance outcomes and the efficiency gains from supplier-managed distribution—are applicable in the domestic retail context. Furthermore, the study explores the underlying mechanisms that shape these outcomes.

III. Overview of Contract Types between Retailer and Suppliers

A. *Data*

First, this study analyzes the distribution of transaction types in the domestic retail industry. In the absence of comprehensive data categorizing all transactions by contract type, it relies on the 2018 Supplier List for the Written Survey on the Distribution Sector (hereinafter the Supplier List), obtained with the cooperation of the Korea Fair Trade Commission (KFTC).

As shown in Table 2, the Supplier List dataset covers seven distribution sectors, from large supermarkets to outlets, detailing the top retailers by market share in each sector and the number of their suppliers.

Table 3 presents detailed information from the Supplier List, including basic identifiers for retailers and suppliers, product categories, transaction types, the initial transaction year, and the transaction volume. A key advantage of this dataset is the 'transaction type' variable, which allows for identifying the contract types associated with each transaction.

It is essential to assess how well this dataset represents the domestic distribution industry. For large supermarkets, the 1,500 suppliers listed account for approximately 30% of all suppliers to Emart, Lotte Mart, and Homeplus. Moreover, because the list primarily includes top suppliers with high transaction volumes, the total transaction value is likely to exceed 30% of the market. While the Supplier List does not cover all large-scale retailers in Korea or every supplier working with the 26 listed retailers, it encompasses major retailers each with a significant market share in each sector and over 30% of their suppliers, making it a valuable resource when conducting such an analysis.

Tables 4 and 5 show transaction volumes and supplier counts by distribution sector and product category. Large supermarkets (23%), convenience stores (22%),

TABLE 2—NUMBER OF COMPANIES INCLUDED IN THE SUPPLIER LIST DATA

(Unit: Number of Firms)

	Number of Retail Companies	Names of Retail Company	Number of Trading Suppliers
Total	26		7,000
Large Supermarkets	3	Emart, Lotte Mart, Homeplus	1,500
Convenience Stores	4	GS25, Seven Eleven, CU, Ministop	1,000
SSM	3	GS Super, Lotte Super, Emart Everyday	500
Department Stores	4	Lotte, Hyundai, Shinsegae, Taepyeong	1,500
Online Shopping	5	Wemakeprice, Lotte.com, Coupang, Interpark, TMON	1,500
TV Home Shopping	3	GS, Hyundai, CJ	500
Outlets	4	Lotte, New Core, Save Zone, Mario	500

Note: Some suppliers have contracts with multiple distribution companies (95 suppliers have signed 199 distribution and supply contracts).

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018.

TABLE 3—INFORMATION RECORDED IN THE SUPPLIER LIST DATA

Sector	Recorded Information
Retailer Sector	Distribution type, Retail company name
Supplier Sector	Supplier name, Product category, Transaction type, Vendor status, Initial transaction year, Transaction amount (purchased by the retailer or sold by the supplier)
Supplier Contact Details	Representative's name, Corporate number, Business number, Address, Email address, etc.

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018

TABLE 4—TRANSACTION AMOUNTS AND NUMBER OF COMPANIES BY DISTRIBUTION TYPE

(Unit: 100 Million KRW, Number of Companies)

Distribution Type	Transaction Amount	Transaction Share	Number of Companies	Supplier Share
Total	202,825	1.00	7,000	1.00
Large supermarkets	47,042	0.23	1,500	0.21
Convenience Stores	44,236	0.22	1,000	0.14
SSM	8,044	0.04	500	0.07
Department Stores	37,920	0.19	1,500	0.21
Online Shopping	24,707	0.12	1,500	0.21
TV Home Shopping	26,112	0.13	500	0.07
Outlets	14,764	0.07	500	0.07

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018.

TABLE 5—TRANSACTION AMOUNTS AND NUMBER OF COMPANIES BY PRODUCT CATEGORY

(Unit: 100 million KRW, Number of Companies)

Product Category	Transaction Amount	Transaction Share	Number of Companies	Supplier Share
Total	202,825	1.00	7,000	1.00
Fresh & Perishable Food	24,154	0.12	700	0.10
Processed Food	49,138	0.24	2,068	0.30
Clothing & Accessories	40,406	0.20	1,287	0.18
Kitchen & Bathroom Supplies	6,031	0.03	290	0.04
Furniture & Interior	4,273	0.02	241	0.03
Electronics	11,110	0.05	392	0.06
Office Supplies & Toys	2,392	0.01	112	0.02
Cosmetics	7,570	0.04	263	0.04
Sports & Leisure	8,438	0.04	334	0.05
Baby Products	5,876	0.03	165	0.02
Household Sundries	10,074	0.05	595	0.09
Others	33,361	0.16	553	0.08

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018.

and department stores (19%) each account for around 20% of all transactions, while other sectors hold approximately 10%. The supplier distribution closely mirrors transaction share levels, but in convenience stores and for TV home shopping, the transaction share is significantly higher, suggesting larger average transaction volumes per supplier.

B. *Analysis of Transaction Type Distribution: By Retail Sector*

An overview of transaction types (Figure 1) shows that direct purchases account for 47% of the 20.3 trillion KRW in transactions, making up nearly half of the total. This is followed by special contract purchases at 21%, consignment transactions at 18%, and store lease transactions at 14%.

By sector, direct purchases are the dominant transaction type in large supermarkets, SSMs, and convenience stores, accounting for 67%, 90%, and nearly 99% of transactions, respectively. These retail formats primarily handle food and essential goods, which exhibit stable demand and strong consumer pull, making direct purchasing the preferred contractual arrangement. From the supplier's perspective, products with stable demand require less need for dedicated sales personnel or the monitoring of the retailer's sales activities. As a result, suppliers can focus on securing stable payments, making direct purchases the preferred transaction method. In large supermarkets, special contract purchases (21%) and store lease transactions (12%) together make up a third of total transactions alongside direct purchases. This likely reflects cases where suppliers' sales representatives operate dedicated sections for

apparel, furniture, cosmetics, and baby products.

In department stores and outlets, over 95% of sales are conducted through special contract purchases and store lease transactions. Due to the seasonal and trend-sensitive nature of high-end apparel, jewelry, and fashion accessories, supplier-trained sales specialists play a critical role in the sales process. To minimize fixed costs, retailers often delegate sales activities to suppliers instead of investing in in-house merchandising teams.

In online and TV home shopping, consignment transactions dominate, accounting for 66% and 75% of sales, respectively. Given that product exposure and promotions are handled by the retailer's merchandising team or show hosts, suppliers have little direct involvement, making consignment the preferred model. Notably, direct purchases account for 33% of online shopping transactions. This reflects a strong

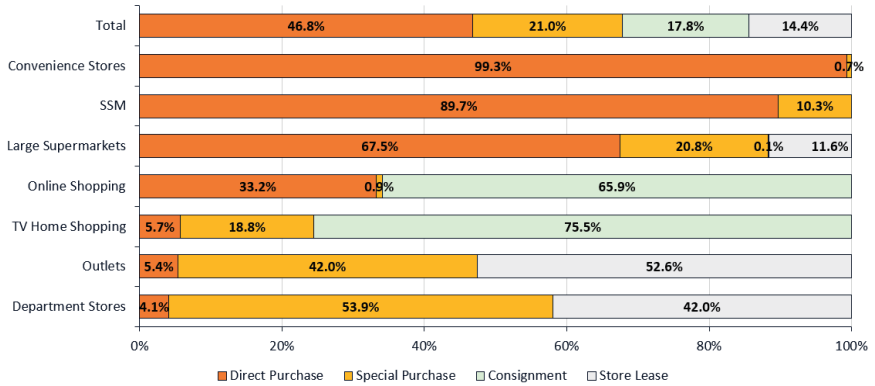

FIGURE 1. SHARES OF TRANSACTION TYPES: OVERALL AND BY RETAIL FORMAT

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018; Compiled by the author.

(Unit: 100 Million KRW)

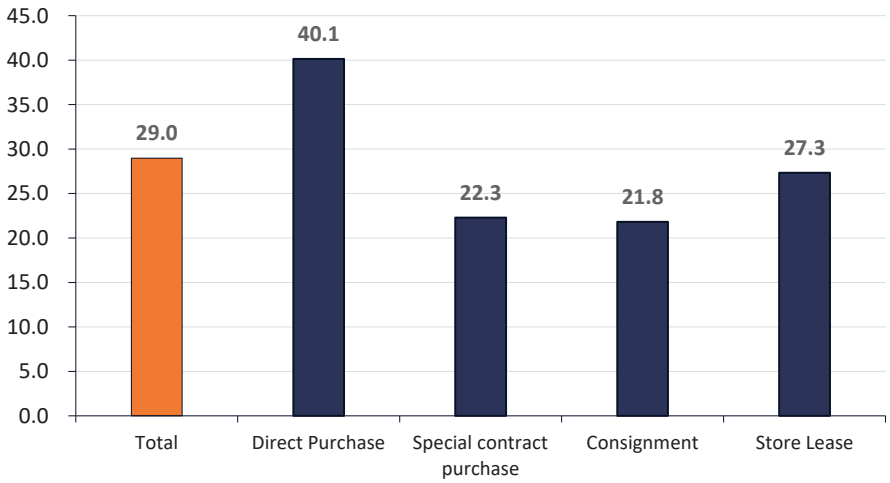

FIGURE 2. AVERAGE TRANSACTION AMOUNT PER SUPPLIER BY TRANSACTION TYPE

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018.

strategy of stocking frequently purchased and easily stored items in the retailer's logistics centers to enable same-day or next-day delivery.

Figure 2 shows the average transaction value between retailers and individual suppliers, with direct purchases averaging 4.01 billion KRW—1.5 to 1.8 times higher than other transaction types. Analyzing the top five suppliers by transaction value for each retailer reveals that direct purchases are the most common, not only in large supermarkets, convenience stores, and SSMs but also for online and TV home shopping, where consignment transactions are prevalent. Given the higher average transaction value, direct purchases likely involve less of an imbalance in bargaining power and negotiating leverage.

C. *Analysis of Transaction Type Distribution by Product Category*

As previously noted, the predominant transaction types differ across distribution sectors. While these differences are largely driven by the unique sales environments of each sector, they may also reflect the varying characteristics of the products sold, which in turn influence the appropriateness of specific transaction types.

Figure 3 presents the marked differences in transaction types by product category. Direct purchases are most prevalent for essential consumer goods—such as fresh & perishable foods, processed foods, office supplies & toys, and kitchen & bathroom supplies. These categories represent 69% of sales in large supermarkets and 56% and 87% in convenience stores and SSMs, respectively. This highlights how a sector's core product composition can shape its preferred transaction structure, with product attributes playing a key role in determining the type of contract.

In contrast, special contract purchases dominate in baby products (46%), cosmetics (41%), sports & leisure (45%), clothing & accessories (33%), and furniture & interior items (32%). These products require specialized sales assistance, have high demand volatility, and are sold in limited varieties and smaller quantities. They account for 64% of department store sales and 75% of outlet sales.

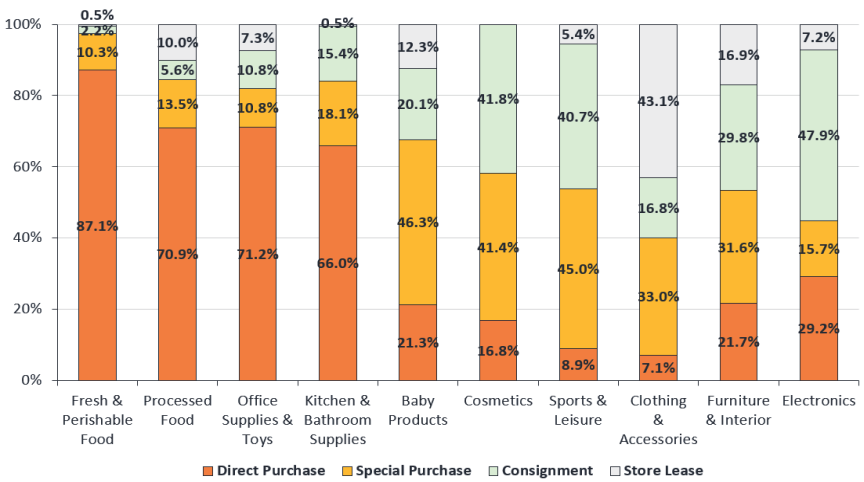

FIGURE 3. SHARE OF TRANSACTION TYPES BY PRODUCT CATEGORY

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018; Compiled by the author.

TABLE 6—PRIMARY TRANSACTION TYPES FOR PROCESSED FOOD PRODUCTS

Retail Category	Primary Transaction Type	Share
Large Supermarkets	Direct Purchase	55%
Convenience Stores		100%
SSM		84%
Department Stores	Special Contract Purchase	58%
Outlets		43%
Online Shopping	Consignment	49%
TV Home Shopping		56%

Source: Korea Fair Trade Commission, Supplier List for the Written Survey on the Distribution Sector, 2018.

Table 6 analyzes transaction types by distribution sector for processed foods. Despite typically being dominated by direct purchases, department stores and outlets rely more on special contract purchases, while online and TV home shopping favor consignment transactions. This highlights how transaction types are shaped by sector characteristics, product attributes, and their interaction.

IV. Factors Influencing the Selection of Contract Types

Variations in transaction types across sectors and products reflect differences in sales and product characteristics. Factors such as market conditions, production settings, relationships, and consumer behavior may shape these choices. This section outlines the main influences and their causal links.

A. *Overview of the Survey*

The supplier list analyzed in Section III provides limited data on transaction amounts by contract type and lacks comprehensive supplier information, rendering it unsuitable for the analysis presented in this section. Furthermore, neither public nor private datasets systematically capture supplier-level information on market conditions, production factors, or transaction characteristics.

To address these data limitations, this study conducted a survey of firms listed in the supplier database. A sample of 1,000 companies was selected to reflect the regional, product category, and distribution channel composition of the broader population of 7,000 firms. The survey was carried out between June and September of 2019.

Table 7 outlines the survey questionnaire, which covers supplier profiles (such as name, establishment date, and location), main product distribution (including product details, sales, costs, PB supply, and distribution by retail channel and transaction type), and key business characteristics. It also addresses market and production conditions, retailer-supplier relationships, product and sales attributes, consumer behavior, experiences with unfair trade practices, and financial information.

TABLE 7—ITEMS IN THE SUPPLIER SURVEY

Category	Survey Items	
Supplier Profile	Supplier name	Date of establishment
	Business registration number	Industry code
	Business location	Factory location
	Product category	Product type
	Product sales	Operating costs
Main Product Distribution	Experience with supplying PB products	Market share ranking
	Supply share by retail channel	Supply share by transaction type
	Primary retail partner	Sales to primary retail partner
	Supply share by transaction type with primary retail partner	Decision-making process for transaction type
	Margin, sales commission, and rental rates	Process for determining margin, commission, and rental rates
	Preferred transaction type	

Category		Survey Items
Other Key Characteristics	Market Environment	Volatility and uncertainty of market demand
		Growth trend of market size
		Level of competition among suppliers
	Production Conditions	Stability of production and supply
		Ability to change retail partners
		Financial and managerial stability
	Retailer-Supplier Relationship	Extent of transaction-specific investments
		Development level of the retailer's purchasing system
		Accumulation of the retailer's sales expertise
		Bargaining power gap between the retailer and supplier
		Supplier's trust in the retailer
	Product Characteristics	Brand recognition
		Inventory depreciation
		Degree of product differentiation
	Sales Characteristics	Need for in-store interior customization
		Need for dedicated sales staff
		Importance of timing in sales
	Consumer Characteristics	Price sensitivity
		Quality and service sensitivity
		Preference for well-known brands
Experience with Unfair Trade Practices	Experience of unfair practices	Transaction types involved in unfair practices
	Type of unfair practices encountered	Responses to unfair pressure
	Reason for accepting unfair conditions	
Financial and Other Information	Sales over the past three years	Share of PB products
	Operating costs	Number of retail partners by sales channel

Source: Compiled by the author based on the Korea Development Institute's Corporate Survey on Transaction Types in the Large-Scale Retail Sector (2019).

TABLE 8—SUMMARY STATISTICS

Variable		Obs.	Mean	Std. Dev.	Min	Max
Supplier Characteristics						
Share of Transaction Types (%)	Direct Purchase	993	41.27	44.33	0	100.00
	Special Contract Purchase	995	10.36	26.59	0	100.00
	Consignment	993	23.35	37.13	0	100.00
	Store Lease	993	21.36	38.99	0	100.00
	Other	994	3.40	12.24	0	91.00
Firm Age (months)		991	168.27	124.93	6.00	1,003
Vendor (1 = Yes)		976	0.14	0.35	0.00	1.00
Total Transaction Duration with Retailers (months)		1,000	197.12	197.92	0.00	1,600
Number of Retail Partners		1,000	66.3	850.66	0.00	25,900
Sales from Main Product (2018, in million KRW)		905	21,369	55,672	50.00	831,073
Total Sales (2018, in million KRW)		892	27,444	83,380	100	1,632,631
Total Sales (2017, in million KRW)		928	25,694	77,921	0.00	1,569,204
Share of PB Products (2017, %)		1,000	3.08	12.11	0.00	100.00
Experience with PB Supply (1 = Yes)		1,000	0.15	0.36	0.00	1.00
Distribution by Retail Format (%)						
Large supermarkets		991	22.06	34.19	0.00	100.00
SSM		998	3.73	13.25	0.00	100.00
Convenience Stores		997	3.76	15.42	0.00	100.00
Department Stores		994	17.45	33.16	0.00	100.00
TV Home Shopping		995	5.07	19.06	0.00	100.00
Online Shopping		991	20.42	34.12	0.00	100.00
Outlets		998	3.82	16.25	0.00	100.00
Duty-Free Shops		999	0.77	7.00	0.00	100.00
Other		992	22.42	32.61	0.00	100.00
Main Product Category (1 = Yes)						
Fresh Food		1,000	0.14	0.35	0.00	1.00
Processed Food		1,000	0.26	0.44	0.00	1.00
Clothing & Accessories		1,000	0.20	0.40	0.00	1.00
Kitchen/Bathroom/Sanitary Goods		1,000	0.05	0.22	0.00	1.00
Furniture & Interior		1,000	0.03	0.17	0.00	1.00
Electronics		1,000	0.07	0.26	0.00	1.00
Stationery & Toys		1,000	0.02	0.14	0.00	1.00
Cosmetics		1,000	0.04	0.19	0.00	1.00
Sports & Leisure		1,000	0.08	0.27	0.00	1.00
Baby Products		1,000	0.03	0.16	0.00	1.00
Household Goods		1,000	0.05	0.21	0.00	1.00
Other		1,000	0.03	0.18	0.00	1.00
Decision-Making Process (1 = Yes)						
Proposed by Supplier		1,000	0.14	0.34	0.00	1.00
Proposed by Retailer		1,000	0.28	0.45	0.00	1.00
Jointly Determined		1,000	0.59	0.49	0.00	1.00
Margin Determination (1 = Yes)						
Proposed by Supplier		1,000	0.07	0.25	0.00	1.00
Proposed by Retailer		1,000	0.31	0.46	0.00	1.00
Jointly Determined		1,000	0.62	0.49	0.00	1.00

Source: Based on survey data.

The section on other key characteristics incorporates variables grounded in transaction cost theory. To assess market uncertainty, the survey captured the volatility and uncertainty of market demand. To evaluate the potential for opportunistic behavior, the trust of suppliers in retailers was measured. In relation to transaction-

specific assets, the survey examined the extent of transaction-specific investments, the necessity for customized in-store interiors, and the requirement of dedicated sales staff. These variables were analyzed to evaluate the relevance and applicability of transaction cost theory within the domestic retail context. Measures related to key product characteristics were assessed using a seven-point Likert scale.

Supplier bargaining power can significantly shape transaction types and contractual terms. To capture the extent of bargaining power asymmetry, the survey included variables such as the decision-making process for transaction types; the profit margins, sales commissions, and rental rates; the product market share ranking; the firm's ability to change retail partners; the perceived bargaining power gap between the retailer and supplier; and the number of distribution partners across sales channels.

Table 8 presents the descriptive statistics of the key variables used in the regression analysis. The distribution of transaction types shows that direct purchases account for 41 percent, special contract purchases for 10 percent, consignment transactions for 23 percent, and store lease transactions for 21 percent. In 2018, the average sales revenue of main products was 21.37 billion KRW, equivalent to 77.9 percent of the overall average sales revenue for that year (27.44 billion KRW), indicating that main products amounted to approximately three-quarters of the suppliers' total revenue. Additionally, 15 percent of firms had supplied private-brand (PB) products over the previous three years, with PB sales accounting for an average of 3 percent of total supplier revenue.

B. *Empirical Model*

To analyze the factors influencing the choice of contract type, this study establishes the following empirical model:

$$y_i = X_i\alpha + \sum_j \beta_j I_j + \sum_s \gamma_s D_s + u_i$$

The dependent variable y_i is the proportion of direct purchase supply provided by supplier i in region s, who specializes in product category j. Using a proportion instead of sales volume accounts for variations in supplier size, preventing larger firms from disproportionately influencing coefficient estimates and significance levels.[1]

X_i is a vector representing the key characteristics of suppliers. It includes the proportion of deliveries by retail format to account for supply format effects and reflects PB supply experience over the past three years (or PB product share), given that PB products are primarily transacted through direct purchases. It also captures core product attributes, classified into six groups in Table 7. Additionally, it includes control variables reflecting the supplier's fundamental characteristics, such as sales,

[1]The focus on direct purchase transactions is motivated by their policy relevance, particularly in light of past institutional initiatives aimed at transitioning from special contract purchases. Direct purchases involve actual procurement processes, distinguishing them from other transaction types. They also exhibit the highest transaction share in both supplier records and survey data and are most frequently observed across retail formats, indicating stronger associations with key explanatory variables.

years in operation, vendor status, and total transaction duration with the retailer.

I_i is a product category dummy to control for fixed effects, while D_s is a regional dummy used at the metropolitan and provincial levels. Finally, u_{ijst} is the error term, satisfying standard assumptions.

This section employs ordinary least squares (OLS) estimation, considering the single-year cross-sectional nature of the survey data. In Section 5, instrumental variables (IV) estimation will be incorporated to address potential endogeneity concerns with regard to certain variables.

C. *Estimation Results: Factors Influencing Transaction Type Selection*

Table 9 presents the regression results on the determinants of transaction types. Model 1 analyzes the relationship between the distribution of deliveries across retail formats and the proportion of direct purchases. Using department stores as the reference category, a 1 percentage point increase in the share of deliveries to large supermarkets is associated with a 0.36 percentage point increase in direct purchases. While this positive and statistically significant effect is consistent with the strong preference for direct purchasing in large supermarkets, the magnitude of the coefficient appears somewhat lower than anticipated.

As shown in Figure 1, the average direct purchase share is 67% for large supermarkets and 4% for department stores. If the survey data accurately reflected the population distribution, the estimated coefficient would be expected to approach 0.63.

Several factors may account for the observed discrepancy. First, the Supplier List dataset aggregates all retailer-supplier transactions into a single transaction value, whereas the survey dataset in this study is limited to suppliers' core products. Variations in transaction types between core and non-core products could contribute to this difference. Second, the survey data report an average direct purchase share of 41.3%, which is lower than the Supplier List average of 47%. This suggests that the surveyed suppliers may have a lower propensity for direct purchase transactions compared to the overall population. Furthermore, while the Supplier List is compiled from retailer-submitted data, the survey responses are provided by suppliers, potentially leading to differences in the classification of transaction types. Given these considerations, the interpretation of the results should focus on the significance and relative magnitude of the coefficients rather than their absolute values.

An increase in transactions with SSMs or convenience stores was also associated with a significant rise in the direct purchase share. A 1 percentage point increase in the sales share to SSMs and convenience stores led to a 0.81 and 0.73 percentage point increase in direct purchases, respectively. This effect was larger than for large supermarkets, likely due to the predominance of direct purchasing for processed and fresh products sold through these channels.

Similarly, increased transactions with online shopping platforms are positively associated with a higher share of direct purchases. This trend is driven by several factors, including the expansion of online sales for both processed and fresh foods, a shift in consumer behavior away from large supermarkets and SSMs toward online channels following the introduction of mandatory bi-weekly store closures, and the growing preference among online retailers to secure inventory through direct

TABLE 9—REGRESSION RESULTS ON THE DETERMINANTS OF THE SHARE OF DIRECT PURCHASE TRANSACTIONS (1)

Dependent Variable: Share of Direct Purchase Transactions (%)		Model 1	Model 2	Model 3
Share of Sales by Retail Format (%)	Large Supermarkets	0.36*** (0.05)	0.28*** (0.05)	0.29*** (0.05)
	SSM	0.81*** (0.10)	0.59*** (0.10)	0.60*** (0.10)
	Convenience Stores	0.73*** (0.09)	0.61*** (0.09)	0.60*** (0.09)
	TV Home Shopping	-0.03 (0.08)	-0.04 (0.07)	-0.08 (0.08)
	Online Shopping	0.13*** (0.05)	0.07 (0.05)	0.05 (0.05)
	Outlets	-0.10 (0.08)	0.05 (0.08)	0.02 (0.08)
	Duty-Free Shops	0.26 (0.19)	0.26 (0.18)	0.20 (0.18)
	Others	0.70*** (0.05)	0.65*** (0.05)	0.61*** (0.05)
Main Product Category (0/1)	Processed Food		-16.78*** (4.40)	-15.20*** (4.51)
	Clothing & Accessories		-29.03*** (4.99)	-28.44*** (5.07)
	Kitchen, Bathroom & Sanitary Products		-8.06 (6.38)	-5.66 (6.46)
	Furniture & Interior		-24.88*** (8.58)	-25.37*** (8.66)
	Electronics		-10.32 (6.64)	-9.88 (6.71)
	Stationery & Toys		-13.83 (9.48)	-11.51 (9.55)
	Cosmetics		-11.96 (7.65)	-12.18 (7.80)
	Sports & Leisure		-37.00*** (6.09)	-37.17*** (6.18)
	Baby Products		-29.95*** (8.44)	-33.21*** (8.80)
	Household Goods		-10.61 (7.08)	-8.64 (7.16)
	Others		-15.17* (8.96)	-14.80 (9.06)
1 / (Sales of Main Product in 2018)		-1,614 (1,119)	-1,060 (1,090)	304.06 (1,286.22)
PB Supply Experience in Previous Three Years (0/1)			18.39*** (3.61)	
Share of PB Products in 2017 (%)				0.34*** (0.10)
ln (Total Sales in 2017)				2.92** (1.20)
ln (Firm Age)		2.00 (2.24)	3.43 (2.18)	2.03 (2.28)
Vendor (0/1)		3.66 (3.81)	1.15 (3.66)	1.71 (3.69)
ln (Total Transaction Duration with Retailers)		2.53 (1.90)	0.38 (1.86)	0.51 (1.90)
Constant		-25.36** (12.32)	-1.06 (12.38)	-18.37 (14.48)
Regional Dummy		Y	Y	Y
Observations		777	777	771
R-squared		0.39	0.46	0.45

Note: Standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

purchasing in order to enable faster delivery services.

Model 1 analyzes the effect of the retail format delivery share on the proportion of direct purchases, controlling for firm age, vendor status, total transaction duration with retailers, and regional fixed effects. Given the potential correlation between retail format delivery share and other factors, the estimated coefficients may be subject to bias.

To mitigate this, Model 2 introduces core product categories and PB supply experience over the past three years as additional controls. These results indicate that transactions with large supermarkets, SSMs, and convenience stores remain statistically significant and positive, though their coefficients decrease to 70–80% of those in Model 1. Conversely, the effect of online shopping transactions becomes statistically insignificant, while core product categories and PB supply experience explain a substantial portion of the model's variance.

By core product category, the direct purchase share for processed foods was 16.8 percentage points lower than for fresh and perishable foods, which had the highest direct purchase share. This difference closely aligns with their respective average direct purchase rates (87% vs. 71%).

In contrast, categories with a higher prevalence of special contract purchases exhibited even stronger negative effects. The direct purchase share was 29.0 percentage points lower for clothing and accessories, 24.9 percentage points lower for furniture and interior goods, 37.0 percentage points lower for sports and leisure products, and 30.0 percentage points lower for baby products. These findings provide robust empirical support for the systematic relationship between retail format, product category, and transaction type distribution, reinforcing the causal link between product characteristics and contract selection.

PB products are typically contract-manufactured and sold exclusively through retailers' proprietary stores, making direct purchases the predominant transaction type. The analysis above confirms this pattern, indicating that suppliers with PB supply experience over the past three years exhibit an 18.4 percentage point higher share of direct purchases.

To investigate this relationship further, Model 3 specifies PB transaction share as a continuous variable, revealing that a 1 percentage point increase in the PB share is associated with a 0.34 percentage point increase in direct purchases.

Models 4–6 in Table 10 extend the analysis by incorporating additional determinants of transaction type selection. These variables were measured using a seven-point Likert scale, and the estimation was conducted using standardized values within each product category to ensure comparability.

The estimates in Table 10 can be interpreted through transaction cost theory and supplier bargaining power. From a transaction cost perspective, the development level of the retailer's purchasing system is associated with a higher share of direct purchases. Structured systems streamline supply, distribution, and ownership transfer, improving efficiency. In contrast, underdeveloped systems often require suppliers to retain ownership and monitor sales closely. Therefore, advancements in retail purchasing systems are likely to have a significant positive effect on direct purchasing.

TABLE 10—REGRESSION RESULTS ON THE DETERMINANTS OF THE SHARE OF DIRECT PURCHASE TRANSACTIONS (2)

Dependent Variable: Share of Direct Purchase Transactions		Model 4	Model 5	Model 6
Distribution by Retail Format (%)		Y	Y	Y
Main Product Category (0/1)		Y	Y	Y
Market Environment	Market Demand Volatility and Uncertainty	1.20 (1.27)	1.18 (1.27)	1.21 (1.24)
	Market Growth Trend	-2.00 (1.31)	-1.71 (1.31)	-0.99 (1.29)
	Competition Among Suppliers	1.22 (1.34)	1.23 (1.33)	1.91 (1.32)
Production Conditions	Stability of Production and Supply	-3.59** (1.53)	-3.74** (1.52)	-2.55* (1.52)
	Ability to Switch Retailers	0.45 (1.38)	0.45 (1.38)	1.02 (1.35)
	Financial Stability	0.63 (1.55)	0.63 (1.54)	-0.22 (1.52)
Relational Characteristics	Transaction-Specific Investments	-1.15 (1.56)	-1.05 (1.55)	-1.29 (1.52)
	The Development Level of the Retailer's Purchasing System	3.57** (1.77)	3.65** (1.76)	3.04* (1.74)
	Accumulation of Retailer's Sales Expertise	1.10 (1.63)	0.99 (1.63)	0.73 (1.60)
	Bargaining Power Gap Between Retailer and Supplier	0.22 (1.33)	-0.10 (1.32)	-0.81 (1.31)
	Supplier's Trust in the Retailer	3.41** (1.61)	3.23** (1.60)	3.03* (1.57)
Product Characteristics	Brand Recognition	-1.73 (1.47)	-1.51 (1.47)	-1.21 (1.44)
	Inventory Depreciation	-0.00 (1.26)	-0.19 (1.25)	-1.00 (1.24)
	Product Differentiation	1.29 (1.51)	1.11 (1.50)	0.58 (1.47)
Sales Characteristics	Need for In-Store Interior Customization	-4.88** (2.02)	-4.69** (2.02)	-4.17** (1.98)
	Need for Dedicated In-Store Sales Personnel	-3.68* (2.20)	-4.03* (2.20)	-3.57 (2.17)
	Seasonality and Timeliness of Sales	-0.33 (1.34)	-0.29 (1.34)	-0.09 (1.31)
Consumer Characteristics	Price Sensitivity	0.60 (1.48)	0.63 (1.47)	0.73 (1.44)
	Quality and Service Sensitivity	-1.42 (1.62)	-1.40 (1.61)	-1.49 (1.58)
	Preference for Well-Known Brands	-0.76 (1.44)	-0.57 (1.44)	-0.64 (1.41)
ln (Number of Distribution Partners)			3.39*** (1.18)	3.72*** (1.17)
Transaction Type Proposed by	Supplier			8.57* (4.62)
	Retailer			0.77 (4.37)
Margin Rate Proposed by	Supplier			0.07 (5.96)
	Retailer			-15.65*** (4.19)
1 / (Sales of Main Product in 2018)		884.9 (1,277)	895.5 (1,270)	1,265.97 (1,251.67)
Share of PB Products in 2017		0.28*** (0.10)	0.28*** (0.10)	0.26*** (0.10)
Ln (Total Sales in 2017)		3.42*** (1.20)	2.43* (1.24)	2.05* (1.22)

Dependent Variable: Share of Direct Purchase Transactions	Model 4	Model 5	Model 6
Ln (Firm Age)	0.44 (2.27)	1.24 (2.28)	1.89 (2.24)
Vendor (0/1)	2.73 (3.63)	1.85 (3.63)	0.80 (3.58)
ln (Total Transaction Duration with Retailers)	0.35 (1.88)	-1.49 (1.98)	-1.86 (1.94)
Constant	-3.74 (14.41)	4.77 (14.64)	14.41 (14.50)
Regional Dummy	Y	Y	Y
Observations	771	771	771
R-squared	0.50	0.51	0.53

Note: 1) Due to space constraints, coefficients for the share of sales by retail format and main product category are not reported. Their significance levels and coefficient magnitudes are broadly consistent with those presented in Table 10.

2) Standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively

Moreover, greater supplier trust in the retailer is positively linked to a higher share of direct purchasing transactions. According to John and Weitz (1988) and Anderson and Schmittlein (1984), when suppliers struggle to monitor retailers' opportunistic behavior or evaluate sales performance, they often adopt direct selling to reduce transaction costs. Among indirect sales methods, suppliers tend to prefer consignment or store lease agreements, which offer more control over distribution and sales. Increased trust, however, reduces concerns over behavioral uncertainty, thereby strengthening the preference for direct purchasing.

Regarding sales characteristics, the greater the need for specialized store design or dedicated sales personnel, the lower the proportion of direct purchasing transactions. This effect is more pronounced than that of relational factors such as the advancement of the retail purchasing system or the supplier's trust in the retailer. Products requiring dedicated sales personnel are often non-standardized and necessitate additional consumer guidance. In such cases, transaction models that fully delegate sales activities to retailers, such as direct purchasing or consignment sales, may be less effective. Additionally, investments in sales personnel recruitment and training, store design, and fixture installation constitute transaction-specific assets, as their value diminishes significantly if the relationship with the retailer is discontinued. To mitigate the risk of asset devaluation, suppliers are more likely to prefer transaction models that allow for greater oversight, thereby increasing the likelihood of selecting special contract purchase or store lease agreements.

Regarding production conditions, greater stability in a supplier's production and delivery processes is associated with a lower share of direct purchasing transactions. While stable order volumes can be expected to improve forecasting and promote direct purchasing, retailers view reliable suppliers as enabling more flexible procurement, reducing the need for advance stockpiling. As a result, direct purchasing declines, with the estimated coefficient suggesting that this negative effect outweighs the positive.

In Model 6, supplier bargaining power variables were added as independent variables. The results show that the share of direct purchasing increases with the number of retail partners and when the transaction type is determined by the supplier's proposal. This aligns with theory, as a broader retail network reduces

dependence on any single retailer, lowering the opportunity cost of transaction termination. With greater bargaining power, suppliers can negotiate more effectively and tend to prefer direct purchasing to ensure timely and reliable payments.

Conversely, when key financial terms—such as direct purchasing margins, consignment commission rates, and rental fees for store leases—are determined by the retailer, the share of direct purchasing transactions decreases significantly by 15.7 percentage points. This suggests that greater retailer bargaining power, coupled with a preference for minimizing inventory risk, plays a decisive role in determining the transaction type.

Ultimately, the choice of contract type between retailers and suppliers is shaped by factors such as the retail format, product category, transaction cost considerations, and bargaining power dynamics. As such, policy interventions that attempt to alter transaction types exogenously risk disrupting industry practices and the broader market order.

Nonetheless, increasing the share of direct purchasing could address issues such as excessive inventory risk for suppliers or disputes under special contracts. Rather than mandating specific contract types, a more effective and sustainable approach would be to strengthen suppliers' bargaining power—encouraging a natural shift toward direct purchasing while promoting long-term market stability.

V. The Differing Effects of Contract Types on Suppliers' Business Performance

What roles do different contract types play in shaping the business performance outcomes of suppliers? This section explores this question through an analysis based on survey data. In Model 1 of Table 11, we incorporate dummy variables for region, distribution type, and main product category, along with factors related to transaction cost theory, supplier bargaining power, and other control variables. This approach enhances the robustness and explanatory power of the model prior to examining the effects of transaction-specific supply proportions. The results indicate that main product sales are positively influenced by market growth trends, balanced bargaining power, consumer brand preferences, and an increasing number of retailers.

In Model 2, transaction-type-specific supply proportions were added, but their coefficients were not statistically significant at the 10% level. Because transaction cost and bargaining power variables are the key determinants of direct purchase supply proportions, analyzing them at the same hierarchical level may introduce endogeneity issues.[2] Moreover, these variables influence sales revenue both directly and indirectly through supply proportions, further complicating the interpretation.

Models 3 and 4 adopt an instrumental variable approach using transaction cost and bargaining power variables as instruments pertaining to the proportion of

[2]For instance, if unobserved supplier characteristics—such as prior experiences of unfair trading practices—simultaneously influence both the composition of transaction types and the level of main product sales, then specifying the proportion of supply by transaction type alongside transaction cost and bargaining power variables as independent variables at the same analytical level may give rise to endogeneity concerns. In such cases, the estimated coefficients on transaction-type proportions may be biased due to the omission of variable confounding.

TABLE 11—EFFECTS OF TRANSACTION TYPES ON SUPPLIER SALES REVENUE

Dependent Variable: Sales of Main Product (2018, million KRW)		Model 1 (OLS)	Model 2 (OLS)	Model 3 (IV)	Model 4 (IV) ln (Sales of Main Product)
Region, Distribution Type, Main Product Category		Y	Y	Y	Y
Share of Transaction Types	Special Contract Purchase		-62.63 (41.49)	-258.52* (146.85)	-0.018*** (0.007)
	Consignment		1.90 (37.24)	-318.11 (210.94)	-0.014 (0.010)
	Store Lease		-53.54 (40.35)	51.95 (123.98)	-0.008 (0.006)
	Other		-3.61 (81.05)	-188.93 (394.16)	0.003 (0.018)
Market Environment	Market Demand Volatility and Uncertainty	-1,478.32 (920.53)	-1,551.39* (926.73)		
	Market Growth Trend	1,655.16* (953.61)	1,726.94* (960.58)		
Relational Characteristics	Bargaining Power Gap Between Retailer and Supplier	-1,764.60* (949.32)	-1,799.64* (957.31)		
Sales Characteristics	Need for In-Store Interior Customization	2,358.02 (1,482.71)	2,499.02* (1,502.99)		
Consumer Characteristics	Preference for Well-Known Brands	2,374.57** (1,045.98)	2,405.75** (1,049.67)		
Other Characteristics		Y	Y		
Number of Retail Partners		53.68*** (14.08)	51.95*** (14.30)		
Transaction Type, Margin Rate Determination		Y	Y		
Firm Age		34.77* (17.81)	36.69** (18.08)	59.23*** (20.64)	0.005*** (0.001)
Firm Age2		-0.03 (0.03)	-0.03 (0.03)	-0.07** (0.03)	-0.000*** (0.000)
Number of Employees		240.24*** (23.95)	240.35*** (24.40)	283.45*** (30.38)	0.017*** (0.001)
Number of Employees2		-0.09*** (0.03)	-0.09*** (0.03)	-0.13*** (0.04)	-0.000*** (0.000)
Share of PB Products in 2017		-38.25 (71.83)	-47.64 (72.48)	-106.07 (86.51)	-0.002 (0.004)
Constant		-2,995.49 (7,030.99)	38.75 (7,455.29)	-1,103.27 (12,735.93)	8.239*** (0.574)
Observations		798	794	794	794
R-squared		0.45	0.45	0.33	0.44

Note: Standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

supply accounted for by different transaction types. Specifically, the instrumental variable set comprises variables related to Market Environment, Relational Characteristics, Sales Characteristics, Consumer Characteristics, Number of Retail Partners, and Transaction Type & Margin Rate Determination. Although these factors are correlated with the share of supply by transaction type, they reflect structural characteristics shaped over extended business relationships. Accordingly, they are unlikely to be systematically related to unobserved, period-specific shocks that directly influence current sales revenue. The findings from Model 3 indicate that a higher proportion of special contract transactions is significantly associated with a decline in suppliers' main product sales revenue, using direct purchase transactions as the reference category. Specifically, a 1 percentage point increase in special contract transactions results in an average revenue loss of 259 million KRW—equivalent to 1.58% of the average supplier revenue (16.35 billion KRW)—highlighting a substantial negative impact.

In Model 4, the dependent variable is the log of the main product sales revenue, allowing the effect to be interpreted as elasticity. The estimated coefficient (-0.018) suggests that a 1 percentage point increase in special contract transactions leads to an average 1.8% decline in main product sales revenue.

Why, then, do suppliers engaged in special contract transactions exhibit significantly lower sales revenue compared to those using direct purchase transactions? Given that both distribution type and main product category are controlled for, this difference cannot be simply attributed to fixed effects related to retail format or product line. To gain a better understanding of the underlying dynamics, it is necessary to examine how value is distributed between suppliers and retailers across different transaction types.

Figure 4 presents the average margin rate for direct purchases, the commission rates for special contract and consignment transactions, and the rental fee rate for store lease transactions. Interestingly, the margin rate for direct purchases (18.6%) is lower than the commission rate for special contract transactions (25.4%). According to transaction cost theory, retailers bear greater demand fluctuation risk under direct purchase arrangements, which should warrant a higher margin. The fact that special contract transactions yield an even higher commission rate suggests that transaction cost considerations alone cannot fully explain this discrepancy.

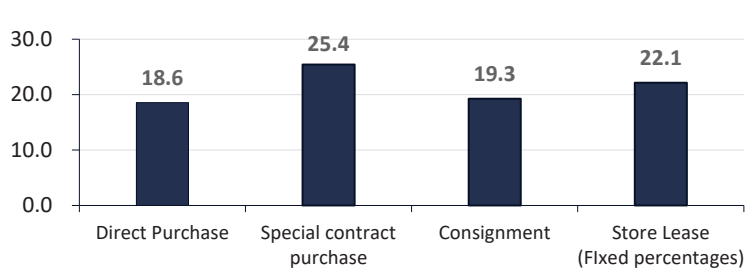

FIGURE 4. AVERAGE MARGIN RATE, SALES COMMISSION RATE, AND RENTAL RATE BY TRANSACTION TYPE

Note: The numbers of observations by transaction type are 350 for direct purchases, 123 for special contract purchases, 247 for consignment, and 153 for store leases.

Source: Based on survey data.

One plausible explanation is the presence of bargaining power asymmetry. Imbalances in negotiation leverage between retailers and suppliers can influence how value is distributed, with special contract transactions often leading to less favorable outcomes for suppliers. Although bargaining power asymmetry is difficult to measure directly, Table 10 in Section 4 shows that the proportion of direct purchase transactions tends to be higher when suppliers have more trading partners or greater influence over transaction decisions—implying that weaker bargaining power may be more prevalent in special contract arrangements.

Furthermore, Figure 5 and Table 12 reveal that suppliers overwhelmingly prefer direct purchase transactions, while special contract transactions are consistently ranked as the least desirable. From this perspective, the negative association between the proportion of special contract transactions and sales revenue likely reflects the higher commission rates imposed on suppliers with limited bargaining power. This interpretation aligns with the broader pattern in which suppliers systematically view special contract transactions as the least favorable option.

Overall, the findings suggest that bargaining power asymmetry plays a critical role in shaping transaction type decisions and has a direct impact on suppliers' sales performance. To promote fairer partnerships and balanced growth in the retail and supply sectors, policies that aim to enhance suppliers' bargaining power should be given greater attention.

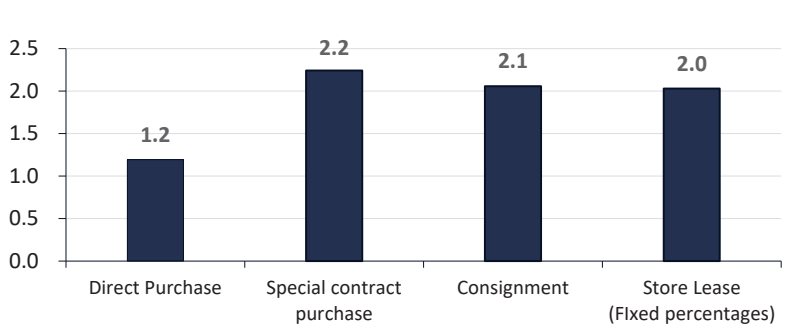

FIGURE 5. PREFERRED TRANSACTION TYPE RANKINGS

Note: The numbers of observations by transaction type are 271 for direct purchases, 111 for special contract purchases, 191 for consignment, and 65 for store leases.

Source: Based on survey data.

TABLE 12—REFERRED TRANSACTION TYPE RANKINGS BY SHARE OF DIRECT PURCHASE TRANSACTIONS

Share of Direct Purchase Transactions	Number of Suppliers	Direct Purchase	Special Contract Purchase	Consignment	Store Lease (Fixed Percentages)
Total	584	1.19	2.24	2.06	2.03
Less than 50%	316	1.36	2.15	2.00	1.96
Less than 30%	234	1.40	2.12	1.91	1.74
Less than 10%	131	1.59	2.21	1.71	1.63
0%	95	-	2.13	1.68	1.6

Source: Based on survey data.

VI. Patterns of Unfair Trade Practices by Contract Type

Section 5 highlights the negative impact of special contract transactions on supplier performance—likely stemming from imbalanced relationships and weaker supplier bargaining power. This raises an important question about the link between transaction types and unfair trade practices in the retail sector.

Despite its significance, systematic analyses of unfair practices by transaction type remain limited, largely due to a lack of direct data. However, identifying whether certain practices are concentrated within specific contract types could improve regulatory oversight and enforcement.

To investigate this connection, this section analyzes the complete set of rulings issued by the Korea Fair Trade Commission (KFTC) related to violations of the Large-Scale Retail Business Act, focusing on how different contract types are implicated in these cases.

According to Figure 6, unfair trade practices in the retail sector are most commonly associated with direct purchases (167 cases, 39.6%) and special contract transactions (160 cases, 37.9%), followed by store lease transactions (53 cases, 12.6%) and consignment transactions (42 cases, 10.0%). Together, direct purchases and special contract transactions account for over three-quarters of all cases, highlighting their greater vulnerability to unfair trade practices.

Interestingly, direct purchases showed a slightly higher frequency of unfair trade practices than special contract transactions, despite expectations that the latter would be more vulnerable. However, as shown in Figure 1, direct purchases make up 47% of the total transaction volume, while special contract transactions account for just 21%. This suggests that the higher occurrence of unfair trade practices in direct purchases is simply a reflection of their larger transaction share.

Figures 7 and 8 examine the relative vulnerability to unfair trade practices after factoring in transaction volume and the number of contracting firms. The analysis reveals that special contract transactions have the highest incidence of unfair trade practices per unit. In Figure 7, their frequency per unit of transaction volume is

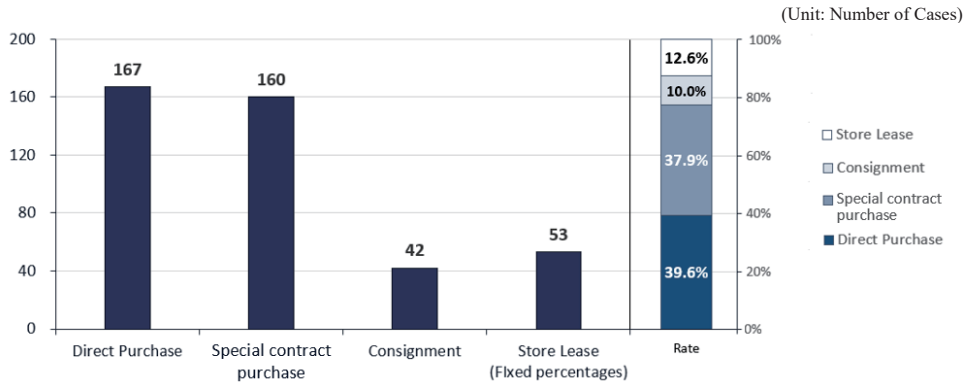

FIGURE 6. FREQUENCY (LEFT) AND SHARE (RIGHT) OF TRANSACTION TYPES INVOLVED IN UNFAIR TRADE PRACTICES IN THE LARGE-SCALE RETAIL SECTOR

Source: Compiled by the author based on the Korea Fair Trade Commission's Rulings on Violations of the Large-Scale Retail Business Act (1998–2018, KFTC Case Information System)

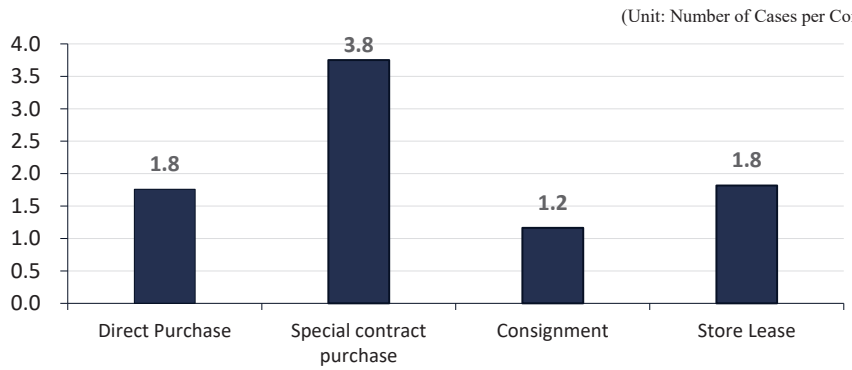

FIGURE 7. FREQUENCY OF UNFAIR TRADE PRACTICES BY TRANSACTION TYPE PER UNIT OF TRANSACTION VOLUME

Source: Korea Fair Trade Commission, KFTC Case Information System (https://case.ftc.go.kr, last accessed: April 3, 2019).

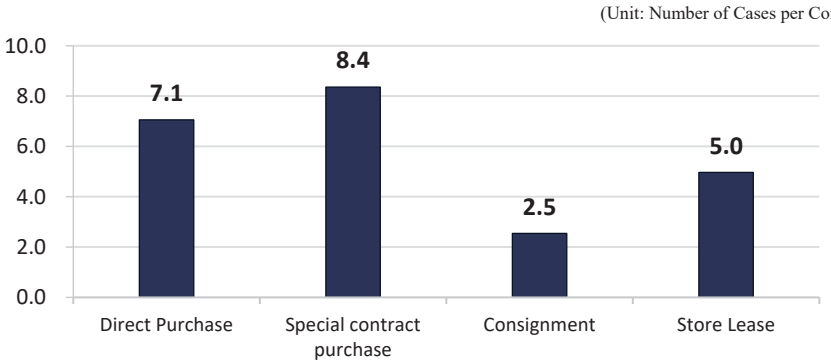

FIGURE 8. FREQUENCY OF UNFAIR TRADE PRACTICES BY TRANSACTION TYPE PER NUMBER OF SUPPLIERS

Source: Korea Fair Trade Commission, KFTC Case Information System (https://case.ftc.go.kr., last accessed: April 3, 2019).

3.75, making them 2.1 to 3.2 times more susceptible than other transaction types. These findings support the need for dedicated regulatory guidelines for special contract transactions and confirm that these types of transactions are most vulnerable to unfair trade practices.

Table 13 presents the annual average frequency of unfair trade practices across different regulatory periods, revealing a distinct upward trend in recent years. Whereas such practices previously occurred mainly in special contract and direct purchase transactions, they have now become more evenly spread across all types of transactions. In particular, the rapid growth of online and TV home shopping has led to a sharp rise in unfair trade practices within consignment transactions.

Figure 9 illustrates the annual average frequency of unfair trade practices by transaction type, based on evolving regulatory frameworks over time. In recent years, there has been a marked increase in frequency, particularly within consignment and store lease transactions following the enactment of the Large-Scale Retail Business Act. This trend suggests a shift from the previous concentration of unfair practices associated with special contracts and direct purchases toward a more

TABLE 13—FREQUENCY OF TRANSACTION TYPES INVOLVED IN UNFAIR TRADE PRACTICES IN THE RETAIL SECTOR: BY YEAR AND LEGAL BASIS

(Unit: Number of Cases)

Year	Direct Purchase	Special Contract Purchase	Consignment	Store Lease	Total
1998		1			1
1999	15	9		3	27
2000	13	4		3	20
2001	13	4		2	19
2002	6	6	1	9	22
2003					0
2004	6	1			7
2005	20	13		7	40
2006	3	1		2	6
2007	5	17	3		25
2008	6	6		1	13
2009	6	12		5	23
2010	11	6	1		18
2011	4	8	4	2	18
2012	11	20		1	32
2013	2	3			5
2014	4	7		1	12
2015	2	10	17	1	30
2016	20	7	5	1	33
2017	7	22		13	42
2018	13	3	11	2	29
Total	167	160	42	53	422

Source: Korea Fair Trade Commission, KFTC Case Information System (https://case.ftc.go.kr., last accessed: April 3, 2019).

(Unit: Number of Cases)

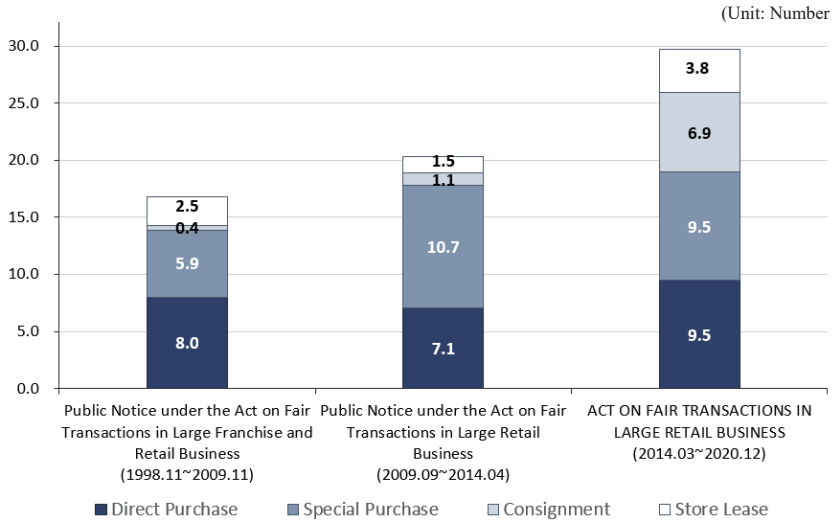

FIGURE 9. FREQUENCY OF TRANSACTION TYPES INVOLVED IN UNFAIR TRADE PRACTICES IN THE RETAIL SECTOR: BY LEGAL BASIS

Source: Compiled by the author based on the Korea Fair Trade Commission's Rulings on Violations of the Act on Fair Transactions in Large Retail Business, Large Franchise Retail Business, and Large-Scale Retail Stores (1998–2020) and the KFTC Case Information System (https://case.ftc.go.kr).

TABLE 14—FREQUENCY OF TRANSACTION TYPES INVOLVED IN UNFAIR TRADE PRACTICES IN THE RETAIL SECTOR, BY LEGAL PROVISION

(Unit: Number of Cases)

Provisions of the Act on Fair Transactions in Large Retail Business		Total Number of Violations	Direct Purchase	Special Contract Purchase	Consignment	Store Lease	Total by Transaction Type
Delivery and Retention of Documents	Article 6	85	38	44	11	18	111
Prohibition of Reduction in Payment of Goods	Article 7	12	11	1		0	12
Payment of Proceeds from Sale	Article 8	23		17	6	2	25
Prohibition of Refusal or Delay of Receipt of Goods	Article 9	1	1				1
Prohibition of Return of Goods	Article 10	46	46				46
Prohibition on Unjustly Shifting Burden of Sales Promotional Expenses	Article 11	76	39	43	9	21	112
Prohibition against using Employees by Suppliers	Article 12	42	32	22	8	2	64
Prohibition of Forcing Exclusive Dealing	Article 13	1			1		1
Prohibition of Request for Management Information	Article 14	15	5	10	3	5	23
Prohibition of Requests for Economic Profits	Article 15	17	15		2		17
Compensation for Costs of Equipment for Sales Floor	Article 16	1		1			1
Prohibition against Giving Disadvantages	Article 17	57	14	43	3	6	66
Total		376	167	160	42	53	479

Source: Compiled by the author based on the Korea Fair Trade Commission's Rulings on Violations of the Large-Scale Retail Business Act (1998–2018, KFTC Case Information System).

widespread distribution across various transaction types.

Table 14 analyzes legal violations by transaction type, revealing that breaches of the prohibition on unfair disadvantageous practices (Article 17 of the Large-Scale Distribution Act) were particularly prevalent in special contract purchases. A significant number of these cases involved unjustified changes to contract terms, such as unfair reductions in supply prices, increases in sales commissions or incentives, and unilateral termination of transactions. Notably, 43 out of 66 such violations (65%) were associated with special contract purchases, with supply price cuts and commission hikes being the most frequent. This pattern appears to be closely linked to the previously observed decline in sales associated with this transaction type.

The most frequently cited violation in direct purchase transactions was the infringement on the prohibition on product returns (Article 10), with 46 recorded cases. This provision is breached when a retailer returns goods previously purchased from a supplier without legitimate grounds. Given that consignment and store lease transactions do not entail actual purchases and that special contract purchases generally permit returns under credit-based terms, this regulation is applicable solely to direct purchases. Notably, 31 of the 46 cases involved large-scale supermarket chains.

Violations of provisions related to the issuance and retention of documentation (Article 6), the unfair allocation of promotional costs (Article 11), the use of supplier personnel (Article 12), and demands for business information (Article 14) were identified across all transaction types. Among these, failure to issue and retain written agreements—a fundamental contractual requirement—was the second most frequent violation, with 111 cases. The most prevalent issue, however, was the imposition of promotional expenses on suppliers without prior agreement, accounting for 112 cases. These findings suggest that many retailer–supplier disputes stem from ambiguities or omissions in contractual arrangements.

VII. Conclusion

A. *Summary of Findings*

The key findings of the study are as follows. Among transactions conducted among 26 large-scale retailers and approximately 7,000 suppliers, direct purchases accounted for the largest share (47%), followed by special contract purchases (21%), consignment transactions (18%), and store lease agreements (14%). The distribution of transaction types varied significantly by retail format: large supermarkets, convenience stores, and super supermarkets (SSMs) predominantly employed direct purchase models, whereas department stores and outlet malls relied almost exclusively (over 95%) on special contract purchases and store lease arrangements. In contrast, consignment transactions emerged as the dominant model in online and TV home shopping platforms. From a product category perspective, direct purchases were primarily used for essential goods, while special contract purchases were preferred for products characterized by high demand volatility—a pattern further supported by a regression analysis.

Second, transaction costs and bargaining power were key determinants in the selection of transaction types. Direct purchases were more prevalent in cases where retailers possessed advanced procurement systems and maintained high levels of trust with suppliers. Conversely, when sales involved specialized store infrastructure or the deployment of dedicated sales personnel, the proportion of direct purchases declined, with a corresponding increase in special contract purchases and store lease arrangements. From the perspective of bargaining power, direct purchases were more likely when suppliers had access to multiple retail partners and held greater leverage over transaction terms and profit margins. These findings indicate that suppliers tend to prefer direct purchase arrangements when the costs associated with terminating a relationship with a specific retailer are relatively low.

Third, as the imbalance in bargaining power between retailers and suppliers widened, a corresponding decline in supplier sales was observed. Specifically, a 1 percentage point increase in the share of special contract purchases was associated with an average decrease of 259 million KRW in core product sales. This decline is largely attributable to the diminished negotiating position of suppliers in special contract arrangements, which are typically characterized by higher commission rates, making them the least preferred transaction type among suppliers. These results suggest that special contract purchases contribute to an inequitable distribution of value

in supplier–retailer relationships.

Finally, more than 75% of unfair trade practices were concentrated in direct and special contract purchases, with special contract purchases exhibiting the highest incidence of violations per transaction unit. Moreover, such violations have shown an upward trend over time, particularly within consignment and store lease transactions. When disaggregated by transaction type, unfair disadvantageous practices—prohibited under Article 17 of the Large-Scale Distribution Act—were most frequently observed in special contract purchases, whereas violations of the product return prohibition (Article 10) were most common in direct purchases.

B. *Policy Recommendations*

While ongoing efforts aim to reduce unfair practices in special contract purchases and to promote the adoption of direct purchase models, policymakers should exercise caution with regard to mandating specific transaction types. This study demonstrates that transaction structures are shaped by a range of factors—including the retail format, product category, transaction costs, and the dynamics of bargaining power. Imposing a uniform transactional model may inadvertently distort market mechanisms and constrain trade. A more sustainable approach to expanding direct purchases would involve strengthening suppliers' bargaining power, particularly through the diversification of retail partnerships. Narrowing the power asymmetry between retailers and suppliers is likely to encourage direct transactions naturally, fostering a more equitable and transparent contracting environment.[3]

Second, regulatory bodies such as the Fair Trade Commission should examine more closely the relationship between transaction types and unfair trade practices. Although special contract purchases in department stores have been a primary focus of scrutiny, other retail sectors remain comparatively under-examined. For example, private brand (PB) transactions exhibit unfair product returns and arbitrary payment decisions at rates two to three times higher than those found in manufacturing subcontracting, indicating heightened risks even within direct purchase arrangements. To improve regulatory oversight, sectoral surveys should be refined to better reflect the nuances of transaction types, thereby enabling more effective monitoring and enforcement of relevant legal provisions.[4]

Finally, the retail industry itself must take a proactive role in driving innovation. Although minimizing inventory risk has become a widespread strategy, transferring this risk to suppliers—while prioritizing high distribution margins—may undermine long-term sustainability. The recent decline in profitability across offline retail channels suggests that the traditional margin-centric model may be approaching its structural limits. To remain competitive, retailers should invest in in-house merchandising capabilities, enhance procurement competencies, and focus on delivering differentiated products and services that elevate consumer welfare.

[3]However, the study does not offer a concrete answer as to how such an enhancement of bargaining power can be practically achieved, which remains an inherent limitation of the research. To address this issue more explicitly, future research may need to examine the determinants of bargaining power itself empirically or to investigate the underlying causes of unfair trading practices across different contract types.

[4]In addition, the regulatory data used in this study—such as enforcement cases by the Korea Fair Trade Commission—are based on information up to 2018. To better reflect recent developments in the retail environment and regulatory responses, periodic updates of such data should be prioritized in future research.

REFERENCES

Anderson, Erin and David Schmittlein. 1984. "Integration of the Sales Force: An Empirical Examination," *The RAND Journal of Economics*, 15(3).

Adida, Elodie and Nantaporn Ratisoontorn. 2011. "Consignment Contracts with Retail Competition," *European Journal of Operational Research*, 215.

Berry, Steven, James Levinsohn, and Ariel Pakes. 1995. "Automobile Prices in Market Equilibrium," *Econometrica*, 63(4)

John, George and Barton Weitz. 1988. "Forward Integration into Distribution: An Empirical Test of Transaction Cost Analysis," *Journal of Law, Economics, and Organization*, 4(2).

Korea Fair Trade Commission (KFTC). KFTC Case Information System (https://case.ftc.go.kr) (in Korean).

Korea Fair Trade Commission (KFTC). 2014. "Establishment of the Review Guidelines on the Unfairness of Special Purchase Transactions in the Large-Scale Retail Sector," Press Release, July 11 (in Korean).

Korea Fair Trade Commission (KFTC). 2018. "Supplier List for the Written Survey on the Distribution Sector" (in Korean).

Korea Fair Trade Commission (KFTC). 1998-2018. "Rulings on Violations of the Large-Scale Retail Business Act" (in Korean).

Li, Jia and Charles C. Moul. 2015. "Who Should Handle Retail? Vertical Contracts, Customer Service, and Social Welfare in a Chinese Mobile Phone Market," *International Journal of Industrial Organization*, 30.

Lim, Chae Un and Hotaek Yi. 2013. "Policy Issues on Win-Win Growth of Purchasing Practices Between Department Stores and Suppliers," *Korea Business Review*, 17(3): 233-250 (in Korean).

Pyun, Hae-soo, Soo-yeon Lee, and Chae Un Lim. 2009. "A Study on the Antecedents and Consequences of Direct Buying Choice: Centered on Domestic Department Store," *Journal of Product Research*, 27(1): 35-46 (in Korean).

Ru, Jun and Yunzeng Wang. 2010. "Consignment Contracting: Who Should Control Inventory in the Supply Chain?" *European Journal of Operational Research*, 201.

Youn, Myoung Kil. 2004. "A Study on Comparison of Buying System between Discount Stores and Department Stores in Korea," *Journal of Distribution Science*, 2(2): 1-15 (in Korean).

LITERATURE IN KOREAN

공정거래위원회. 온라인사건처리시스템 (http://case.ftc.go.kr).

공정거래위원회. 2014.「대규모유통업분야 특약매입거래 부당성 심사지침 제정」, 보도자료, 7. 11.

공정거래위원회. 2018.「2018년도 유통분야 서면실태조사를 위한 납품업자 목록」.

공정거래위원회. 1998-2018.「대규모유통업법 위반 관련 의결서」.

윤명길. 2004.「국내의 할인점과 백화점 매입유형에 관한 비교 연구」,『유통과학연구』, 제2권 제2호: 1-15.

임채운·이호택. 2013.「우리나라 백화점의 매입관행 개선방안: 납품업체와의 동반성장 관점」,『Korea Business Review』, 제17권 제3호: 233-250.

편해수·이수연·임채운. 2009.「직매입 선택의 선행요인과 결과요인에 대한 연구: 국내 백화점을 중심으로」,『상품학연구』, 제27권 제1호: 35-46.

KDI Journal of Economic Policy 2025, 47(3):31-68
https://dx.doi.org/10.23895/kdijep.2025.47.3.31

On the Effects of National Debt on the Distribution of Household Assets†

By SEUNG-RYONG SHIN*

This study examines the long-term effects of higher national debt in South Korea on asset distribution. Using an overlapping generations general equilibrium model, we focus on two key channels: rising interest rates and falling wage rates, both driven by the crowding-out effect of capital. Higher interest rates increase asset dispersion, benefiting older groups with more accumulated assets, while younger groups with fewer assets gain less. Falling wage rates reduce the capacity to save money across all age groups, partially offsetting the dispersion effects of higher interest rates. A simulation of a 50% increase in national debt reveals a decline in the Gini coefficient of asset holdings, driven by the diminishing marginal increase in future assets relative to current holdings. However, widening cross-sectional dispersion proved more welfare-relevant: older age groups, which experienced greater gains in average assets, saw increases in average welfare, whereas early life-cycle cohorts with low asset levels experienced welfare losses. Given this trade-off associated with higher national debt, initial asset transfers as a counteracting measure can enhance lifetime welfare overall, mitigate the rising asset dispersion, and improve the asset Gini coefficient.

Key Words: National Debt, Government Debt, Asset Inequality, Asset Distribution, General Equilibrium, OLG
JEL Code: E10, E20

* Associate Fellow, Korea Development Institute (E-mail: seushi@kdi.re.kr)
* Received: 2025. 3. 11
* Referee Process Started: 2025. 3. 11
* Referee Reports Completed: 2025. 7. 31
† This paper is an extension of Shin, 2024, "On the Effects of National Debt on the Distribution of Household Assets," KDI (*in Korean*). I thank two anonymous referees and the Editor for their useful suggestions. All remaining errors are mine.

I. Introduction

The idea of a country accumulating significant debt is generally perceived negatively. This concern is also relevant in the case of South Korea, which underwent painful structural adjustments to repay the funds borrowed from the International Monetary Fund (IMF) during the 1997 financial crisis. Given this historical experience, the notion of a rising level of national debt remains a significant and concerning issue. One can easily imagine a scenario in which the government suddenly issues large amounts of government bonds, leading to a sharp increase in interest rates and subsequent concerns over debt repayment. However, if we set aside situations related to economic crises, is a consistently high national debt ratio necessarily problematic if the country can refinance it? Unlike corporate or personal debt, national debt is relatively easier to refinance. Due to this characteristic, the government debt of OECD countries reached 110.5% of OECD's total GDP in 2023 (OECD, 2025). With the South Korean government projecting that ITS national debt-to-GDP ratio could rise from around 47.8% to 173.0% by 2072 (NABO, 2025), this study examines the long-term effects of maintaining higher level of national debt ratio on Korea's domestic economy.[1]

When assuming an overlapping generations general equilibrium model in a closed economy, there are two primary channels through which rising national debt can affect long-term economic equilibrium. The first channel is the capital market. In a simplified model of the capital market, household assets are divided into two categories: capital used by domestic firms and national debt. Therefore, any change in national debt must be accompanied by a change in capital, assets, or both. For example, if household assets remain fixed, an increase in national debt has a crowding-out effect, reducing available capital. As a result, capital becomes relatively scarce compared to labor used by firms, leading to higher interest rates and lower wage rates.

Of course, if we assume a complete (financial) market in which households increase their assets by an amount that matches precisely the rise in national debt, then higher national debt would have no impact on the capital market. In economics, this situation—where government bond issuance does not affect real markets—is commonly referred to as the Ricardian Equivalence Theorem (Barro, 1974). However, in a more realistic scenario where financial markets are incomplete and many households remain financially constrained even as national debt increases, the Ricardian Equivalence Theorem serves only as a theoretical starting point rather than an accurate depiction of reality. Due to similar reasons, in practical settings such as the overlapping generations model—where individuals have limited assets in the early stages of their life cycle and tend to deplete their assets toward the end—capital crowding-out is inevitable.

The second channel through which rising national debt can impact long-term equilibrium is via an increase in interest costs. When the real interest rate exceeds

[1]Therefore, this paper abstracts from a detailed examination of both reasons behind the rise in national debt and the transitional dynamics toward long-term equilibrium.

the economic growth rate, a rise in national debt instills a growing interest burden in terms of the ratio to GDP, necessitating higher tax rates to satisfy the government budget equation and maintain long-term equilibrium. However, if the real interest rate is close to or below the economic growth rate, national debt has little impact on tax rates.[2] Given this consideration, this study will largely set aside the channel of government budget pressure to focus on other mechanisms.[3]

Ultimately, as national debt rises, households will experience its effects primarily through higher interest rates and lower wage rates. How do households respond to these price changes? This study aims to analyze this issue by focusing on the asset accumulation process over the life cycle. First, as interest rates rise, cross-sectional asset dispersion tends to broaden. In particular, the age group with the highest asset holdings—typically just before retirement—benefits the most, while those in the earliest and latest stages of the life cycle, who hold the fewest assets, experience little benefit from higher interest rates. This situation arises because those with assets accumulated over their working years will see their compounded returns grow more significantly, whereas those without assets remain less affected by interest rate levels. Not only does this broaden asset dispersion across age groups, but asset dispersion within the same age group may also broaden. Even minor early-life asset differences can result in greater dispersion as higher interest rates compound over time. Consequently, rising interest rates may contribute to an overall increase in asset dispersion.

Conversely, lower wage rates reduce the saving capacity of all age groups, thereby decreasing total asset accumulation. Wage declines not only affect the working-age population but also reduce pension benefits, leading to lower lifetime earnings across all age groups. Consequently, the effects of a capacity reduction in can accumulate over time, offsetting the dispersion-broadening impact of rising interest rates. Ultimately, it remains unclear as to how rising national debt quantitatively alters the dispersion of household assets – a gap in the literature this study aims to fill.

The model used in this study primarily references Woo (2022), one of the most recent paper in the South Korean macro-fiscal literature, and is based on the standard closed economy macro-fiscal general equilibrium framework. Households are assumed to begin with zero initial assets and decide on consumption and savings over their life cycle. Before retirement, they endogenously determine their labor hours while facing idiosyncratic labor productivity shocks. Upon retirement, they receive pension benefits, which are also linked to wage rates. Firms are assumed to follow a Cobb-Douglas production function, and the government budget constraint is satisfied primarily through adjustments in consumption tax rates.

The model's parameterization largely follows the macro-fiscal economics literature on South Korea. Among the parameters, the most critical for the topic here is the constant relative risk aversion (CRRA) coefficient, which governs household saving behavior. After a brief theoretical discussion, we conclude that within the range

[2]In Korea, the average nominal growth rate from 2015 to 2024 (4.69%) exceeded the three-year government bond yield (2.09%).

[3]This study focuses on asset accumulation in a life-cycle setting. Assuming log period utility of consumption and a flexible consumption tax that satisfies the government budget constraint, government budget pressure does not affect asset and labor choices, although it still influences consumption and welfare.

commonly used in the literature (1 to 1.5), the main results would remain robust.

An experiment that compared two stationary general equilibria before and after a 50% increase in national debt level was conducted.[4] The results indicate that while the gap between the 75th and 25th percentile of asset holdings ("asset gap") widened after the increase in national debt, the Gini coefficient—another common measure of inequality—actually decreased. This outcome is closely linked to changes in household asset policy functions. Specifically, when national debt rises, those with higher asset levels tend to increase their assets more significantly in the following year, but the rate of increase diminishes. This finding aligns with the observed decline in the Gini coefficient, indicating that the direction of inequality depends on the chosen metric. Similarly, within the same age group, the asset gap widened, while the Gini coefficient generally decreased.

However, the implications of changes in the cross-sectional asset distribution, well summarized by variations in average assets by age group, are more significant from a welfare perspective. Specifically, age groups that experienced a greater increase in average assets due to rising national debt also saw higher value functions (welfare measure in terms of utility), whereas those in the early stages of the life cycle, who consistently have little to no assets, experienced a decline in their average value function.[5] Although more than 80% of households experienced an increase in value functions overall, the decline in value functions during the early life cycle stages raises concerns from a social welfare perspective, given that only the ex-ante value function includes welfare at all ages.

These findings motivated a policy experiment that increased initial asset transfers to the youngest age group as a direct means of enhancing the ex-ante value function. As initial assets increase, the total asset supply rises, resulting in lower interest rates. Consequently, the value function of younger households improves, while that of older households declines. Despite this trade-off, this study finds that an appropriate rise in initial assets can fully offset the loss in the ex-ante value function caused by higher national debt, while simultaneously keeping the value functions of the majority of age groups better off.

This study further finds that both measures of asset inequality, which move in opposite directions in response to rise in national debt level, improve as initial assets increase. Asset dispersion, measured by the "asset gap", declines as higher capital offsets the price effects of higher national debt, while the asset Gini coefficient falls because fewer individuals hold extremely low (zero) assets.

Care must be taken when interpreting the results of this policy experiment. Fundamentally, in terms of the ex-ante value function, an increase in national debt is undesirable,[6] whereas initial asset transfers are considered beneficial. Therefore, the key takeaway from this study is that if an increase in national debt is inevitable,

[4]This analysis abstracts from other specific fiscal or macroeconomic shifts that could be closely associated with the increase in national debt.

[5]On the other hand, with-in age group asset distribution had little implication. For example, although asset gap increased for individuals nearing retirement, their average assets rose significantly, leading to an improvement in their simulated value functions. Also, the value functions of individuals just entering the labor market declined, even though their assets were commonly zero.

[6]Even when initial assets are positive yet not unrealistically high at the outset, an increase in national debt lowers the ex-ante value function.

compensating for its effects through initial asset transfers may serve as an appropriate policy measure.

Research on the long-term effects of increasing levels of national debt within a heterogeneous household model was introduced initially by Aiyagari and McGrattan (1998). Since then, various studies have followed this approach, with Lim (2011) adapting the framework to the context of the Korean economy. More recently, Shin (2022) extended the analysis beyond long-term effects to examine the general equilibrium impacts that may arise during the transition to an increased level of national debt. A common feature in these studies is their focus on infinite-horizon households, whereas this study differs by adopting a life-cycle model.

There is no definitive answer as to whether the infinite-horizon household model or the life-cycle model is superior. In reality, individuals exhibit age-based heterogeneity over their life cycle, yet there also exists a long-term intergenerational characteristic where descendants behave as a single household over time. Both assumptions hold significant implications with regard to a general equilibrium analysis of national debt. This study primarily focuses on the economic differences across households of different ages and further contributes by analyzing the policy effects of initial asset transfers in the early stages of the life cycle.

This study is closely related to numerous papers that analyze fiscal effects using the overlapping generations (OLG) model. The foundational work in this field was conducted by Auerbach and Kotlikoff (1987), and later, Nishiyama (2003) and Nishiyama and Smetters (2014) extended the model by incorporating idiosyncratic shocks, allowing it to become widely used in macroeconomic distribution research. In Korea, studies by Moon and Lee (2013) and Woo (2022) have built upon this model to analyze fiscal policy. Unfortunately, this study makes only a modest methodological contribution. That said, its significance lies in how it focuses more specifically on how an increase in national debt affects asset distribution.

Section 2 outlines the model used in the analysis and explains the parameterization methods. Section 3 discusses the theoretical framework for how asset accumulation evolves over the life cycle in response to an increase in national debt within a general equilibrium setting. Section 4 presents the quantitative results of rising national debt and derives corresponding policy implications.

II. Model

This section explains the model used in the analysis and the methods used for parameterization. The model primarily references Woo (2022) and assumes an overlapping generations (OLG) general equilibrium framework encompassing households, firms, and the government. Households maximize utility, firms maximize profits, and the government adjusts the consumption tax rate to satisfy the government budget constraint. The analysis is conducted within a stationary equilibrium where the distribution of aggregate variables remains constant over time. The parameters are primarily calibrated to reflect the economic and demographic conditions of 2023.

A. *Model Setting*

1. Household's Utility Maximization Problem

The household utility maximization problem is formulated under a life-cycle model framework. Heterogeneous households exist continuously and participate in economic activities at each age $i \in \{1,\cdots,I\}$. Due to an exogenously and independently given mortality probability γ_i, households may not transition to the next age $i+1$ and instead face death. At the final age $i=I$, the probability of death is set to $\gamma_I = 1$.

Households enter the labor market at age $i=1$ and can work only until $i=i_R-1$. The age group within the range $i \in \{1,\cdots,i_R-1\}$ is referred to as the "working-age" population. Given the labor productivity shock x, age-specific labor productivity ε_i, and the equilibrium wage w, households determine their labor hours l, which results in labor income given by $y_i^l = w\varepsilon_i x l$. The idiosyncratic labor productivity shock follows an AR(1) process and evolves according to the following process:

$$ln\left(x'\right) = \rho_x ln\left(x\right) + \nu_x,\ \nu_x \sim \left(0,\sigma_x{}^2\right).$$

For a given asset level a, capital income is ra, and households pay a capital income tax of $\tau_k ra$. They also contribute to the national pension system by paying a payroll tax of $\tau_{ss} y_i^l$. Taxable income is given by $y_i = (1-\tau_k)ra + (1-\tau_{ss})y_i^l$.[7] Households then pay an income tax of $\tau_w y_i$ on this taxable income.

Given disposable income and the current asset level a, households decide on next-period assets a' and consumption c, while also paying a consumption tax of $\tau_c c$. Households face incomplete market restriction $a' \geq 0$.

The age group $i \in \{i_R,\cdots,I\}$ is referred to as the "retirement-age" population. During this period, households do not earn labor income and therefore do not pay contributions to the national pension system. Their income consists of interest income ra and pension benefits $pen(x)$. The pension benefit $pen(x)$ is assumed to be determined by the productivity shock in the final year of the working period, following the approach of Woo (2022). Households pay a capital income tax of $\tau_k ra$, and their taxable income is given by $y_i = (1-\tau_k)ra$. An income tax of $\tau_w y_i$ is then levied on this taxable income.[8] Households determine their next-period assets and consumption based on their disposable income and current asset holdings, while also paying a consumption tax.

The national pension benefit is defined as follows:

[7]The capital income tax is interpreted as corporate tax. Therefore, similar to real-world tax structures, income tax is levied after the capital income tax has already been applied.

[8]In reality, pension benefits are also subject to income tax. However, since tax deductions on pension income are significantly larger compared to labor income, this study chooses to disregard them for simplicity.

$$pen(x) = \xi w(0.5 + 0.5x)N / \sum_{i=1}^{i_R-1} \mu_i .$$

$\xi = 0.4$ represents the income replacement rate of the current national pension system. N denotes the total labor supply, and μ_i represents the population at age i. The following equation is designed to reflect the redistributive function of the national pension system as accurately as possible given the state variables.

The period utility function $u(c,l)$ for each age group is given as follows:

$$u(c,l) = \frac{c^{1-\sigma_u} - 1}{1-\sigma_u} - \varphi \frac{l^{1+\frac{1}{\sigma_l}}}{1+\frac{1}{\sigma_l}} .$$

The utility decreases as labor hours increase, reflecting the disutility of labor. This utility is discounted over time by a factor of β.

The value function $V_R^{\,i}(a,x)$, which solves the utility maximization problem for retirees, can be expressed using the Bellman equation as follows:

$$\begin{aligned} V_R^{\,i}(a,x) &= \max_{c,a'} u(c,0) + \beta(1-\gamma_i)(1+g_z)^{1-\sigma_u} V_R^{\,i+1}(a',x) \qquad s.t. \\ (1+\tau_c)c + a'(1+g_z) &= a + (1-\tau_k)ra + pen(x) - \tau_w y_i , \\ y_i &= (1-\tau_k)ra , \\ a &\geq 0,\ I \geq i \geq i_R . \end{aligned} \tag{1}$$

Here, g_z is the adjustment factor for the growth rate of per capita variables, driven by the growth of total factor productivity z.[9] Along with the population growth rate g_n, the term $(1+g_z)(1+g_n)$ represents the overall economic growth rate.

The value function $V^i(a,x)$, which solves the utility maximization problem for the working-age population, can be expressed using the Bellman equation as follows:

$$\begin{aligned} V^i(a,x) &= \max_{c,a',l} u(c,l) + \beta(1-\gamma_i)(1+g_z)^{1-\sigma_u} E_{x'|x} V^{i+1}(a',x') \\ &\quad s.t. \\ (1+\tau_c)c + a'(1+g_z) &= a + (1-\tau_k)ra + (1-\tau_{ss})y_i^{\,l} - \tau_w y_i , \\ y_i^{\,l} &= w\varepsilon_i x l , \\ y_i &= (1-\tau_k)ra + (1-\tau_{ss})y_i^{\,l} , \end{aligned}$$

[9]Total factor productivity z grows each year by a factor of $(1+g_z)^{1-\theta}$.

$$ln\left(x^{'}\right)=\begin{cases}\rho_x \ln\left(x\right)+\nu_x,\ \nu_x \sim N\left(0,\sigma_x{}^2\right) & if\ i<i_R-1\\ \ln\left(x\right) & o.w.\end{cases},$$

$$V^{i_R}\left(a,x\right)=V_R{}^{i_R}\left(a,x\right),$$

$$a\geq 0,\ i<i_R. \tag{2}$$

2. Firm's Profit Maximization Problem

Firms operate under the following Cobb-Douglas production technology:

$$Y=\mathrm{zK}^{\theta}N^{1-\theta}.$$

In this equation, K represents capital input, N represents labor input, z denotes total factor productivity, and θ is the capital income share. Using the production technology described above, the GDP, denoted as Y, is generated. Firms solve the following optimization problem:

$$\max_{K,N}\left\{\mathrm{zK}^{\theta}N^{1-\theta}-\left(r+\delta\right)K-wN\right\}. \tag{3}$$

Here, δ represents the depreciation rate, r denotes the interest rate, and w represents the wage rate.

The optimality conditions derived from solving this optimization problem are as follows:

$$w=\left(1-\theta\right)\mathrm{zN}^{-\theta}K^{\theta},$$

$$r+\delta=\theta\mathrm{zN}^{1-\theta}K^{\theta-1}.$$

This implies that the wage rate corresponds to the marginal product of labor, while the sum of the interest rate and the depreciation rate corresponds to the marginal product of capital. When the relative capital-to-labor ratio K/N decreases, capital becomes relatively scarce, and labor becomes more abundant, leading to a decrease in w and an increase in r. Conversely, when K/N increases, the opposite occurs—wages rise while the interest rate declines.

Furthermore, these equations can be used to demonstrate that the income distribution ratio remains unchanged.

$$\theta Y=\left(r+\delta\right)K,$$

$$\left(1-\theta\right)Y=wN.$$

3. Government Budget Constraint

$\psi^i(a,x)$ represents the density function for age i. The government finances its revenue T through consumption taxes, capital income taxes, income taxes, and death taxes, with the process expressed as follows:

$$T = \sum_{i=1}^{I} \mu_i \int \left[\tau_c c + \tau_w y_i + \tau_k r a + \frac{\gamma_{i-1}}{1-\gamma_{i-1}} a \right] d\psi^i(l,a,x),$$
$$\gamma_0 = 0.$$

In this equation, μ_i represents the population at age i. Given government revenue T, government consumption G, the current national debt D, and the next-period national debt D', the following government budget constraint holds:

$$G + (1+r)D = D'(1+g_z)(1+g_n) + T,$$
$$G = \bar{g} \times \sum_{i=1}^{I} \mu_i . \tag{4}$$

Under stationary equilibrium, $D' = D$ holds. Government spending is assumed to be proportional to the total population, following a constant parameter $\bar{g}$. The government adjusts the consumption tax rate to achieve fiscal balance. The fiscal condition of the national pension system is omitted to focus on the pure effects of national debt in the current economic environment.[10]

4. Market Clearing Conditions

The total labor supply for each age i is expressed as follows:

$$N_i = \mu_i \int \varepsilon_i x l d\psi^i .$$

The labor market clearing condition is given as follows:

$$N = \sum_{i=1}^{i_R - 1} N_i . \tag{5}$$

For the capital market, the national debt D and firms' capital demand K must be

[10]If the financial condition of the national pension system deteriorates, as projected for Korea in the future, general government resources would need to be injected as compensation under a formal stationary equilibrium. However, under the assumptions of log utility of consumption and a flexible consumption taxes, such general government pressures do not affect households' asset, labor, or before-tax consumption choices.

fully funded by households' capital supply A.

$$A = D + K,$$
$$A = \sum_{i=1}^{I} \mu_i \int ad\psi^i(l,a,x). \quad (6)$$

5. Definition of Stationary Equilibrium

A state of stationary equilibrium normally satisfies the following conditions:

1. Households maximize utility.
2. Firms maximize profits.
3. The government satisfies its budget constraint.
4. The capital market and labor market clear.
5. The macroeconomic distribution maintains dynamic consistency.

Stationary equilibrium for this model is defined as the set of variables and functions $a^{i*}(a,x)$, $c^{i*}(a,x)$, $l^{i*}(a,x)$, r, w, τ_c, N, K, and $\psi^i(l,a,x)$ such that $a^{i*}(a,x)$, $c^{i*}(a,x)$, and $l^{i*}(a,x)$ solve (1) and (2) given r, w, and τ_c; firms solve (3) given r and w; the government satisfies (4); and the markets clear through (5) and (6). In this study, the concept of dynamic consistency is modified. Under a standard stationary equilibrium, economic agents accurately predict future demographic structures using mortality rates, ensuring that the aggregate distribution remains unchanged over time. However, in this model, mortality rates and population structures may not be fully consistent. For example, in a true stationary equilibrium, the condition $\gamma_i = \mu_{i+1} / [\mu_i \times (1+g_n)]$ must hold. However, given that this model directly incorporates γ_i, μ_i, and g_n as exogenous inputs from data, this equation may not necessarily hold. To maintain the essence of dynamic consistency, this study defines μ_i as an age-specific weight used in the construction of aggregate variables. Economic agents take this as given, and their decisions lead to a macroeconomic distribution that remains unchanged over time. While this approach does not fully align with a rational expectations-based macroeconomic model, it is considered sufficient for capturing the key macroeconomic effects analyzed in this study.

This study assumes a population structure where $\sum_{i=1}^{I} \mu_1 = 1$ and adjusts for the population growth rate g_n. As a result, all macroeconomic variables, except for rate-based variables such as the interest rate r, are interpreted as per capita values and are assumed to grow annually by a factor of $(1+g_z)$. Additionally, although μ_i remains constant in the model, the population at each age group is interpreted as increasing by a factor of $(1+g_n)$ each year.

B. *Parameterization*

The specific source for parameter selection is summarized in Table 1. The following parameter values are predetermined, independent of the model solution, and are commonly used in the Korean macroeconomic literature: $\sigma_\mu = 1,\ \ \sigma_l = 0.4,$ $\sigma_x = 0.05,\ \ \rho_x = 0.92,\ \ \theta = 0.36,\ \ \delta = 0.08.$ The income replacement rate of the national pension system is set at 40%, leading to $\xi = 0.4.$ Regarding the life cycle, the model assumes that age $i = 1$ corresponds to 20 years old, $i = i_R$ corresponds to 65 years old (retirement age), and $i = I$ corresponds to 98 years old (the terminal age).

The parameters calibrated to match the economic and demographic conditions of 2023 are as follows: $g_z = 0.0132$ and $g_n = 0.0008.$ The values for μ_i and γ_i are extracted from the 2021 Population Projections. For convenience, μ_i is adjusted so that the total population sum equals 1. The national debt D is set to ensure that the debt-to-GDP ratio, given by $D(1+g_z)(1+g_n)/Y,$ equals 50.4%.

Assuming $Y = 1$ and $N = 1$, and applying optimality conditions for firms, the following equations are derived:

$$K = \frac{\theta - \tau_k rK}{\delta + (1-\tau_k)r},$$

$$z = \frac{1}{K^\theta},$$

$$R = \frac{\theta}{K},$$

$$r = R - \delta.$$

Setting $\tau_k rK$ as the capital income tax-to-GDP ratio to 3.35% and $(1-\tau_k)r$ as the real government bond interest rate to 1.673%,[11] the values for K, z, R, r, and τ_k are sequentially determined.

[11]The 2023 nominal government bond interest rate (three-year maturity) of 3.573% is adjusted by subtracting the GDP deflator growth rate of 1.9%.

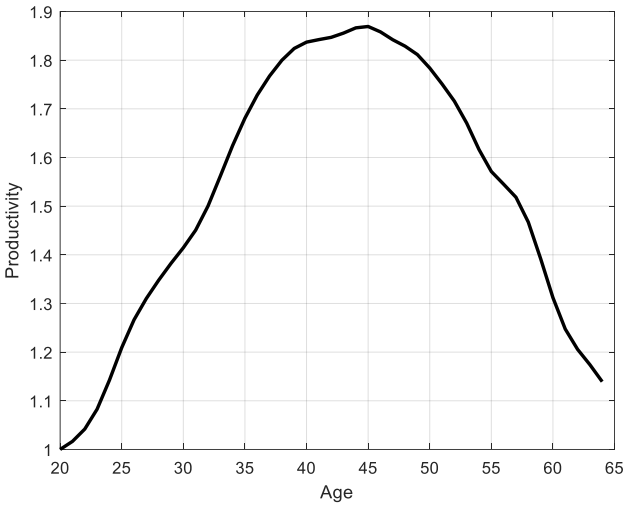

FIGURE 1. LABOR PRODUCTIVITY BY AGE

Note: Standardized by dividing by the productivity at age 20.

The relative magnitude of age-specific labor productivity ε_i is extracted from the 2019 Korean Labor & Income Panel Survey,[12] as shown in Figure 1. This is calculated by dividing the average income by the average working hours for each age group. The overall level of ε_i is exogenously adjusted so that $N=1$ holds if every households sets $1=1/3$ before solving the model. The parameter φ is estimated so that $N=1$ after solving the model.

The consumption tax rate τ_c is estimated to ensure that the consumption tax-to-GDP ratio is 3.073%. The income tax rate τ_w is set so that the income tax-to-GDP ratio is 4.82%, and the payroll tax rate τ_{ss} is determined to match the pension revenue-to-GDP ratio of 2.43%.

During calibration, the government budget constraint is first satisfied by determining $\bar{g}$. In the policy experiment where the national debt ratio increases, the budget constraint is adjusted through τ_c rather than $\bar{g}$.

[12]Because labor market conditions after 2019 may not have fully recovered from the impact of COVID-19, the year 2019—the last year unaffected by COVID-19—is chosen for the analysis.

TABLE 1—PARAMETER SETTINGS

Variable	Description	Value	Source
σ_u	CRRA coefficient	1	Woo (2022)
σ_l	Labor elasticity	0.4	Woo (2022), Kwon (2016)
β	Time discount factor	1.0084	ECOS three-year government bond interest rate
φ	Disutility of labor coefficient	60.8	Set to satisfy N=1
ε_i	Age-specific average labor productivity	-	Korean Labor & Income Panel Survey (2019) wage and working hours data N=1 if all l=1/3
γ_i	Age-specific mortality rate	-	Population Projections (2021)
μ_i	Age-specific population share	-	
σ_x	Variance of idiosyncratic labor productivity shocks in AR(1) process	0.05	Lee *et al*. (2019)
ρ_x	Autoregressive coefficient of labor productivity shocks in AR(1) process	0.92	
θ	Capital income share	0.36	Lee *et al*. (2019)
z	Total factor productivity	0.6454	Set to satisfy Y=1
δ	Depreciation rate	0.08	Lee *et al*. (2019)
g_z	Per capita growth rate	0.0132	JipyoNuri (2023)
g_n	Population growth rate	0.0008	
τ_k	Capital income tax rate	0.3723	e-Nara Indicators, corporate tax
τ_c	Value-added tax rate	0.054	e-Nara Indicators, consumption tax
τ_{ss}	National pension contribution rate	0.038	e-Nara Indicators, national pension revenue
τ_w	Income tax rate	0.0708	e-Nara Indicators, income tax
D	National debt-to-GDP ratio	0.497	e-Nara Indicators, national debt ratio
G	Government spending	0.133	Government budget equation
ξ	National pension income replacement rate	0.4	Set to match a 40% income replacement rate

III. Theoretical Discussion

The primary focus of this study is the long-term impact of rising national debt on household assets. Thus, the key question concerns the factors that influence households' asset choices; i.e., if national debt increases but the exogenous variables perceived by households remain unchanged, then household assets will also remain unaffected. This section examines the theoretical impact of rising national debt on price variables (interest rates and wages) and tax rates.

The capital market is the primary market directly affected by national debt. Under a state of closed-economy stationary equilibrium within an overlapping generations model, an increase in national debt has a crowding-out effect, resulting in higher interest rates. This can be demonstrated using the following reasoning: (1) Capital demand is downward-sloping. (2) Capital supply is upward-sloping. (3) An increase in national debt shifts the capital supply curve to the left.

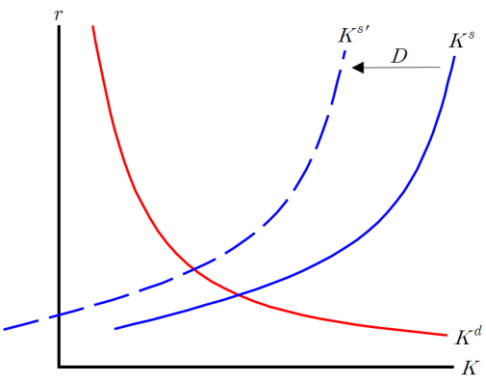

FIGURE 2. SUPPLY AND DEMAND OF CAPITAL MARKET

The total asset supply of households, A, is divided between firms' capital demand, K, and national debt, D. The partial equilibrium interest rate r of capital market is determined by the interaction of this supply and demand. If firms follow a Cobb-Douglas production function, their optimal condition with respect to capital demand is given by

$$r + \delta = \theta z N^{1-\theta} K^{\theta-1}.$$

Without loss of generality, we assume that the total labor N remains fixed. Then, capital demand is downward-sloping, as illustrated in Figure 2.

Does the capital supply curve shift to the left as D increases? If $D = 0$, the market-clearing condition $A = K$ implies that the asset supply curve for A is identical to the capital supply curve. If D increases, because the tax rates and prices other than interest rates faced by households remain unchanged, the asset supply curve itself does not shift. However, according to the new market-clearing condition, $A = K + D$, the portion of A allocated to national debt D reduces the capital

available for firms. As a result, as illustrated in Figure 2, the capital supply curve shifts leftward by exactly D.

The most complex issue is whether the asset supply curve is truly upward-sloping under general equilibrium. In a partial equilibrium setting where wages are fixed and the firms' optimality condition with respect to labor does not apply, it is more likely that an increase in the interest rate would lead to an increase in asset holdings (and thus in capital supply via the capital market clearing condition) of households due to the income effect on savings. However, under general equilibrium, the relationship is not as straightforward. Based on firms' both optimality conditions, the following inverse relationship holds between wages and interest rates:

$$w = \frac{z^2(1-\theta)\theta}{r+\delta}.$$

From this equation, we can infer that if the interest rate increases, the wage rate decreases, potentially reducing the ability of households to accumulate assets. This raises the possibility that the capital supply curve may not be upward-sloping.

However, we show that if the intertemporal elasticity of substitution in the utility function is sufficiently high, the compounded accumulation of assets over a working life of approximately 45 years outpaces the decline in wages. As a result, the total asset supply ultimately increases despite the wage drop. To illustrate this, we consider a simplified $N-$period life-cycle model, excluding labor supply decisions and any uncertainty.

$$\max_{\{c_t, a_{t+1}\}_{t=0}^{N}} \sum_{t=0}^{N} \beta^t \frac{c_t^{1-\sigma_u} - 1}{1-\sigma_u}$$

$$s.t.$$

$$c_t + a_{t+1} = (1+r)a_t + \mathrm{wl}_t,$$

$$a_{t+1} \geq 0,\ a_0 = 0.$$

The dynamics of a_t for this problem can be expressed as follows:

$$a_{t+1} = a_t(1+r) \times \frac{\beta^{1/\sigma_u}(1+r)^{(1/\sigma_u-1)} + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u-1)}}{1+\cdots+\beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u-1)}} + \frac{\mathrm{wl}_t\beta^{1/\sigma_u}(1+r)^{(1/\sigma_u-1)} + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u-1)}}{1+\cdots+\beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u-1)}} - \frac{w[1_{t+1}(1+r)^{-1} + \cdots + 1_N(1+r)^{-(N-t)}]}{1+\cdots+\beta^{\frac{N-t}{\sigma_u}}(1+r)^{(N-t)\left(\frac{1}{\sigma_u}-1\right)}} \quad \text{for} \quad t < N.$$

TABLE 2—ASSET BY AGE AS INTEREST RATE $\rightarrow \infty$

σ_u	$w = \bar{w}$	$w = \frac{z^2(1-\theta)\theta}{r+\delta}$
$\sigma_u < 0.5$	$a_t \rightarrow \infty$ for $t \geq 1$	$a_t \rightarrow \infty$ for $t \geq 1$
$\sigma_u = 0.5$	$a_t \rightarrow \infty$ for $t \geq 1$	$a_1 \rightarrow \bar{a_1},\ 0 < \bar{a_1} < \infty,$ $a_t \rightarrow \infty$ for $t \geq 2.$
$0.5 < \sigma_u < 1$	$a_t \rightarrow \infty$ for $t \geq 1$	$a_1, a_2 \rightarrow 0,$ $a_t \rightarrow \infty$ for $t \geq 3.$
$\sigma_u = 1$	$a_1 \rightarrow \bar{a_1},\ 0 < \bar{a_1} < \infty,$ $a_t \rightarrow \infty$ for $t \geq 2.$	$a_1 \rightarrow 0,$ $a_2 \rightarrow \bar{a_2},\ 0 < \bar{a_2} < \infty,$ $a_t \rightarrow \infty$ for $t \geq 3.$
σ_u in gerenal	Assume $\sigma_\mu = k.$ $a_t \rightarrow 0$ for $t < k,$ $a_k \rightarrow \bar{a_k},\ 0 < \bar{a_k} < \infty,$ $a_t \rightarrow \infty$ for $t \geq k+1.$	Assume $\sigma_\mu = k/2.$ $a_t \rightarrow 0$ for $t < k,$ $a_k \rightarrow \bar{a_k},\ 0 < \bar{a_k} < \infty,$ $a_t \rightarrow \infty$ for $t \geq k+1.$

From this equation, we can infer that as long as the asset level a_t in a given period t does not converge to zero, an infinitely increasing r will also cause next-period assets a_{t+1} to diverge to infinity. Also, we can summarize, as in Table 2, whether assets at each age diverges as r diverges to infinity, with a detailed solution provided in the appendix. We observe three important points. Firstly, as σ_u increases (i.e., as the intertemporal elasticity of substitution decreases), a greater number of younger age groups do not experience asset divergence. If interest rates rise and lifetime income diverges to infinity, households with a stronger preference for complementarity between present consumption and future consumption will tend to increase their current consumption along with higher average life cycle consumption, but because initial assets are nearly zero, individuals in the early stages of life must reduce their savings to increase current consumption. Secondly, if we incorporate the labor market clearing condition and assume wages as the inverse of the interest rate, the tendency to reduce savings becomes even stronger.

However, an important point to note is that the commonly used values of σ_u in the macroeconomic literature are between 1 and 1.5. Within this range, asset levels begin to diverge as early as age $t \geq 4.$ Of course, whether the capital supply curve is always upward-sloping across all interest rate levels or whether it is strictly upward-sloping for all parameter values requires further analysis. However, given that the life cycle spans 79 years, the period during which assets can compound at the interest rate is significantly long. Thus, the likelihood that the capital supply curve is upward-sloping remains high.

Lastly, how does an increase in the national debt-to-GDP ratio affect tax rates?

$$G + D[1 + r(1-\tau_k)(1-\tau_w) - (1+g_z)(1+g_n)]$$

$$\approx \sum_{i=1}^{I} \mu_i \int [\tau_c c + \tau_w y_i^l + \frac{\gamma_{i-1}}{1-\gamma_{i-1}} a] d\psi^i(l,a,x) + [\tau_w(1-\tau_k) + \tau_k] rK$$

Let us examine the factors that cause fiscal conditions to deteriorate using the government budget equation. If the after-tax interest rate is significantly higher than the economic growth rate, an increase in national debt can directly worsen fiscal conditions through the budget constraint. Additionally, K declines as observed under the capital market equilibrium state, leading to an overall economic contraction, which in turn reduces revenue from capital income taxes, consumption taxes, and labor income taxes. As a result, the pressure to raise tax rates increases, which may lead to a certain amount of household savings contraction.

Meanwhile, as D increases, the capital market clearing condition implies that the entire increase in D is absorbed into household assets. Consequently, the total assets of households are likely to increase. As household assets grow, death tax revenue rises. Additionally, due to the crowding-out effect, an increase in r leads to higher capital income tax revenue amounts, which can partially offset the rising interest burden on national debt. Depending on the specific parameters, the final tax rate may either increase or decrease.

In this study, we assume a special case in which $\sigma_u = 1$ and the consumption tax rate τ_c is adjusted to meet the government budget constraint. When only looking at the household's utility maximization problem, changes in τ_c do not affect the choices of $(1+\tau_c)c$, a', or l, as the change in τ_c is offset by the change in c. As a result, the condition to meet the government budget constraint does not affect household asset choices. In this study, to focus more on the impact of an increase in national debt on the capital and labor markets, we assume that $\sigma_u = 1$ and that the government budget constraint is met by adjusting the consumption tax rate.[13]

IV. Model Analysis

In this section, first we examine the asset distribution in the baseline model before the increase in national debt, after which we examine how macroeconomic variables and the asset distribution change when the national debt increases. Next, we explore how the household value function changes, and finally we derive policy implications.

[13]What would happen if $\sigma_u > 1$? The complementarity between consumption and leisure increases; hence, if τ_c decreases, c rises and l falls.

A. *Baseline Model*

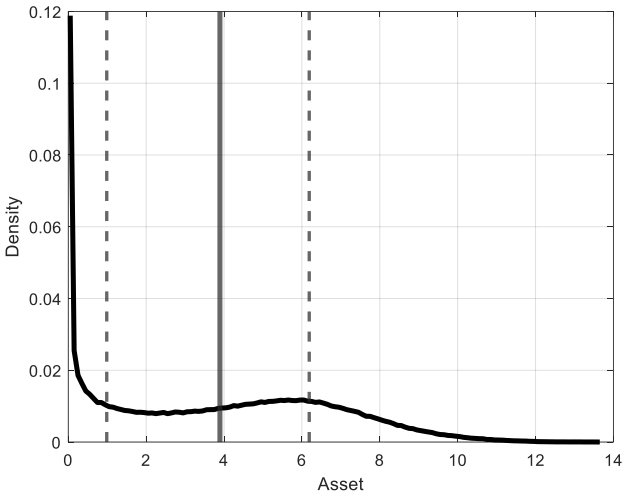

FIGURE 3. ASSET DENSITY FUNCTION IN THE BASELINE

Note: The bold vertical line represents the median, and the dashed lines indicate the 75th and 25th percentiles.

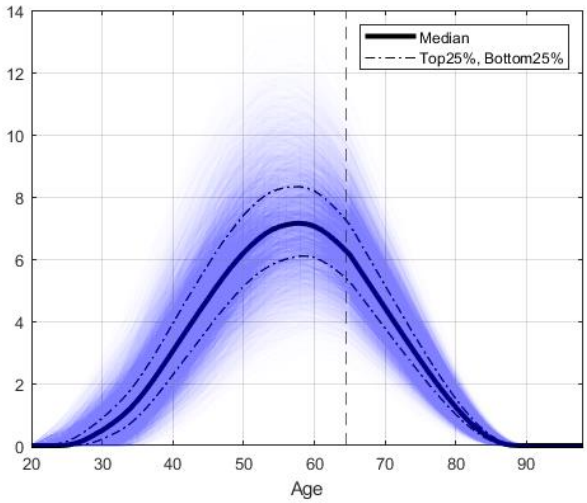

FIGURE 4. ASSET SIMULATIONS IN THE BASELINE

Note: The vertical dashed line represents the retirement point. The thin lines denote 10,000 simulation results.

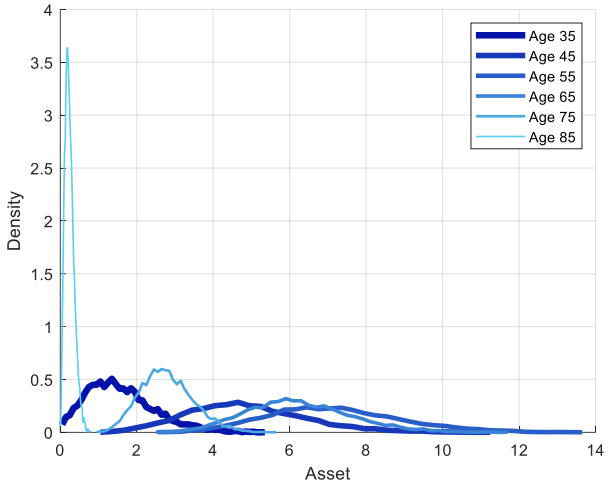

FIGURE 5. ASSET DENSITY FUNCTION BY AGE IN THE BASELINE

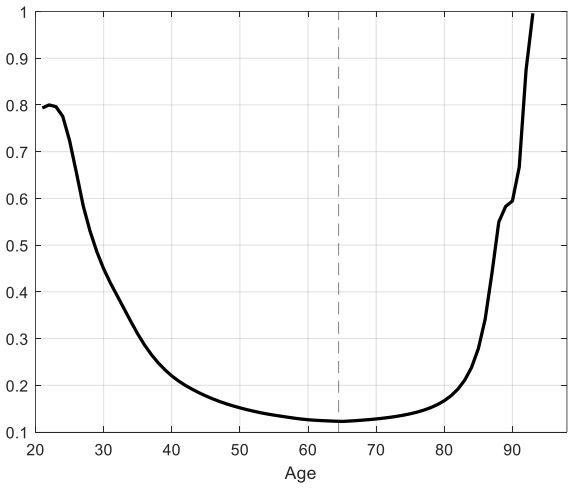

FIGURE 6. ASSET GINI COEFFICIENT BY AGE IN THE BASELINE

Note: The vertical dashed line represents the retirement point.

First, we examine the asset distribution in the baseline model. As shown in Figure 3, the highest density is around asset 0. This occurs because we assume that each household enters the labor market with $a_0 = 0$. The distribution is skewed to the right, similar to real-world data. In the figure, it can be observed that the density near 6 is higher than the density near 2, arising because the population of retired individuals holding assets around 2 is smaller than the population of middle-aged individuals holding assets around 6.

Figure 4 shows the life-cycle results of the asset simulation. It can be seen that households accumulate assets until retirement to prepare for the decline in income at retirement age. In the late 50s, assets peak on average, and the difference between

the 75th and 25th percentiles (the "asset gap") also reaches its maximum. After retirement, because there is no uncertainty for individuals in the model, the life-cycle trajectory of assets does not intersect with the asset trajectories of other households.

The asset density function by age group is presented in Figure 5. Even when examining the distribution by age, it can be observed that it is slightly right-skewed because households with more assets benefit more from the compounding effect through interest rates, which increases the dispersion in asset accumulation. As expected, the asset variance is visually largest around the mid-50s.

What does the Gini coefficient look like by age group? While the asset gap by age group peaks in the late 50s, as shown in Figure 4, Figure 6 reveals the opposite for the Gini coefficient. At the beginning and end of the life cycle, most households have no assets, leading to very high Gini coefficient. When only a few households hold positive assets in a situation where most have none, those few households hold all of the assets for that age group, causing the Gini coefficient to be very high. On the other hand, the Gini coefficient is at its lowest around retirement. This is basically due to the high average assets around retirement relative to the asset dispersion. Note that if the average increases while the variance remains the same, the Gini coefficient decreases. Ultimately, it is difficult to determine with certainty the direction of inequality along the life cycle.

B. *Experimenting with a Rise in National Debt*

TABLE 3—RISE IN NATIONAL DEBT

	Baseline	D ↑
Debt-to-GDP	0.5040	0.7616
GDP	1.0000	0.9926
Asset	3.8720	4.0452
Capital	3.3754	3.2996
Labor	1.0000	1.0012
K/N	3.3754	3.2957
Consumption	0.5693	0.5676
Interest Rate	0.0267	0.0283
Wage Rate	0.6400	0.6345
Consumption Tax Rate	0.0540	0.0523
Capital Income Tax	0.0335	0.0348
Income Tax	0.0482	0.0484
Consumption Tax	0.0307	0.0297
Death Tax	0.0219	0.0230
Real Debt Interest	0.0014	0.0028
Consumption (Labor)	0.4453	0.4417
Consumption (Retirement)	0.1240	0.1260
Ex-ante Value Function	-29.8128	-29.9350

What changes in macroeconomic variables occur when the national debt increases by 50% such that the national debt-to-GDP ratio rises from 50.4% to 76.2%? As shown in Table 3, GDP decreases, which can be attributed to the reduction in capital, primarily caused by the crowding-out effect in the capital market. Although total labor increases, the extent of the increase is small and the final total output thus decreases.

Why does total labor increase? Let's examine the optimal conditions for labor.

$$l = [\frac{1-\tau_{ss}-\tau_w}{1+\tau_c} \times w\varepsilon_i x \times \frac{1}{c^{\sigma_u}\varphi}]^{\sigma l}.$$

Accordingly, when the wage rate decreases, there is a direct substitution effect where labor decreases. However, if $(1+\tau_c)c^{\sigma_u}$ decreases, there is also the outcome of labor increasing due to the wealth effect. Ultimately, according to Table 3, the reduction rate of $(1+\tau_c)c^{\sigma_u}$ in the working-age population is, on average, greater than the reduction rate of the wage rate, meaning that the wealth effect is more significant. As a result, K/N decreases, leading to an increase in the final interest rate and a decrease in the wage rate.

It can be observed that the consumption tax rate decreases, suggesting that the final fiscal burden decreases. While the rise in the national debt-to-GDP ratio increases the real debt interest burden, $D[(1+r)(1-\tau_k)-(1+g_z)(1+g_n)]$, the increase in capital income tax and death tax results in a decrease in the consumption tax rate. However, under the assumption of $\sigma_u = 1$ in this study, these fiscal burden changes do not affect the assets or labor supply choices of households.

TABLE 4—PRICE EFFECTS OF A RISE IN NATIONAL DEBT

	Baseline	D ↑	r ↑	w ↓
Interest Rate	0.0267	0.0283	0.0283	0.0267
Wage Rate	0.64	0.6345	0.64	0.6345
Consumption Tax Rate	0.054	0.0523	0.054	0.054
Assets	3.872	4.0452	4.0832	3.8389
Labor	1.0	1.0012	1.0012	1.0
Consumption	0.5693	0.5676	0.5715	0.5644
Asset Gap 75%-25%	5.2001	5.3194	5.3687	5.1557
Asset Gini Coefficient	0.4315	0.4244	0.4243	0.4315

How does asset change when the national debt rises? We compare the general equilibrium effects with partial effects when only the interest rate rises and when only the wage rate decreases.[14] As shown in Table 4, total assets increase, and as shown in Figure 7, assets increase for nearly all age groups under general equilibrium. This is primarily due to the effect of the increase in interest rates. For example, if only the interest rate rises while the wage rate remains unchanged, assets increase more significantly compared to the general equilibrium effect. On the other hand, if only the wage rate decreases while the interest rate remains unchanged, the ability to save assets diminishes. For those in their late 50s, the effect of the decreased wage rate accumulates more, resulting in a larger reduction in assets. Ultimately, because the effect of rise in the interest rate is stronger, the final assets increase under general equilibrium.

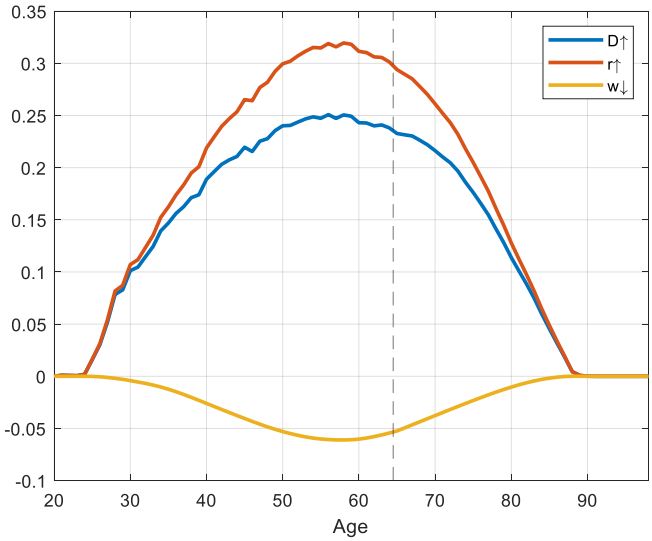

FIGURE 7. CHANGES IN AVERAGE ASSETS AFTER A RISE IN NATIONAL DEBT

Note: The vertical dashed line represents the retirement point.

[14]The price change magnitudes of partial equilibria are determined by those of the general equilibrium. Under partial equilibria, we only consider the household utility maximization problem and disregard market clearing conditions and government budget constraints.

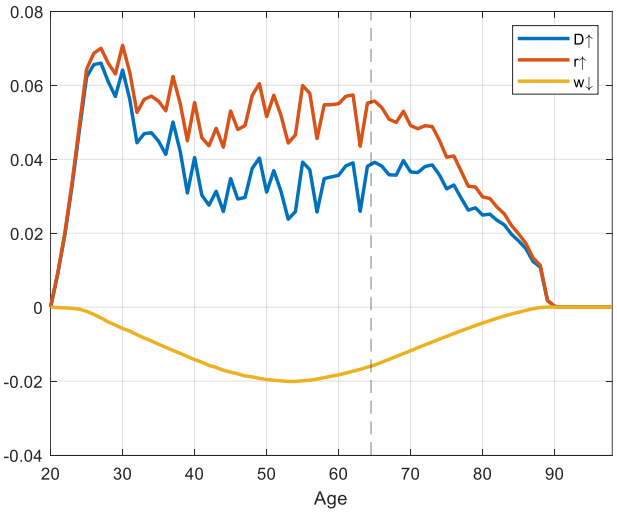

FIGURE 8. CHANGES IN THE 75-25 PERCENTILE ASSET GAP DUE TO A RISE IN NATIONAL DEBT

Note: The vertical dashed line represents the retirement point.

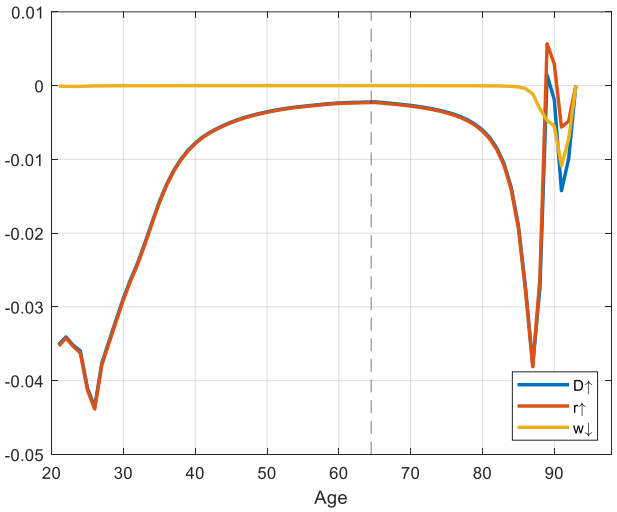

FIGURE 9. CHANGES IN THE GINI COEFFICIENT AFTER A RISE IN NATIONAL DEBT

Note: The vertical dashed line represents the retirement point.

How does the asset distribution change? As shown in Table 4, when the national debt increases, the asset gap between the 75th and 25th percentiles actually widens. When decomposing this into each price effect, we can observe that when only the interest rate rises, the asset gap widens further, but the effect is offset somewhat by the decrease in the wage rate. This phenomenon can be observed across all age groups in Figure 8.

On the other hand, when looking at the Gini coefficient of assets, the opposite trend appears. As shown in Table 4, the overall Gini coefficient of assets actually decreases. This effect is entirely due to the rise in interest rates, while the decrease in wage rates has little impact on the Gini coefficient. This phenomenon is similarly observed across all age groups in Figure 9. Except for those in their late 80s who have almost no assets, the decrease in the asset Gini coefficient due to the rise in national debt and that due to the rise in interest rates are nearly identical across all age groups, while the decrease in wage rates has little effect on the Gini coefficient.

We have observed that inequality varies significantly depending on the index chosen to measure it. Let's explore why this difference arises through the asset policy function. Figure 10 shows the asset decision function (also known as "policy function") averaged over age and labor productivity shocks in the baseline scenario. It indicates how much asset households are expected to choose in the following year based on their current assets. This function is nearly a straight line. Compared to a 45-degree line, we can observe that its y-intercept is positive, and the slope is a positive number less than 1. The greater the current assets, the more assets will be chosen in the next year. However, because the life cycle is limited, households will eventually deplete their assets, suggesting that they do not accumulate assets infinitely.

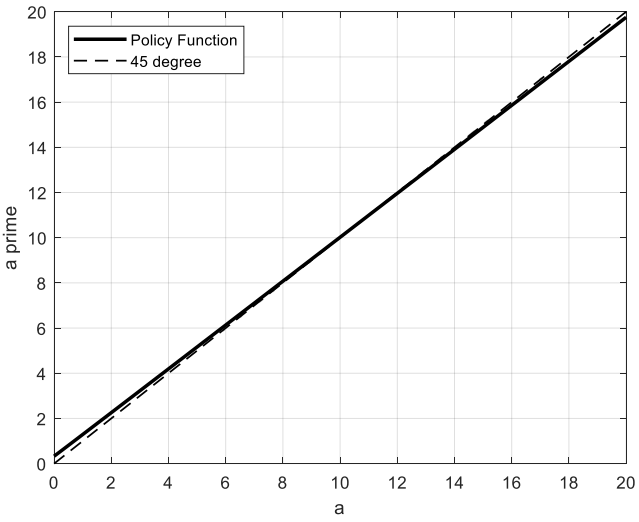

FIGURE 10. AVERAGE ASSET POLICY FUNCTION IN THE BASELINE

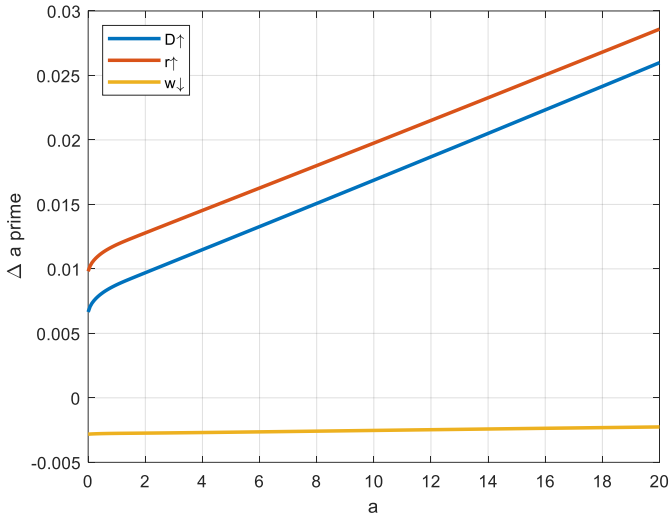

FIGURE 11. CHANGES IN THE ASSET POLICY FUNCTION AFTER A RISE IN NATIONAL DEBT

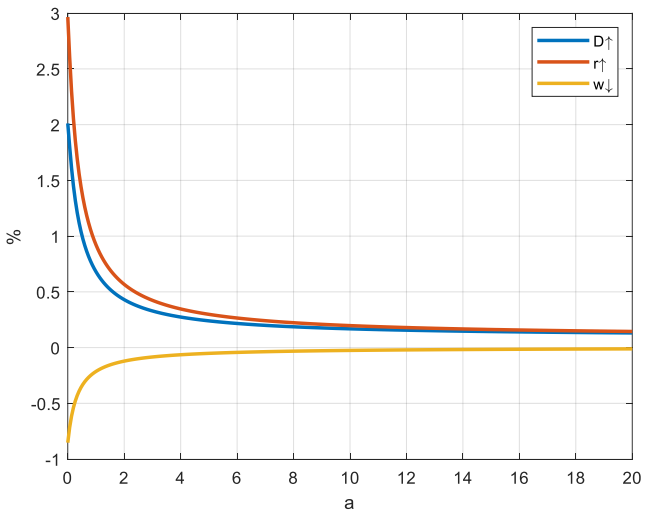

FIGURE 12. CHANGE RATES IN THE ASSET POLICY FUNCTION AFTER A RISE IN NATIONAL DEBT

How does the average asset policy function change with a rise in national debt? As shown in Figure 11, when the national debt increases, the amount of assets for the following year increases across all asset states. However, it does not increase by the same amount for all asset states. In other words, the asset policy function does not shift upward in a parallel fashion. Instead, the greater the current assets, the larger the increase in assets for the following year; i.e., the slope of the asset policy function becomes steeper, indicating that asset dispersion increases in absolute terms.

It can also be seen that most of these effects stem from the rise in interest rates. As shown in Figure 11, when only the interest rate rises, households save more across

all current asset states. However, if the wage rate simultaneously decreases, the interest rate effect is somewhat offset. Ultimately, the broadening of the asset gap across all age groups is primarily due to the rise in interest rates.

Meanwhile, as touched upon earlier, what matters during the calculation of the Gini coefficient is not the change in assets but the rate of change. Figure 12 shows the change rate of the asset policy function for each asset state. First, when the national debt increases, we can see that households with lower levels of current assets increase their assets by a larger percentage in the following year. This change is qualitatively identical to the asset policy function change when only the interest rate rises. On the other hand, if only the wage rate decreases, there is an opposite effect where households with lower levels of current assets reduce their assets by a larger percentage in the following year. Ultimately, the improvement in the asset Gini coefficient when the national debt rises is due to the greater interest rate effect on the asset policy function.

Lastly, it is important to acknowledge that the interpretations via the asset policy function are not entirely clear-cut in their implications for asset dispersion and the asset Gini coefficient, as it does not account for compounding effects over the life cycle. Nonetheless, a broad interpretation is possible: an increasing upward shift in the asset policy function can be viewed as a sufficient condition for broadening asset dispersion, whereas a declining rate of increase in the policy function is a necessary condition for a reduction in the asset Gini coefficient.

C. *Welfare Analysis*

Let's examine which age groups benefit more when the national debt increases. Households whose value function increases when the national debt rises will be considered to "support" the rise in national debt, while households whose value function decreases will be considered to "oppose" it.[15] Partial changes in the interest rate or wage rate will be omitted, as it is clear that when only the interest rate rises, all households will support it, and when only the wage rate decreases, all households will oppose it, given the constraint $a_t \geq 0$.

Figure 13 shows the level of support for the rise in national debt by each age group. The overall support ratio is 88.9%. The support ratio for 20-year-olds, who have no assets, is 0%, but it increases sharply with age, reaching 100% at the age of 40. As assets near depletion in old age, the support ratio declines sharply, and by the age of 90, it approaches 0% again.

The first implication drawn from Figure 13 is that, as seen earlier, while the asset gap increases with the rise in national debt, households, despite being risk-averse, are not significantly affected in terms of their value function. In particular, households aged 40 to 85, despite the fact that their wages have decreased due to the decline in wage rates, see a greater increase in average assets, leading all of them to support the rise in national debt. In general equilibrium models based on life-cycle

[15]Interpretation of the support ratio requires caution. Because this model is a general equilibrium analysis, it is preferable to interpret it as a change in welfare for a specific age group rather than interpreting it as the actual 'support' of a specific household or generation during the equilibrium transition process. For example, it is not appropriate to use this analytical tool to discuss electoral engineering through democracy.

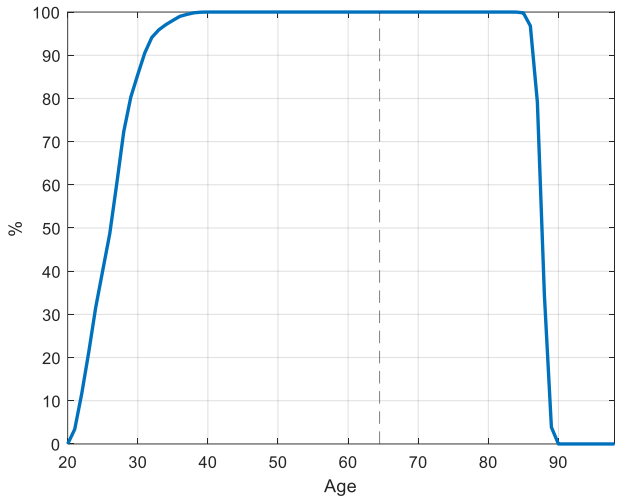

FIGURE 13. SUPPORT RATIO OF A RISE IN NATIONAL DEBT

Note: The vertical dashed line represents the retirement point.

models, the welfare implication of average values by age is stronger than that of idiosyncratic uncertainty or distributions.[16] Shortly, it is easier for asset-rich age groups to support the rise in national debt.

Another important consideration is the significant gap between the support ratio and the ex-ante value function as social welfare measures. In this model, the only age group whose value function encompasses value functions of all ages is the 20-year-old group, i.e., at the first age of the life cycle, individuals consider their entire life cycle, but afterward, they no longer reflect on their past. Of course, in real-world democracies, as policy decisions are not made by simply considering the life cycle of younger people, the support ratio also serves as an important social welfare measure. However, because the ex-ante value function, which has greater suitability as a social welfare function, decreases, it is challenging to interpret the rise in national debt positively.

D. *Policy Analysis*

Next, we discuss policies to address the problem of the declining ex-ante value function due to a rise in national debt. One idea that can be derived from Figure 13 is to increase initial assets through taxes. The following effects could arise theoretically. First, wealth is simply transferred through initial assets, meaning that younger age groups benefit more, while older age groups suffer. Second, if the interest rate is fixed, the total assets across the life cycle increase. Third, there is a general equilibrium effect by which the capital supply increases, leading to a decrease in the interest rate. Age groups that had more assets previously benefit less

[16]If we consider an infinite-horizon household model, such as the Aiyagari model, the main motivation for savings would be a precautionary motive due to uncertainty, which could lead to different results. In other words, the results here may stem from the fact that the model does not consider the descendants of each household.

from the compound interest effect, resulting in greater losses. Fourth, the decrease in the interest rate is accompanied by an increase in the wage rate, especially benefiting assetless groups, as they are freed from financial constraints. In summary, the beneficiaries of increased initial asset transfers are the younger age groups, while the middle-aged groups suffer, while the benefits for assetless elderly groups are uncertain. Through such a policy, we can moderate the polarized support ratios by age groups shown in Figure 13. Let's examine whether it is possible to increase the ex-ante value function with an appropriate increase in initial asset transfers, while not significantly reducing the support ratio.

TABLE 5—EFFECTS OF A RISE IN NATIONAL DEBT WITH AN INITIAL ASSET TRANSFER

	Baseline	$D\uparrow$ $a_0 = 0$	$D\uparrow$ $a_0 = 0.2$	$D\uparrow$ $a_0 = 0.4$	$D\uparrow$ $a_0 = 0.7$
Debt-to-GDP	0.5040	0.7616	0.7612	0.7604	0.7588
GDP	1.0000	0.9926	0.9932	0.9943	0.9964
Asset	3.8720	4.0452	4.0608	4.0818	4.1186
Capital	3.3754	3.2996	3.3153	3.3362	3.3731
Labor	1.0000	1.0012	0.9994	0.9976	0.9947
K/N	3.3754	3.2957	3.3172	3.3444	3.3910
Consumption	0.5693	0.5676	0.5677	0.5680	0.5686
Interest Rate	0.0267	0.0283	0.0278	0.0273	0.0263
Wage Rate	0.6400	0.6345	0.6360	0.6379	0.6411
Consumption Tax Rate	0.0540	0.0523	0.0571	0.0621	0.0697
Capital Income Tax	0.0335	0.0348	0.0344	0.0339	0.0331
Income Tax	0.0482	0.0484	0.0483	0.0483	0.0483
Consumption Tax	0.0307	0.0297	0.0324	0.0353	0.0396
Death Tax	0.0219	0.0230	0.0229	0.0227	0.0225
Real Debt Interest	0.0014	0.0028	0.0026	0.0023	0.0019
Consumption (Labor)	0.4453	0.4417	0.4426	0.4438	0.4458
Consumption (Retirement)	0.1240	0.1260	0.1251	0.1242	0.1228
Ex-ante Value Function	-29.8128	-29.9350	-29.8045	-29.6822	-29.5175
Asset Gap 75%-25%	5.2001	5.3194	5.2655	5.1936	5.0737
Asset Gini Coefficient	0.4315	0.4244	0.4186	0.4110	0.3979

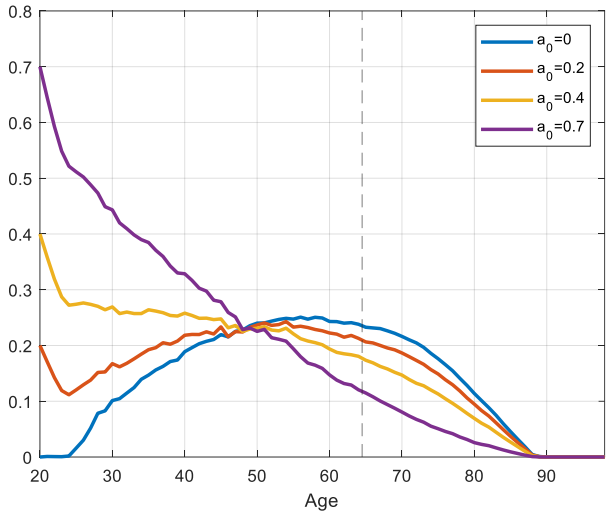

FIGURE 14. CHANGES IN AVERAGE ASSETS AFTER A RISE IN NATIONAL DEBT WITH AN INITIAL ASSET TRANSFER

Note: The vertical dashed line represents the retirement point.

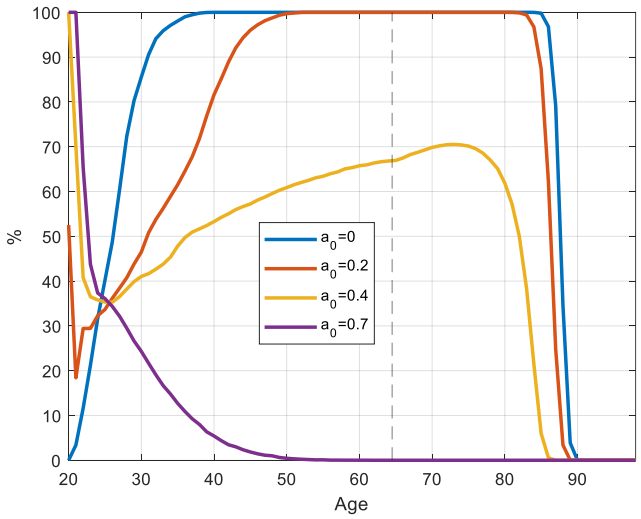

FIGURE 15. SUPPORT RATIO OF A RISE IN NATIONAL DEBT WITH AN INITIAL ASSET TRANSFER

Note: The vertical dashed line represents the retirement point.

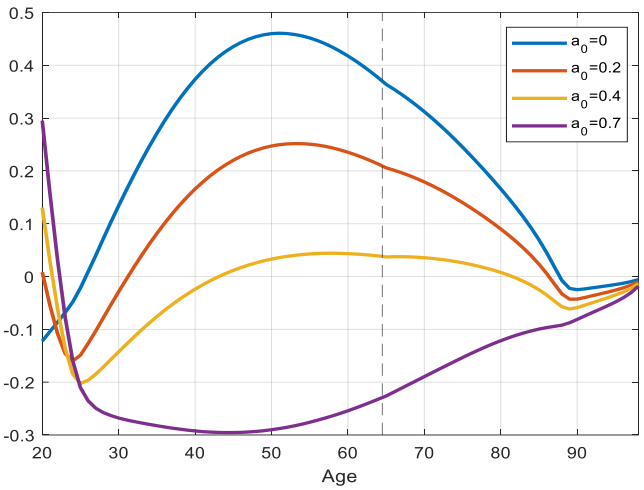

FIGURE 16. CHANGES IN THE VALUE FUNCTION AFTER RISE IN NATIONAL DEBT WITH AN INITIAL ASSET TRANSFER

Note: The vertical dashed line represents the retirement point.

The changes in key macroeconomic variables according to various initial asset levels, while maintaining the increased level of D, are shown in Table 5. When initial assets are increased, the interest rate falls and the wage rate rises, while the ex-ante value function increases. Despite the decline in the ex-ante value function due to the rise in national debt, in the range of $a_0 \geq 0.2$, the final ex-ante value function actually increases. Notably, in the scenarios for $a_0 = 0.2$, and $a_0 = 0.4$, although consumption for working-age groups decreases and consumption for retirement-age groups increases compared to the baseline, the ex-ante value function still rises. This suggests that the ex-ante value function is highly suitable as a social welfare measure.

The effects of these changes in initial asset policies on average assets by age group can be observed in Figure 14. When initial assets increase, assets rise for those in the early stages of entering the labor market. However, from the late 50s onward, it can be seen that assets generally decline. This occurs because the compound interest effect of the interest rate decreases more significantly as age increases.

Most importantly, we can observe through Figure 15 and Figure 16 that the age groups with larger increases in assets tend to increase value function more easily. Figure 15 especially shows that the support ratios before and after the mid-20s move in completely opposite directions with respect to changes in the initial asset level. This suggests that an appropriate adjustment of the initial asset level is required to avoid a polarization of opinion.

Meanwhile, how does the cross-sectional asset distribution change? As shown in Table 5, when national debt rises without initial asset transfers, the asset gap and the asset Gini coefficient move in opposite directions. However, when initial assets increase, both the asset gap and the asset Gini coefficient decline, indicating an overall improvement in asset inequality. The asset gap narrows as the price effects—particularly the rise in interest rates—are offset by increased savings and capital. Meanwhile, the Gini coefficient decreases because fewer individuals, especially

among younger age groups, hold extremely low or zero assets. Results regarding distribution changes within age groups are provided in the appendix.

Finally, we discuss the practicality of implementing such a policy. In South Korea, various forms of initial asset transfer policies are actively debated, either directly or indirectly. These include proposals to reduce inheritance taxes, subsidize national pension contributions for young adults, and expand youth loan programs. However, several challenges must be addressed to make such policies politically viable. First, policymakers often lack a deep understanding of general equilibrium effects. There is little recognition that the current set of youth support policies may serve as partial offsets to the interest rate effects of rising public debt in a general equilibrium context. Second, in a super-aged society such as South Korea, expanding youth-targeted asset transfer policies through democratic majority rule is politically difficult. Such policies offer limited or no direct benefits to older generations, who comprise a large share of the electorate. Third, politicians tend to focus on short-term policies, whereas initial asset transfers aim at generating long-term outcomes. Despite these challenges, the primary contribution of this study lies in how it highlights the potential role of initial asset transfers as a viable policy response to the increase in asset dispersion and lower social welfare caused by rising national debt—a perspective that, to the author's knowledge, has not been explicitly addressed in the existing literature.

E. *Aging Population*

South Korea is expected to face the worst aging population era due to the lowest fertility rate among OECD countries. Analyzing the impacts of increasing the national debt in such a demographic environment is also an important topic.

The results of the simulation conducted by changing the population structure to 2070 and assuming a population growth rate of -1.8% per year are shown in Table 6. Qualitatively, the results are largely similar to those from the analysis conducted before population aging in Table 5. However, two differences emerge when increasing the initial assets alongside the rise in national debt. First, unlike the analysis before population aging, total consumption decreases as initial assets increase. As with the analysis in Table 5, in Table 6, consumption for working-age groups increases and consumption for retirement-age groups decreases as initial assets rise; however, in Table 6, due to population aging, the proportion of the retirement-age group increases, which results in a decrease in total consumption.

Another difference is that the GDP is affected non-linearly as initial assets increase. When the initial assets are increased from zero, GDP decreases, but when additional assets are increased further, GDP actually increases. When initial assets are increased by small amount from zero, the phenomenon of households excessively supplying labor under financially constraint in the early stages of the life cycle is eased, which leads to a relatively sharp decrease in labor supply. However, as initial assets are increased further, the effect of financial constraint relief diminishes.

As a result, while the effects on GDP and total consumption may differ depending on whether the population is aged, the qualitative implications with regard to benefits by age group and the ex-ante value function due to changes in national debt or initial assets remain the same.

TABLE 6—EFFECTS OF A RISE IN NATIONAL DEBT AND AN INITIAL ASSET TRANSFER, UNDER AN AGED POPULATION

	Baseline	$D\uparrow$ $a_0 = 0$	$D\uparrow$ $a_0 = 0.2$	$D\uparrow$ $a_0 = 0.4$	$D\uparrow$ $a_0 = 0.7$
Debt-to-GDP	0.4713	0.7112	0.7116	0.7118	0.7118
GDP	0.5058	0.5028	0.5025	0.5023	0.5024
Asset	2.2241	2.3063	2.3076	2.3104	2.3176
Capital	1.9845	1.9469	1.9482	1.9510	1.9582
Labor	0.4648	0.4654	0.4648	0.4642	0.4633
K/N	4.2696	4.1833	4.1914	4.2026	4.2266
Consumption	0.3920	0.3911	0.3906	0.3903	0.3897
Interest Rate	0.0118	0.0130	0.0129	0.0127	0.0124
Wage Rate	0.6965	0.6914	0.6919	0.6925	0.6940
Consumption Tax Rate	0.1611	0.1626	0.1662	0.1698	0.1753
Capital Income Tax	0.0087	0.0094	0.0093	0.0092	0.0090
Income Tax	0.0232	0.0233	0.0232	0.0232	0.0232
Consumption Tax	0.0632	0.0636	0.0649	0.0662	0.0683
Death Tax	0.0103	0.0109	0.0108	0.0108	0.0107
Real Debt Interest	0.0030	0.0048	0.0047	0.0047	0.0046
Consumption (Labor)	0.2035	0.2013	0.2016	0.2020	0.2027
Consumption (Retirement)	0.1884	0.1898	0.1890	0.1883	0.1871
Ex-ante Value Function	-35.4379	-35.8953	-35.7614	-35.6444	-35.4805
Asset Gap 75%-25%	4.6435	4.7586	4.7491	4.6903	4.5926
Asset Gini Coefficient	0.5183	0.5122	0.5106	0.5083	0.5035
Support Ratio (%)	NaN	53.9344	42.5881	11.8614	0.9453

V. Conclusion

This study analyzes the long-term economic effects of increases in national debt, focusing on the process of household asset accumulation. When national debt rises, interest rates can increase when capital contract, and wages can decrease. These two effects are conflicting, but the impact of an increase in the interest rate was assessed as being stronger. As a result, the absolute dispersion in asset holdings over the life cycle broadened, particularly between early and late working ages. Additionally, the asset gap within the same age group also broadened. Although the asset Gini coefficient, another common inequality measure, showed a tendency to improve, the age groups benefiting from the rise in national debt were those who already held

more assets, while the value function of those with no assets in the early life cycle decreased. To address this, appropriately increasing initial asset transfer expenditures can help alleviate the phenomenon of concentrated benefits and losses in specific age groups, while also increasing the ex-ante value function.

Care must be taken when interpreting these welfare results. This policy experiment of increasing initial asset transfer aims to compensate for the decrease in the ex-ante value function due to a rise in national debt. From a welfare perspective, it is preferable to avoid a rise in national debt, whereas increasing initial asset transfer expenditures should be considered for implementation regardless of the national debt. However, this study emphasizes that the long-term damage caused by the rise in national debt can be effectively targeted and mitigated through initial asset transfers.

Lastly, although this study emphasizes that rising national debt leads to greater asset dispersion and lower social welfare, these findings should not be viewed as the primary reasons to avoid increasing national debt. Rather, the more realistic and fundamental concern could lie in whether the government can actually refinance the debt—issues such as national default risk and the emergence of risk premiums, which this study abstracts from. Accordingly, this study focuses on the additional consequences and policy implications of higher national debt, under the assumption—commonly made by many governments—that refinancing is not a constraint. The extent to which refinancing is actually feasible remains an important subject for future research.

APPENDIX 1

We derive the solution to the following problem for a fixed condition of $\{l_t\}_{t=0}^{N}$.

$$\max_{\{c_t,a_{t+1}\}_{t=0}^{N}} \sum_{t=0}^{N} \beta^t \frac{c_t^{1-\sigma_u}-1}{1-\sigma_u}$$

$$s.t.$$

$$c_t + a_{t+1} = (1+r)a_t + \mathrm{wl}_t\,,$$

$$a_{t+1} \geq 0,\ a_0 = 0.$$

Assuming that the financial constraint of $a_{t+1} \geq 0$ is ignored, the present value budget constraint for each age is as follows for $t < N$:

$$c_t + \cdots + \frac{c_N}{(1+r)^{N-t}} = a_t(1+r) + w\left[l_t + \cdots + \frac{l_N}{(1+r)^{N-t}}\right].$$

By using the Euler equation $c_{t+1} = [\beta(1+r)]^{1/\sigma_u} c_t$, the solution for $\mathrm{c_t}$ can be derived.

$$c_t\left[1 + \cdots + \frac{[\beta(1+r)]^{\frac{N-t}{\sigma_u}}}{(1+r)^{N-t}}\right] = a_t(1+r) + w\left[l_t + \cdots + \frac{l_N}{(1+r)^{N-t}}\right].$$

When combined with the original budget constraint, the dynamics of a_t can be expressed as follows:

$$a_{t+1}^{*}(r,a_t) \equiv a_t(1+r)$$

$$\times \frac{\beta^{\frac{1}{\sigma_u}}(1+r)^{\left(\frac{1}{\sigma_u}-1\right)} + \cdots + \beta^{\frac{N-t}{\sigma_u}}(1+r)^{(N-t)\left(\frac{1}{\sigma_u}-1\right)}}{1 + \cdots + \beta^{\frac{N-t}{\sigma_u}}(1+r)^{(N-t)\left(\frac{1}{\sigma_u}-1\right)}}$$

$$+\mathrm{wl}_t \frac{\beta^{1/\sigma_u}(1+r)^{(1/\sigma_u-1)} + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u-1)}}{1 + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u-1)}}$$

$$-\frac{w\left[1_{t+1}(1+r)^{-1} + \cdots + 1_N(1+r)^{-(N-t)}\right]}{1 + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u-1)}}$$

When expressed in asymptotic notation as $r \to \infty$, it is as follows:

$$a_1 \approx w(1+r)^{1/\sigma_\mu - 1}$$

$$a_{t+1} \approx a_t (1+r)^{1/\sigma_\mu}$$

$$a_t \approx w(1+r)^{t/\sigma_\mu - 1}$$

If $w = \bar{w}$ is fixed, then a_t does not converge to 0 or diverge to infinity when $\sigma_\mu = t$. If $w = z^2(1-\theta)\theta/(r+\delta)$, then $\sigma_\mu = t/2$ is required for a_t to neither converge to 0 nor diverge to infinity.

Finally, does a case in which $a_{t+1}^*(r, a_t) < 0$ exist? For sufficiently large r, it can be seen that for $1 \le j \le N - t$, the expression $l_t \beta^{\frac{j}{\sigma_u}} (1+r)^{\frac{j}{\sigma_u}} - l_{t+j} > 0$ holds, meaning that even when $a_t = 0$, $a_{t+1}^*(r, a_t) > 0$ will always be true.

Of course, in reality, r does not tend to infinity, meaning that there may be cases in which $a_{t+1}^*(r, a_t) < 0$. However, assuming that $\beta(1+r) \approx 1$ or even $\beta(1+r) > 1$, and considering that, as in real life cycles, pension income decreases relative to labor income after retirement, we assume that at some age $\bar{t}$, for all $1 < j \le N - \bar{t}$, the condition $l_{\bar{t}} > l_{\bar{t}+j}$ holds. In this case, the following holds:

$$\mathrm{wl}_t \frac{\beta^{1/\sigma_u}(1+r)^{(1/\sigma_u - 1)} + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u - 1)}}{1 + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u - 1)}}$$

$$> \frac{w\left[1_{t+1}(1+r)^{(-1)} + \cdots + l_N(1+r)^{-(N-t)}\right]}{1 + \cdots + \beta^{(N-t)/\sigma_u}(1+r)^{(N-t)(1/\sigma_u - 1)}}.$$

In this case, even if $a_{\bar{t}} = 0$, $a_{\bar{t}+1} > 0$. Assets at higher ages increase as r increases. Of course, the age at which the above condition starts to hold is likely to be lower than $t < \bar{t}$. It is sufficient for $a_{t+1} > 0$ to hold at age t, where the current salary is higher than the weighted average of future salaries; accordingly, it is not necessary always to satisfy $l_{\bar{t}} > l_{\bar{t}+j}$.

APPENDIX 2

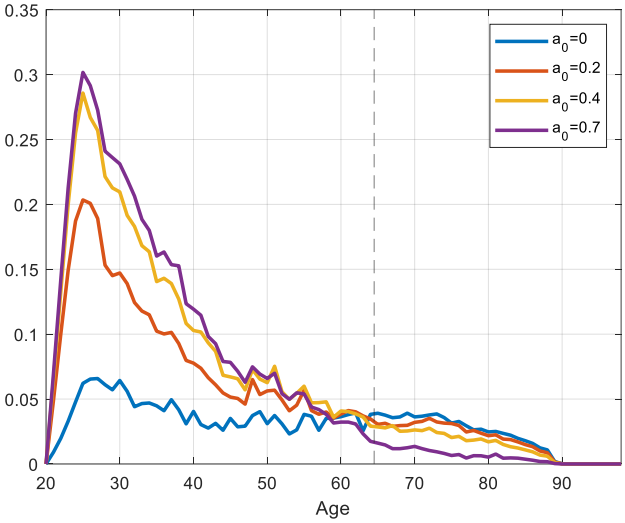

FIGURE A1. CHANGES IN THE 75-25 PERCENTILE ASSET GAP AFTER RISE IN NATIONAL DEBT AND THE INITIAL ASSET TRANSFER

Note: The vertical dashed line represents the retirement point.

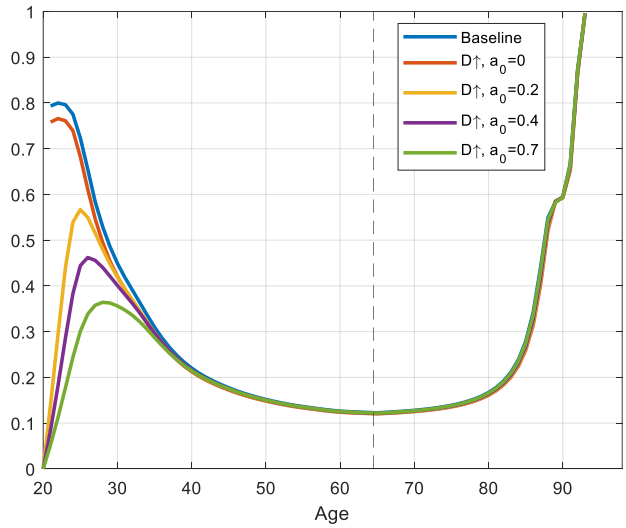

FIGURE A2. GINI COEFFICIENT BY AGE WITH AN INITIAL ASSET TRANSFER

Note: The vertical dashed line represents the retirement point.

REFERENCES

Aiyagari, S. Rao and Ellen R. McGrattan. 1998. "The Optimum Quantity of Debt," *Journal of Monetary Economics*, 42(3): 447-469.

Auerbach, Alan and Laurence Kotlikoff. 1987. "Dynamic Fiscal Policy," Cambridge: Cambridge University Press.

Barro, Robert J. 1974. "Are Government Bonds Net Wealth?" *Journal of Political Economy*, 82(6): 1095–117. JSTOR.

Kwon, Gyuho. 2016. "Analysis of the Macroeconomic Spillover Effects and Intergenerational Cost Burden of Pension Reform Plans," Policy Study 2016-11, Korea Development Institute (in Korean).

Lee, Youngjae, Jongseok Han, and Jaehwa Hong. 2019. "Analysis of the Income Redistribution Effect of the National Pension: An Analysis Using a Heterogeneous Agent Life Cycle Model," *Journal of Economic Studies*, 67(3): 5-44 (in Korean).

Lim, Jin. 2011. "A Study on the Optimal Level of National Debt," *Journal of Economic Studies*, 59(3): 81-111 (in Korean).

Moon, Woesol and Dongwon Lee. 2013. "Macroeconomic Effects of Fiscal Rules, Demographic Structure, and Long-term Growth Rate Changes: Transition Path of an Overlapping Generations Dynamic General Equilibrium Model," *Journal of Fiscal Studies*, 6(2): 41-87 (in Korean).

National Assembly Budget Office (NABO). 2025. "2025–2072 NABO Long-term Fiscal Outlook," Seoul: National Assembly Budget Office (in Korean).

Nishiyama, Shinichi and Kent Smetters. 2014. "Analyzing Fiscal Policies in a Heterogeneous-Agent Overlapping-Generations Economy," *Handbook of Computational Economics*, 3: 117-160.

Nishiyama, Shinichi. 2003. "Analyzing Tax Policy Changes Using a Stochastic OLG Model with Heterogeneous Households," Congressional Budget Office.

OECD. 2025. "Government at a Glance 2025," Paris: OECD Publishing.

Shin, Seung-Ryong. 2022. "A Study on the General Equilibrium Effects of Increasing National Debt," Policy Study 2022-1, Korea Development Institute (in Korean).

Shin, Seung-Ryong. 2024. "On the Effects of National Debt on the Distribution of Household Assets," in Kim, Meeroo (ed.), "Changes in South Korea's Debt and Policy Directions," Research Monograph, Korea Development Institute (in Korean).

Statistics Korea. 2021. Population Projections (in Korean).

Statistics Korea. e-Nara Indicators (National Indicator System) (in Korean).

Statistics Korea. JipyoNuri (Indicator Portal) (in Korean).

Woo, Jinhee. 2022. "Analysis of the Effects of Fiscal Consolidation Policies Using an Overlapping Generations Model," *Analysis of the Korean Economy*, 28(1): 1-62 (in Korean).

LITERATURE IN KOREAN

국회예산정책처. 2025.『2025~2072년 NABO 장기재정전망』.

권규호. 2016.『국민연금제도 개혁방안의 거시경제적 파급효과 및 세대 간 비용부담 분석』, 정책연구시리즈 2016-11, 한국개발연구원.

문외솔·이동원. 2013.「재정준칙, 인구구조 및 장기 성장률 변화의 거시경제 효과: 중첩세대 동태적 일반균형모형의 전이경로」,『재정학연구』, 6(2): 41-87.

신승룡. 2022.『국가채무 증가의 일반균형 효과에 대한 연구』, 정책연구시리즈 2022-1, 한국개발연구원.

신승룡. 2024.「국가채무가 가계 자산 불평등에 미치는 영향에 대한 연구」, 김미루 편,『대한민국 부채의 변화와 정책방향』, 연구보고서 (발간예정), 한국개발연구원.

우진희. 2022.「중첩세대 모형을 이용한 재정건전화 정책의 효과 분석」,『한국경제의 분석』, 28(1): 1-62.

이영재·한종석·홍재화. 2019. 「국민연금의 소득재분배 효과 분석: 이질적 경제주체 생애주기 모형을 이용한 분석」, 『경제학연구』, 67(3): 5-44.
임진. 2011. 「국가채무의 최적수준에 대한 연구」, 『경제학연구』, 59(3): 81-111.
통계청. 「장래인구추계」, 2021.
통계청. 지표누리.
통계청. e-나라지표.

KDI Journal of Economic Policy 2025, 47(3):69-88
https://dx.doi.org/10.23895/kdijep.2025.47.3.69

The Macroeconomic Effects of Structural Oil Price Shocks: An International GVAR Analysis†

By SORA CHON*

This paper investigates the macroeconomic impacts of structural oil price shocks by employing a Global Vector Autoregression (GVAR) framework, utilizing the structural shocks as identified by Baumeister and Hamilton (2019). Our analysis differentiates among three types of oil shocks: economic activity shocks caused by fluctuations in global demand, oil supply shocks driven by production disruptions, and oil inventory demand shocks linked to shifts in market expectations about future supply-demand imbalances. Empirical findings indicate that the macroeconomic consequences of these shocks differ depending on their underlying sources and related structural characteristics.

In oil-importing countries such as Korea and China, oil supply disruptions and inventory-related shocks generally exert negative short-term effects on economic activity due to increased import costs and uncertainty-driven price volatility. Conversely, oil-exporting countries such as Canada and the United States respond differently, benefiting from increased export opportunities associated with higher oil prices. Overall, the study emphasizes the critical importance of distinguishing the structural causes of oil price fluctuations, highlighting how the indirect transmission of these shocks through international economic linkages significantly influences domestic macroeconomic performance outcomes. The results provide important implications for policymakers, underscoring the necessity of tailored policy responses to mitigate macroeconomic risks arising from energy transitions and geopolitical uncertainties.

Key words: Energy and commodity market, Global VAR (GVAR), Structural Oil Shock, Macroeconomic impact
JEL Code: Q41, Q43, E32

* Assistant Professor of Economics, Inha University (E-mail: sora28@inha.ac.kr)
* Received: 2025. 2. 26
* Referee Process Started: 2025. 2. 27
* Referee Reports Completed: 2025. 7. 31
† I sincerely thank the two anonymous referees for their valuable comments and suggestions. Any remaining errors are my own responsibility.

I. Introduction

Understanding the macroeconomic impacts of oil price fluctuations has long been an important research topic, given the central role of oil as a global energy source. Interest in this area has intensified recently due to heightened volatility and disruptions in global energy markets following the COVID-19 pandemic, ongoing geopolitical tensions, and shifts in international climate policies. Rising energy prices and global commitments toward carbon neutrality have further increased the relevance of oil price changes in relation to economic growth, inflation, employment, and overall financial stability.

Previous studies, notably Kilian (2009), have clearly demonstrated a strong link between oil prices and macroeconomic performance, highlighting significant implications across diverse economic contexts. Countries that are heavily reliant on imported energy resources, such as Korea, often described as an energy island, are especially vulnerable to global oil price fluctuations. In such economies, oil price volatility directly affects inflation, industrial production, employment, consumption, and financial stability, intensifying their sensitivity to certain developments in the international energy market.

Historically, economic analyses often treated oil price fluctuations as external, exogenous shocks. While this approach clarified short-term economic effects, it largely overlooked the underlying structural factors driving such price changes. This type of simplification could lead to incomplete interpretations and potentially ineffective policy recommendations, especially during periods of heightened uncertainty or complex global interactions.

More recent studies, particularly Baumeister and Hamilton (2019), emphasize the importance of explicitly identifying the structural factors behind oil price fluctuations. They distinguish clearly among economic activity (demand) shocks, oil supply shocks, and inventory shocks driven by market expectations. Inventory shocks, which involve market participants adjusting current inventories based on expected future supply-demand imbalances, significantly influence short-term price volatility. Clearly identifying these structural shocks enables policymakers to more accurately understand the economic implications of oil price movements, resulting in more effective policy responses.

Additionally, contemporary climate policies and carbon neutrality initiatives introduce further complexity into global oil markets. As countries transition toward low-carbon energy systems, expectations about future fossil fuel demand change substantially. Such expectations can influence current oil prices through inventory adjustments and investment decisions, underscoring the need for more structural analysis.

Building on the frameworks established by Kilian (2009) and Baumeister and Hamilton (2019), this study contributes to the existing literature by examining structural oil price shocks within an open economy context. While prior research extensively explored domestic impacts, it has rarely conducted detailed comparative analyses across both oil-importing and oil-exporting countries. To address this gap, we apply a global vector autoregression (GVAR) model, integrating international economic interdependence explicitly. We then analyze macroeconomic responses to

distinct structural oil shocks across selected major economies—Korea, China, Canada, and the United States.

Our empirical results indicate that macroeconomic responses differ significantly depending on the type of structural shock considered. Oil-importing economies such as Korea and China face adverse short-term effects from oil supply disruptions and inventory shocks due to increased import costs and market uncertainty. Conversely, oil-exporting economies such as Canada and the United States can benefit substantially from supply-driven oil price increases, as higher prices incentivize increased domestic production and exports (Cashin *et al*., 2014; Kilian, 2009. These differences underscore the limitations of treating oil shocks merely as short-term input-cost fluctuations and reinforce the importance of identifying their structural origins.

Overall, our study provides important insights for policymakers. A clear understanding of structural shocks is essential for effective macroeconomic management. Tailored policy measures that reflect the distinct characteristics of each type of shock can help mitigate economic risks, enhance resilience. Moreover, they respond effectively to ongoing geopolitical uncertainty, energy market volatility, and evolving climate policies.

The remainder of this paper is structured as follows. Section 2 thoroughly reviews relevant prior research, highlighting key findings, methodological advances, and identifying existing gaps. Section 3 details our empirical model and methodological approach, explicitly outlining the GVAR framework and the structural shocks identification strategy employed. Section 4 presents comprehensive empirical results, analyzing country-specific responses to distinct structural oil shocks. Finally, Section 5 summarizes the study's main findings, discusses significant policy implications, and offers suggestions for future research to deepen our understanding of oil price dynamics and their macroeconomic effects.

II. Literature Review

This section expands on the earlier discussions by reviewing previous studies of structural oil price shocks and their macroeconomic effects. Oil prices have been widely recognized as a crucial economic factor due to their significant influence on inflation, economic growth, employment, and overall financial stability. Owing to their broad impact, extensive research has aimed to clarify how oil price fluctuations affect economic performance and to identify precisely which underlying factors drive these changes.

Early studies, beginning notably with Hamilton (1983), generally treated oil price fluctuations as exogenous shocks, focusing primarily on short-term economic outcomes. Hamilton's foundational research demonstrated that sudden increases in oil prices negatively impacted major economies, resulting in lower economic growth, increased inflation, and higher unemployment rates. These early studies typically focused on direct, immediate effects and did not deeply investigate the structural factors underlying oil price fluctuations.

A significant methodological advance was introduced by Kilian (2009), who argued that interpreting oil price changes as purely external shocks could cause analytical biases, especially reverse causality, potentially leading to incorrect policy

recommendations. Kilian developed a structural vector autoregression (SVAR) model that explicitly identified different structural oil price shocks, in this case oil supply shocks, economic activity (global demand) shocks, and precautionary demand shocks, known as "oil-specific shocks." Oil supply shocks typically emerge from production disruptions due to geopolitical events, natural disasters, or deliberate output cuts by major oil producers. Economic activity shocks reflect broader global demand fluctuations driven by worldwide economic expansions or downturns. Precautionary demand shocks, in contrast, capture market uncertainty and expectations about future oil supplies, motivating market participants to adjust their inventories in anticipation of possible shortages.

Building upon Kilian's (2009) structural framework, Baumeister and Hamilton (2019) emphasized the importance of explicitly identifying inventory-related shocks driven by market expectations and uncertainty. While earlier studies typically grouped inventory-driven fluctuations under broader demand shocks, Baumeister and Hamilton argued that inventory shocks independently influence oil price dynamics and macroeconomic outcomes. They distinguished clearly between two distinct types of inventory shocks: precautionary inventory shocks, reflecting genuine market uncertainty regarding future oil supply disruptions, and speculative inventory shocks, driven by investor expectations about future price increases not necessarily aligned with market fundamentals. An important methodological contribution of Baumeister and Hamilton (2019) is their application of Bayesian econometric techniques to address identification uncertainty explicitly. Using Bayesian inference allowed them to quantify the uncertainty surrounding structural shock identification by imposing informative priors, thereby enabling more robust estimations and interpretations of the economic impacts of oil price fluctuations. This Bayesian approach provided a statistically rigorous foundation for distinguishing among competing structural hypotheses and underscored the significance of clearly identifying each type of shock to evaluate macroeconomic effects accurately and formulate appropriate policy responses.

Cashin *et al*. (2014) similarly investigated structural oil price shocks, distinguishing primarily between supply-driven and demand-driven shocks. Unlike Baumeister and Hamilton (2019), however, their approach did not explicitly separate inventory-related shocks into precautionary and speculative categories. Consequently, the analysis in Cashin *et al*. (2014) did not fully capture the distinct macroeconomic implications associated with these different inventory-driven shocks, representing a key methodological difference from the approach adopted by Baumeister and Hamilton (2019) and subsequently employed in our current study. Nonetheless, Cashin *et al*. (2014) highlighted that oil-importing economies tend to experience adverse economic effects following supply-driven price increases, aligning broadly with the findings of Baumeister and Hamilton (2019) and reinforcing the importance of explicitly differentiating among structural shocks to assess macroeconomic outcomes more accurately.

Cross *et al*. (2020) provided additional clarity regarding this distinction, emphasizing the different economic signals precautionary and speculative shocks generate. While precautionary shocks usually encourage producers to maintain stable production and inventory levels to manage potential disruptions, speculative shocks can send distorted signals, causing producers to delay production or investors to accumulate excessive inventories. These distinctions matter considerably because the macroeconomic effects

of precautionary versus speculative shocks differ substantially, impacting economic stability and informing different policy recommendations.

These explicit structural distinctions help explain why seemingly similar oil price increases may result in different macroeconomic outcomes depending on the underlying shock. For example, demand-driven oil price increases during global economic expansions tend to stimulate industrial production, increase exports, and boost economic activity, although they also raise inflation pressures due to higher input costs. In contrast, supply-driven price hikes caused by geopolitical disruptions typically produce negative economic impacts, particularly for importing economies, by directly raising production costs and reducing consumers' purchasing power, consequently slowing economic growth.

Several studies have specifically analyzed oil price shocks in the context of open economies, emphasizing how international economic connections shape domestic outcomes. Kilian *et al*. (2009) and Peersman and Van Robays (2012) investigated the international spillover effects of oil price shocks, demonstrating how global trade and financial linkages influence different countries' economic responses. They showed that global interdependencies can significantly amplify or mitigate the macroeconomic effects of oil price fluctuations, highlighting the necessity of analyzing oil price shocks within an open economy framework.

Specifically, several studies have focused on Korea due to its high dependence on imported energy. An *et al*. (2017) applied Kilian's structural framework to assess how distinct oil price shocks influence Korea's exports, imports, and current account balance differently. Their findings demonstrated that structural shocks—supply disruptions, economic activity changes, or precautionary shocks—resulted in distinct macroeconomic responses, depending on the type of shock. Chon and Jung (2021) reinforced these findings by incorporating Korea's GDP growth and inflation, showing clearly differentiated economic impacts between demand-driven and precautionary shocks. They found that demand-driven oil shocks generally increased economic growth, whereas precautionary shocks primarily raised inflation without significantly benefiting economic performance.

However, traditional single-country SVAR analyses, despite treating oil price shocks as exogenous variables, face limitations in clearly distinguishing domestic effects from indirect global spillover effects, particularly for small open economies such as Korea. To address this methodological gap, Jeong (2014) adopted a global VAR (GVAR) framework that explicitly incorporates international economic linkages while still treating oil price shocks as exogenous. Jeong's analysis clearly demonstrated that indirect international spillover effects significantly influenced Korea's macroeconomic outcomes. Similarly, studies by Kim and Park (2009) and Shin *et al*. (2013) employed GVAR models to analyze the spillover phenomenon in small open economies, highlighting the importance of capturing global economic interactions to improve the accuracy of macroeconomic analyses.

Despite these advances, existing studies based on GVAR models generally did not explicitly incorporate structural shock identification, limiting their explanatory power. Recognizing this gap, the current study integrates the explicit structural shocks methodology proposed by Baumeister and Hamilton (2019) into a comprehensive global analytical framework. Specifically, we apply their structural shock classification approach within a GVAR model, comparing macroeconomic responses across selected oil-importing countries (Korea and China) and major oil-exporting economies

(Canada and the United States). By explicitly combining global economic modeling with this type of structural shock analysis, our study provides clearer insights into how different structural oil shocks distinctly affect economic outcomes, contributing to the existing literature and informing policy discussions.

In the next section, we describe our empirical methodology in detail. We explicitly present the GVAR modeling framework and the structural shock classification method adopted from Baumeister and Hamilton (2019). This clear and integrated approach allows us to better identify macroeconomic impacts associated with distinct structural shocks, addressing existing research gaps and offering practical guidance to policymakers.

III. Empirical Model and Methodology

To analyze systematically how structural oil price shocks propagate through the global economy and influence macroeconomic outcomes, we adopt an integrated methodological approach combining the global vector autoregression (GVAR) model developed by Chudik and Pesaran (2015) and the structural shocks identification framework proposed by Baumeister and Hamilton (2019). This combined approach addresses certain key limitations of previous empirical analyses by explicitly considering structural shocks within an open economy framework. The methodological rigor here is particularly critical for accurately capturing the direct and indirect international transmission channels through which global oil shocks influence domestic economies.

The GVAR model was selected due to its proven capability in capturing international economic interdependencies and spillover effects, which is especially suitable for analyzing small open economies such as Korea. By explicitly incorporating foreign macroeconomic variables constructed as weighted averages based on bilateral trade flows, the GVAR framework provides a comprehensive tool for tracing how global shocks diffuse across interconnected economies, offering precise quantification of both direct and indirect macroeconomic impacts.

A. *Global VAR (GVAR) Framework*

The GVAR model, developed by Chudik and Pesaran (2015), captures the global interdependencies and dynamic relationships among international macroeconomic variables, making it especially suitable for analyzing the transmission of external shocks in small open economies such as Korea. Each country-specific VAR within the GVAR model includes both domestic and foreign variables, with foreign variables represented as trade-weighted averages of corresponding variables from other countries. Formally, the country-specific GVAR model for country i at time t can be expressed as in Equation [1] using a VARX* $(s_i s_i^*)$ model, as presented in Equation [2].

[Equation 1] $$\Phi_i\left(L, s_i\right) x_{it} = a_{i0} + a_{i1} t + \Gamma_i\left(L, s_i^*\right) x_{it}^* + A_i\left(L, s_i^{\omega}\right) \omega_t + u_{it}$$

Here, the error term u_{it} is assumed to have no cross-correlation or autocorrelation. The external variables x_{it} * for each country are constructed by taking the trade-

weighted cross-section average of other countries' domestic variables,

$$x_t* = \Sigma_{j=1}^{N} \omega_{ij} x_{jt}, \qquad j = 1, 2, \ldots, N,$$

and the weights sum to 1. Common global variables, such as structural oil shocks and oil prices, can be treated as exogenous in the model.

B. *Data Description and Variable Selection*

Our empirical analysis utilizes the Global VAR (GVAR) dataset introduced by Mohaddes and Raissi (2020), which covers 33 major economies collectively accounting for over 90% of global GDP. The dataset has been extended in this study to include the period from the second quarter of 1979 through the first quarter of 2020. The data include key macroeconomic variables necessary to analyze international economic interactions and spillover effects.

For each economy, this study constructs country-specific vector autoregression (VAR) models, capturing both domestic economic conditions and international linkages. The models incorporate real gross domestic product (GDP) data and the Consumer Price Index (CPI), obtained from seasonally adjusted IMF International Financial Statistics (IFS) and Haver Analytics. To reflect financial market conditions and monetary policy environments, short-term and long-term interest rates derived from Haver Analytics and the IMF IFS are included, specifically covering treasury bill rates, deposit rates, discount rates, and money market rates appropriate to each country's financial market structure. Additionally, exchange rates—calculated as quarterly averages of bilateral nominal exchange rates against the US dollar—are incorporated. All variables are consistently constructed across economies according to the standard GVAR framework, including logarithmic transformations.

To identify structural shocks, this study employs an updated version of the dataset used in Baumeister and Hamilton (2019). Oil supply shocks are identified using Brent crude oil prices sourced from Bloomberg, calculated as quarterly averages of daily closing prices. Aggregate demand shocks (economic activity shocks) are identified using the global economic activity index from the OECD Main Economic Indicators (MEI) database, which aggregates industrial production indices of OECD countries and six major non-member countries (Brazil, China, India, Indonesia, Russia, and South Africa) using weights provided by the IMF World Economic Outlook (WEO). Inventory-driven demand shocks are identified using quarterly global oil inventory data calculated from OECD crude oil inventory statistics, which are derived from U.S. crude oil inventory data provided by the U.S. Energy Information Administration (EIA), reflecting changes in market participants' expectations about future supply-demand imbalances.

Figure 1 illustrates quarterly averages of the identified structural shocks—economic activity shocks, oil supply shocks, and inventory shocks—over the period of 1979 to 2020. Economic activity shocks generally track major global economic cycles, while oil supply shocks are less volatile and correspond to recognized historical geopolitical or production events. Inventory demand shocks exhibit relatively frequent short-term volatility, reflecting market-driven expectations and

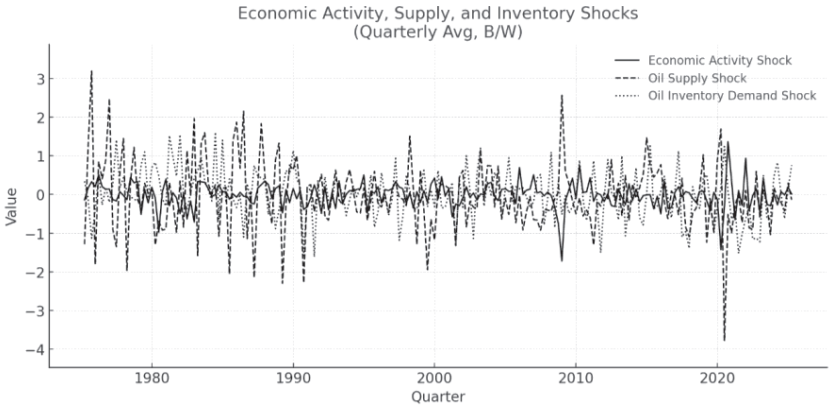

FIGURE 1. DOMESTIC GDP RESPONSES TO ECONOMIC ACTIVITY SHOCKS

Note: The figure displays quarterly averages of the economic activity, oil supply, and oil inventory demand shocks as identified by Baumeister and Hamilton (2019).

uncertainties. However, caution is required when interpreting these shocks directly, as their identification relies on specific modeling assumptions and the data sources used. By explicitly distinguishing these three structural shocks, our analysis provides clearer insights into how different factors driving oil price fluctuations affect key economic indicators.

Our estimation procedure within the GVAR framework relies primarily on generalized impulse response functions (GIRFs). GIRFs allow us to trace the dynamic effects of each structural oil price shock on economic variables such as the real GDP and consumer prices, explicitly accounting for global economic linkages. Using GIRFs, this paper demonstrates how distinct structural shocks propagate across interconnected global economies over time.

By combining the robustness of the GVAR modeling approach with the clear structural shock classification proposed by Baumeister and Hamilton (2019), our analysis delivers detailed insights. This methodology improves our understanding of how specific structural oil shocks differently influence oil-importing and oil-exporting economies, thus offering valuable guidance for policymakers facing complex global energy market dynamics.

In the following section, we present detailed empirical results derived from this methodological framework, highlighting country-specific responses to each type of structural oil shock.

IV. Empirical Investigation

A. *Weak Exogeneity Tests for Global Variables in the GVAR Model*

Before analyzing the transmission of structural oil price shocks through impulse response functions, first we assess the validity of including global variables—oil prices (oil price), economic activity demand shocks (Activity), oil supply shocks (Supply), and oil inventory demand shocks (Inventory)—in our global VAR model. Specifically, we conduct weak exogeneity tests following the methodology outlined

in the GVAR literature to determine whether these global variables can be treated as weakly exogenous at the 5% significance level. Establishing weak exogeneity justifies the inclusion of global variables as conditioning variables, ensuring the accuracy of subsequent impulse response analyses.

Table 1 summarizes the results of these tests for each country in the model. If the calculated F-statistic exceeds the critical value (CV), we reject the null hypothesis of weak exogeneity. The results confirm that, in most cases—including key economies such as Canada, China, Korea, the Euro area, and the United States—the global variables can be treated as weakly exogenous at the 5% significance level. Although there are a few isolated exceptions, these instances do not significantly affect the overall robustness of our model. Thus, the findings broadly support the assumption of weak exogeneity in our GVAR analysis.

TABLE 1—TEST FOR WEAK EXOGENEITY AT THE 5% SIGNIFICANCE LEVEL

Country	F test	CV	Oil Price	Activity	Supply	Inventory
ARGENTINA	F(2,101)	3.086	1.302	0.427	1.236	0.393
AUSTRALIA	F(4,98)	2.464	0.865	1.316	1.092	0.378
BRAZIL	F(2,102)	3.085	0.551	1.226	0.684	0.507
CANADA	F(5,97)	2.308	1.215	2.186	0.203	0.472
CHINA	F(2,98)	3.089	0.163	0.783	0.832	1.210
CHILE	F(2,101)	3.086	0.259	0.292	0.795	0.025
EURO	F(1,101)	3.935	0.071	0.054	0.484	1.902
INDIA	F(2,101)	3.086	0.078	0.241	0.729	0.148
INDONESIA	F(3,101)	2.694	1.119	3.182	0.088	0.798
JAPAN	F(2,100)	3.087	3.790	1.418	0.372	1.070
KOREA	F(4,98)	2.464	0.380	1.119	1.213	1.488
MALAYSIA	F(2,101)	3.086	1.235	4.318	1.52241	0.201
MEXICO	F(1,103)	3.933	0.001	1.678	1.952	0.012
NORWAY	F(3,99)	2.696	0.946	0.276	0.775	0.179
NEW ZEALAND	F(4,98)	2.464	0.659	0.529	0.773	0.300
PERU	F(3,101)	2.694	0.354	0.133	0.207	0.796
PHILIPPINES	F(3,100)	2.695	0.917	2.026	2.376	4.666
SOUTH AFRICA	F(2,111)	3.078	1.595	1.536	0.075	1.364
SAUDI ARABIA	F(3,102)	2.693	0.661	0.716	0.406	0.728
SINGAPORE	F(2,101)	3.086	0.430	0.271	0.204	0.180
SWEDEN	F(3,110)	2.687	1.621	2.634	0.182	1.620
SWITZERLAND	F(2,100)	3.087	0.681	0.086	0.130	0.174
THAILAND	F(3,100)	2.695	0.671	0.616	0.217	0.184
TURKEY	F(2,102)	3.085	1.976	0.091	0.387	2.516
UK	F(1,112)	3.925	0.108	0.129	1.460	0.936
USA	F(2,105)	3.082	0.542	0.490	0.739	4.658

Note: The table reports F-test statistics for weak exogeneity of global variables (oil price, economic activity shock, oil supply shock, and oil inventory demand shock) within each country-specific VAR model. The critical values (CV) indicate significance at the 5% level. An F-statistic exceeding the critical value implies rejection of weak exogeneity.

B. *Generalized Impulse Response Analysis*

Following the confirmation of weak exogeneity conditions within the global VAR (GVAR) framework, we proceed to analyze how structural shocks in oil prices propagate across the global economy using generalized impulse response functions (GIRFs), originally proposed by Koop, Pesaran, and Potter (1996). GIRFs are computed by examining the difference between two conditional forecasts of the endogenous variables: one conditional on a hypothetical shock and the other conditional on the absence of a shock. Unlike traditional impulse response functions, GIRFs do not rely on specific ordering of the variables, making them particularly suitable for large-scale global models in which the ordering of variables can be ambiguous. This method provides a quantitative assessment of the dynamic responses of key macroeconomic indicators—specifically real GDP and consumer prices—to economic activity, oil supply, and oil inventory demand shocks over a defined time horizon. The primary objective is to illustrate clearly the different effects of distinct types of structural shocks on economic growth and inflation, thus identifying precise transmission mechanisms through which oil-related shocks affect macroeconomic stability.

To provide a clear and focused analysis, this section explicitly focuses on selected major economies—Korea, China, Canada, and the United States—chosen from the comprehensive GVAR dataset of 33 countries due to their prominent roles in global energy markets and their distinct economic characteristics. According to the International Energy Agency (IEA, 2023), Korea and China are representative oil-importing economies, importing approximately 97% and 72% of their total oil consumption, respectively, due to their limited domestic oil reserves. In contrast, Canada and the United States represent major oil-exporting nations, with Canada exporting about 80% of its crude oil production, and the United States emerging as a net oil exporter since 2019, primarily due to the significant expansion in shale oil production (IEA, 2023).

Empirical findings regarding economic activity shocks, primarily driven by fluctuations in global demand, revealed broadly positive effects on economic activity across these selected countries. Figure 2 illustrates clearly that increases in economic activity due to global expansions tend to stimulate industrial production, consumption, and overall GDP growth significantly. Such positive economic outcomes, however, are accompanied by increased inflationary pressures due to higher demand-driven energy and transportation costs, permeating various economic sectors. As depicted in Figure 3, inflationary responses were statistically significant in Canada, China, and the United States, whereas the response was notably muted and less significant in Korea, suggesting country-specific factors related to price-setting mechanisms, regulatory environments, or differing degrees of energy dependency. These findings align closely with those of Cashin *et al*. (2014), who similarly reported differentiated macroeconomic effects of demand-driven oil price shocks, highlighting the tendency of such shocks to stimulate economic growth while simultaneously contributing to inflationary pressures.

When analyzing negative oil supply shocks—typically resulting from geopolitical events, conflicts, or production disruptions, as highlighted by Baumeister and Hamilton (2019)—our analysis identifies significant differences in macroeconomic outcomes between oil-importing and oil-exporting nations. Specifically, Figure 4

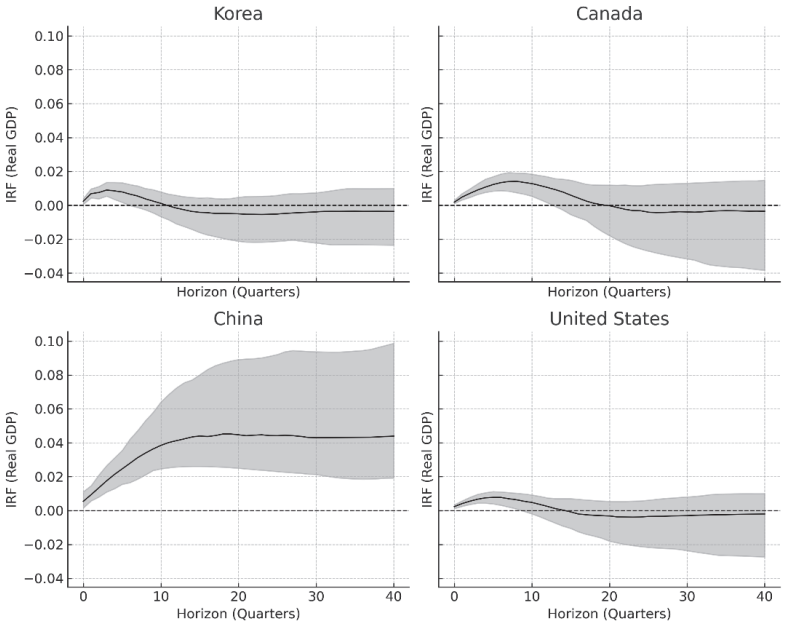

FIGURE 2. DOMESTIC GDP RESPONSES TO ECONOMIC ACTIVITY SHOCKS

Note: The solid line represents the median response of domestic GDP to a one-standard-deviation economic activity shock, estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

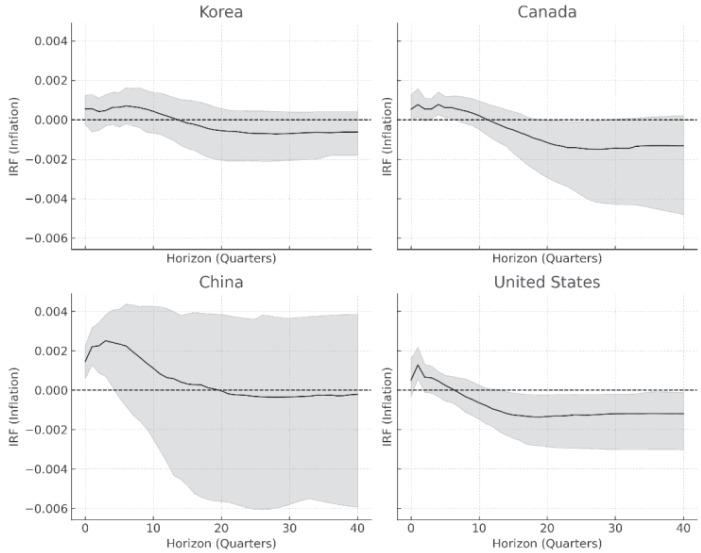

FIGURE 3. CPI RESPONSES TO ECONOMIC ACTIVITY SHOCKS

Note: The solid line represents the median response of the Consumer Price Index (CPI) to a one-standard-deviation economic activity shock, estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

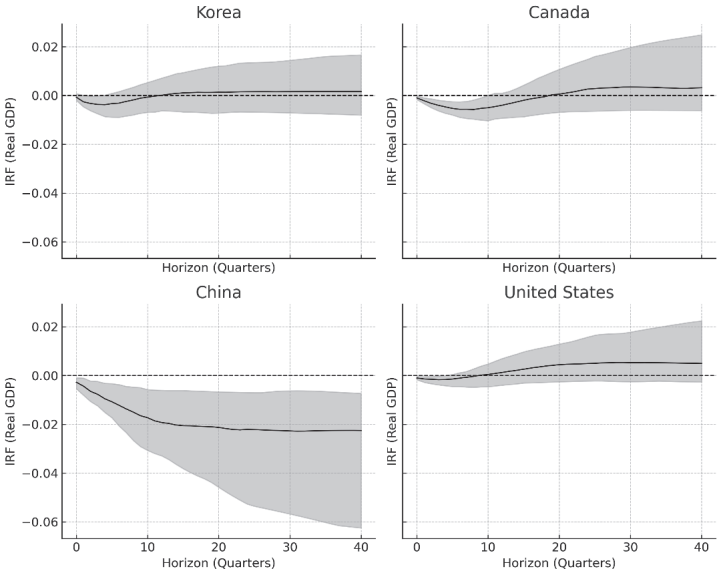

FIGURE 4. DOMESTIC GDP RESPONSES TO OIL SUPPLY SHOCKS

Note: The solid line represents the median response of domestic GDP to a one-standard-deviation oil supply shock, estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

illustrates that economies heavily dependent on imported oil, such as Korea and China, faced adverse economic impacts. Rising import prices directly elevate production costs and reduce consumer purchasing power, subsequently dampening economic growth overall. Increased input costs significantly burden manufacturing sectors, transportation, and household consumption, reflecting short-term economic challenges faced by such importing economies due to supply-driven price increases (Baumeister and Hamilton, 2019). These findings are broadly consistent with those of Cashin *et al*. (2014), who similarly found significant variations in economic responses to oil supply shocks, emphasizing the heightened vulnerability of oil-importing countries to sudden price increases.

In sharp contrast, oil-exporting nations such as the United States and Canada exhibited notably differentiated macroeconomic responses. Figure 5 suggests that, in the United States, rising oil prices caused by supply disruptions provided strong incentives for increased investment in the shale oil production capacity. Such incentives contributed positively to employment growth within the energy sector while also leading to higher exports, improved trade balances, and an overall economic expansion in the medium-to-long term. Conversely, Canada's initial economic responses were somewhat more nuanced due to its substantial dependence on oil exports to the U.S. market. Elevated oil prices motivated increased U.S. domestic production, thereby intensifying competitive pressures on Canadian oil exports. These conditions initially constrained Canada's economic performance.

However, subsequent market adjustments, strategic shifts in production, and export diversification eventually mitigated these adverse impacts, resulting in an economic recovery over time (Baumeister and Hamilton, 2019). This observation aligns with Cashin *et al*. (2014), who also documented differentiated impacts of oil price shocks,

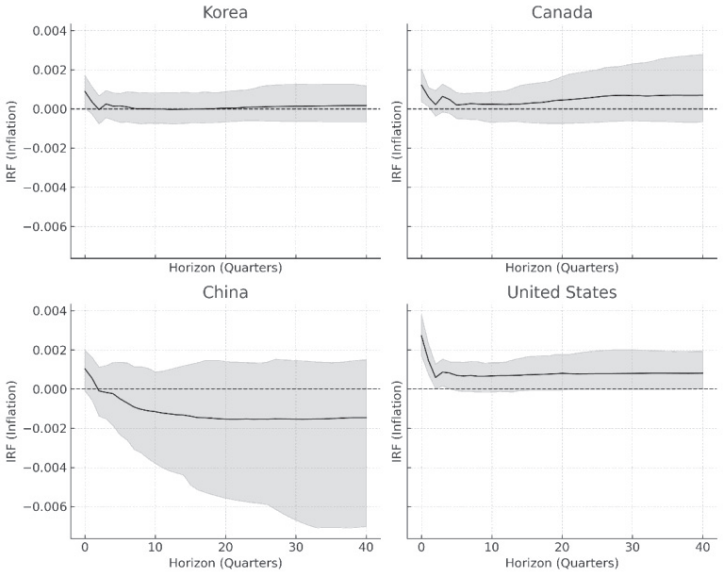

FIGURE 5. CPI RESPONSES TO OIL SUPPLY SHOCKS

Note: The solid line represents the median response of the Consumer Price Index (CPI) to a one-standard-deviation oil supply shock, estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

highlighting the resilience and adaptive capacity of major oil-exporting economies.

Positive oil inventory shocks, characterized by unexpected increases in oil inventories, typically reduce market participants' precautionary demand and exert downward pressure on crude oil prices. Baumeister and Hamilton (2019) emphasize that inventory shocks represent market reactions either to genuine uncertainty about future oil supplies (precautionary motives) or to speculative expectations about future price changes. Figure 6 indicates that this dynamic tends to be favorable for oil-importing countries such as Korea and China, as reduced oil prices can lower inflationary pressures and production costs in the manufacturing sector. Yet for Korea—an economy significantly reliant on petrochemical exports—falling oil prices could potentially affect profit margins and export competitiveness, suggesting nuanced economic trade-offs. For oil-exporting countries such as Canada and the United States, increased oil inventories initially present short-term economic challenges. As depicted in Figure 7, elevated inventory levels can signal reduced immediate demand, possibly prompting producers to curtail output and investment activities temporarily. However, these negative economic implications generally appear short-lived, and adjustments in inventories can help restore equilibrium conditions. Regarding consumer prices, increased inventories initially tend to exert downward pressure on inflation through lower crude oil prices, as indicated in Figure 8. This disinflationary effect, however, appears modest and temporary, illustrating the complex relationship between short-term inventory fluctuations and broader macroeconomic dynamics. These observations broadly align with findings from Baumeister and Hamilton (2019) and Cashin *et al*. (2014), highlighting the relevance

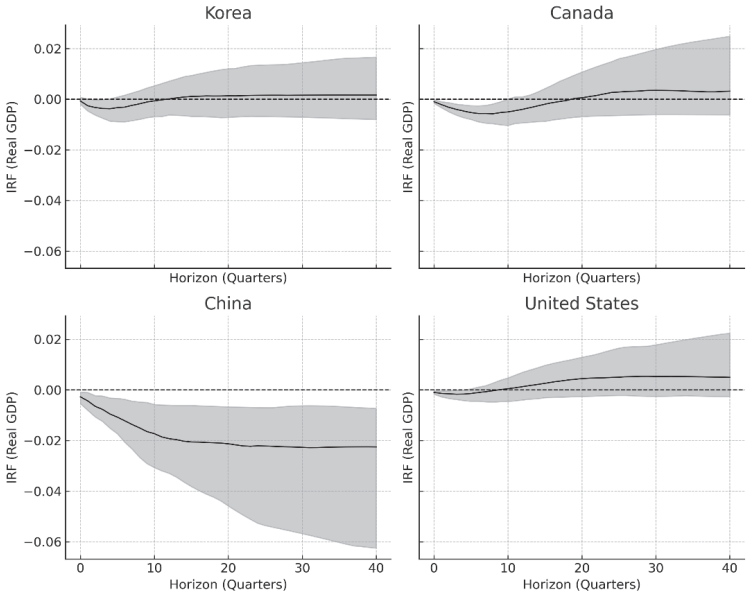

FIGURE 6. DOMESTIC GDP RESPONSES TO OIL INVENTORY SHOCKS

Note: The solid line represents the median response of domestic GDP to a one-standard-deviation oil inventory shock, estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

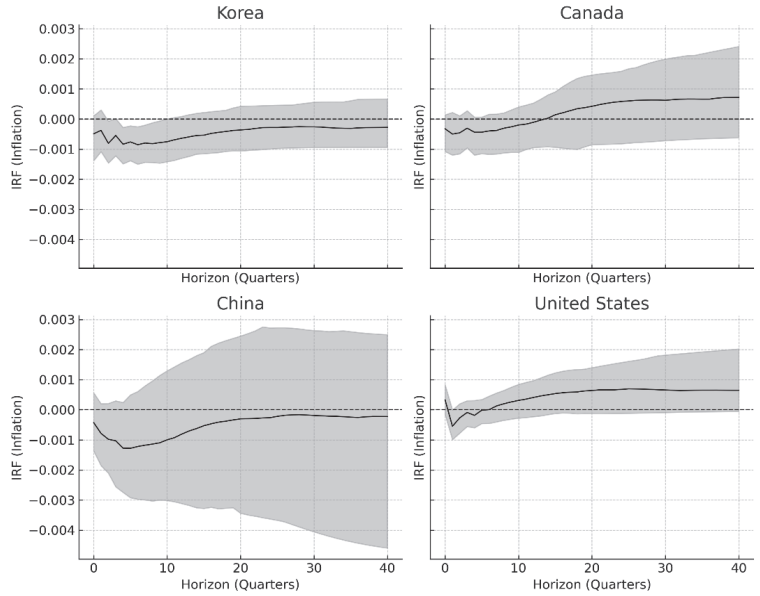

FIGURE 7. CPI RESPONSES TO OIL INVENTORY SHOCKS

Note: The solid line represents the median response of the Consumer Price Index (CPI) to a one-standard-deviation oil inventory shock, estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

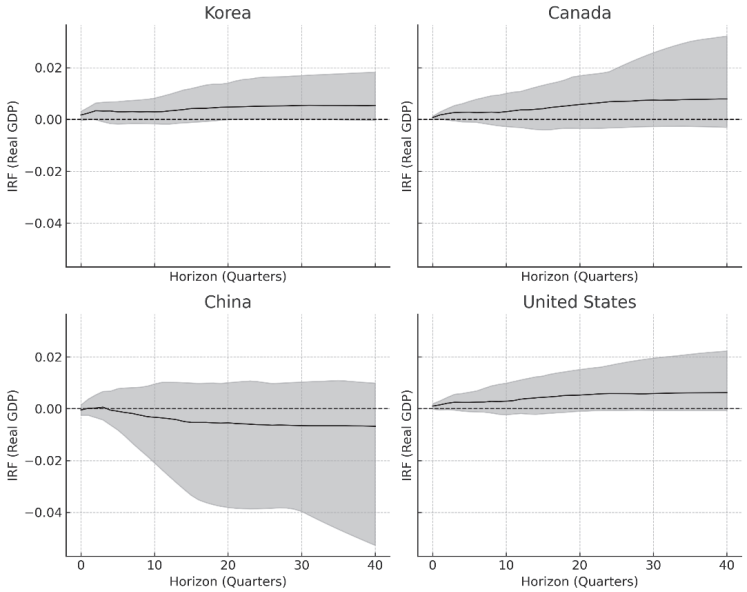

FIGURE 8. DOMESTIC GDP RESPONSES TO OIL PRICE SHOCKS

Note: The solid line represents the median response of domestic GDP to a one-standard-deviation shock in oil prices (oil price shock itself), estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

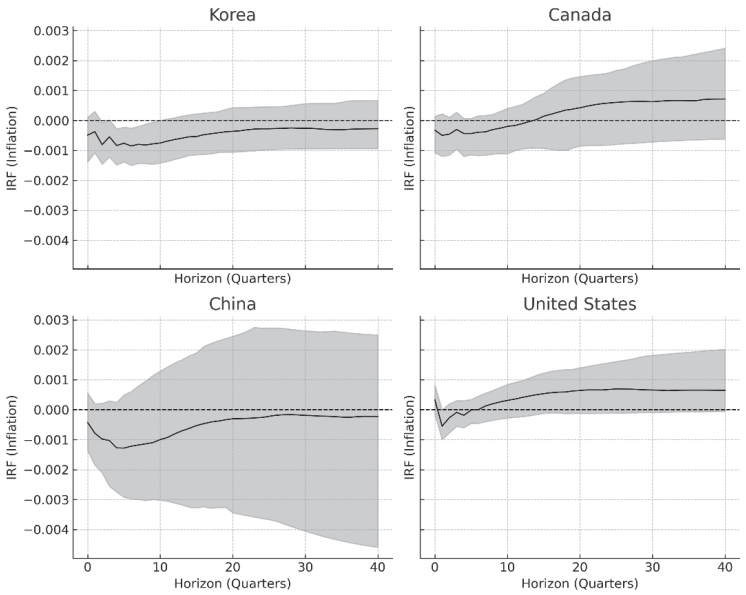

FIGURE 9. CPI RESPONSES TO OIL PRICE SHOCKS

Note: The solid line represents the median response of the Consumer Price Index (CPI) to a one-standard-deviation shock in oil prices (oil price shock itself), estimated from the GVAR model. The dotted lines indicate the corresponding 90% bootstrap confidence intervals.

Source: Calculated by the author.

of differentiating among structural shocks to assess macroeconomic impacts more comprehensively.

Overall, the comparative assessment of selected countries highlights substantial differences in macroeconomic outcomes compared to analyses not accounting for structural distinctions. Canada, China, the United States, and Korea generally demonstrated positive responses to economic activity shocks, though China displayed mixed or slightly negative responses in some scenarios. Specifically, Korea presented particular complexities in that positive economic responses occasionally coincided with unexpected declines in consumer prices, suggesting possible country-specific structural or market factors complicating straightforward interpretations. Similarly, China's economic responses to certain oil shocks, while negative in some cases, were statistically insignificant, highlighting the interpretative challenges inherent in analyses not specifically identifying structural shocks.

These findings emphasize a critical point: without explicit structural shock analyses, identifying the broader macroeconomic implications of oil price fluctuations remains challenging. Interpreting these shocks merely as short-term cost increases can lead to oversimplified and potentially misguided policy recommendations. Therefore, our analysis highlights the importance of explicitly distinguishing economic activity, supply, and inventory shocks, providing policymakers and researchers with nuanced insights into the diverse macroeconomic impacts associated with oil price fluctuations. This understanding is essential for developing informed and targeted policy responses that mitigate macroeconomic risks, enhance economic resilience, and strengthen macroeconomic stability amid ongoing global energy transitions and persistent geopolitical uncertainties.

In addition to structural shocks (economic activity, oil supply, and inventory shocks), we also directly analyze the macroeconomic responses to shocks stemming from oil price changes themselves. This analysis allows for a comparative assessment of the effects from explicitly identified structural shocks versus direct price fluctuations without structural identification. Figures 8 and 9 illustrate the responses of domestic GDP and consumer prices, respectively, to these direct oil price shocks. Notably, the responses to direct oil price shocks exhibit substantially different patterns compared to responses explicitly linked to structural factors, highlighting the potential risks of interpreting oil price changes solely as exogenous price movements. These findings further reinforce the importance of explicitly analyzing structural shocks to avoid misinterpretations regarding macroeconomic implications, a point also underscored by Baumeister and Hamilton (2019) and Cashin *et al*. (2014).

V. Summary and Implications

This paper empirically analyzed the macroeconomic impacts of structural oil price shocks using a global vector autoregression (GVAR) framework, incorporating the structural shock classification established by Baumeister and Hamilton (2019). We explicitly distinguished among economic activity shocks related to global demand conditions, oil supply shocks from geopolitical disruptions or production constraints, and oil inventory demand shocks reflecting market expectations about future supply-demand imbalances. This classification enabled a detailed assessment of the

macroeconomic effects associated with different types of oil shocks, particularly relevant for small open economies such as Korea, given its high dependency on imported energy and sensitivity to global oil price volatility.

Our analysis indicates substantial variation in macroeconomic outcomes depending on the type of structural shock. Economic activity shocks, driven by global demand changes, generally had positive effects on economic growth across the selected countries (Korea, Canada, China, and the United States). During periods of global economic expansion, industrial production, consumption, and GDP growth responded positively. However, these shocks also resulted in increased inflationary pressures due to higher energy and transportation costs. Inflation responses were statistically significant in Canada, China, and the United States but were less pronounced and statistically weaker in Korea. These differences may stem from factors such as energy market structures, regulatory environments, and the mechanisms transmitting oil price fluctuations to domestic prices—all areas requiring further research.

Negative oil supply shocks, typically resulting from geopolitical disruptions or production constraints, showed pronounced differences between oil-importing and oil-exporting countries. Oil-importing nations such as Korea and China experienced immediate negative economic effects from increased import costs, higher production expenses, and reduced consumer purchasing power. In contrast, oil-exporting countries such as the United States and Canada benefitted from higher oil prices, driven by their capacity to expand domestic production and exports. It should be noted, however, that additional complexities—such as market competition or production flexibility—were beyond the scope of this analysis.

The study also underscores the significance of oil inventory demand shocks, reflecting shifts in market expectations pertaining to future supply-demand imbalances. Inventory-driven shocks caused short-term volatility in oil prices and inflation, with differing implications for various economies. For oil-importing countries, increased oil inventories typically lowered oil prices, temporarily reducing inflationary pressures and production costs. However, for economies such as Korea, heavily reliant on petrochemical exports, falling oil prices could potentially compress profit margins and weaken export competitiveness, suggesting the need for sector-specific analyses.

In oil-exporting nations such as Canada and the United States, increased oil inventories were initially associated with temporary declines in immediate demand, leading to reduced production and investment levels. These negative effects were short-lived, with market adjustments quickly restoring equilibrium and supporting an economic recovery. Consumer price responses to inventory shocks were modest and temporary, requiring further investigation, particularly concerning inventory management practices and market dynamics.

Our empirical results also confirmed the assumption of weak exogeneity for global variables within the GVAR framework, supporting the validity of our model. However, these findings should be interpreted cautiously due to potential data or model limitations not explicitly tested here.

In conclusion, our study demonstrates the critical importance of distinguishing clearly among different structural shocks when analyzing oil price fluctuations. Recognizing the specific macroeconomic impacts associated with each shock type helps policymakers tailor responses to mitigate risks and enhance economic resilience. Given ongoing global energy transitions and geopolitical uncertainties, further research is needed to deepen our understanding of oil market dynamics and

to refine methods for identifying structural shocks, ultimately supporting more effective and targeted policy decisions.

APPENDIX

TABLE A1—DESCRIPTIVE STATISTICS OF GLOBAL VARIABLES

Statistics	Mean	Median	Maximum	Minimum	Std. dev.	Skewness	Kurtosis
Oil Price	3.741	3.868	4.811	2.407	0.691	-0.136	1.658
Demand	-0.024	0.007	1.368	-1.722	0.356	-0.633	8.811
Oil Invent	-0.110	-0.102	1.298	-1.615	0.635	-0.125	2.790
Oil Supply	-0.137	-0.134	2.566	-3.778	0.750	-0.522	7.447

Source: Calculated by the author.

TABLE A2—ORDER OF WEAK EXOGENEITY REGRESSION EQUATIONS

(p*: lag order of domestic variables, q*: lag order of foreign variables)

Country	p*	q*
ARGENTINA	1	2
AUSTRALIA	1	2
BRAZIL	1	2
CANADA	1	2
CHINA	2	2
CHILE	1	2
EURO	1	2
INDIA	1	2
INDONESIA	1	2
JAPAN	1	2
KOREA	1	2
MALAYSIA	1	2
MEXICO	1	2
NORWAY	1	2
NEW ZEALAND	1	2
PERU	1	2
PHILIPPINES	1	2
SOUTH AFRICA	1	1
SAUDI ARABIA	1	2
SINGAPORE	1	2
SWEDEN	1	1
SWITZERLAND	1	2
THAILAND	1	2
TURKEY	1	2
UK	1	1
USA	1	2

Source: Calculated by the author.

REFERENCES

Baumeister, Christiane and James D. Hamilton. 2019. "Structural Interpretation of Vector Autoregressions with Incomplete Identification: Revisiting the Role of Oil Supply and Demand Shocks," *American Economic Review*, 109(5): 1873-1910.

Cashin, Paul, Kamiar Mohaddes, Maziar Raissi, and Mehdi Raissi. 2014. "The Differential Effects of Oil Demand and Supply Shocks on the Global Economy," *Energy Economics*, 44(C): 113-134

Chudik, Alexander and M. Hashem Pesaran. 2015. "Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Data Models with Weakly Exogenous Regressors," *Journal of Econometrics*, 188(2): 393-420.

Jamie L. Cross, Bao H. Nguyen, and Trung Duc Tran. 2020. "The Role of Precautionary and Speculative Demand in the Global Market for Crude Oil," CAMA Working Paper No. 34.

Hamilton, J. D. 1983. "Oil and the Macroeconomy since World War II," *Journal of Political Economy*, 91(2): 228-248.

International Energy Agency (IEA). 2023. "World Energy Outlook 2023. Paris: International Energy Agency," Retrieved from https://www.iea.org/reports/world-energy-outlook-2023.

Kilian, Lutz. 2009. "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," *American Economic Review*, 99(3): 1053-1069.

Kilian, Lutz, Alessandro Rebucci, and Nikola Spatafora. 2009. "Oil Shocks and External Balances," *Journal of International Economics*, 77(2): 181-194.

Koop, G., M. H. Pesaran, and S. M. Potter. 1996. "Impulse Response Analysis in Nonlinear Multivariate Models," *Journal of Econometrics*, 74(1): 119-147.

Mohaddes, K. and M. Raissi. 2020. "Compilation, Revision and Updating of the Global VAR (GVAR) Database," Cambridge Working Papers in Economics.

Peersman Gert and Ine Van Robays. 2012. "Cross-Country Differences in the Effects of Oil Shocks," *Energy Economics*, 34(5): 1532-1547.

Kim, Yun-Yeong and Park, Joon-Yong. 2009. "Transmission Effects of Foreign Shock: Global Structural VAR Approach," *Bank of Korea Analysis of Financial Economy*, 358: 1-32 (in Korean).

Shin, Yongcheol, Sangdon Boo, and Yongmin Kim. 2013. "Measuring the Connectedness of the Korean Financial System: The GVAR-GCM Modeling Approach," Bank of Korea (in Korean).

Ahn, Sungbae, Sungyup Cho, Jeong Ho Kim, and Kang-Hoon Lee. 2017. Changes in International Energy Market and Their Impact on the Korean Economy. Korea Institute for International Economic Policy (KIEP) Research Report, Vol. 17, No. 27. (in Korean).

Chung, Jun Hwan. 2014. The Macroeconomic Effects of Oil Price Shocks in Korea. Korea Energy Economics Institute (KEEI). (in Korean).

Chon, Sora and Kyu-Chul Jung. 2021. Recent Oil Price Hikes and the Ripple Effect on the Korean Economy. KDI Economic Outlook, First Half 2021. (in Korean).

LITERATURE IN KOREAN

김윤영·박준용. 2009.「글로벌 구조 VAR 모형을 이용한 해외충격의 파급효과 분석」,『경제학연구』, 57(2): 5-37.

신용철·부상돈·김용민. 2013.「Measuring the Connectedness of Korean Financial System: The GVAR-GCM Modeling Approach」, 한국은행.

안성배·안성배·김기환·김수빈·이진희·한민수.「국제에너지시장 구조변화의 거시경제효과 분석」,『대외경제정책연구원-연구보고서』, 17(27), 2017.

정준환. 2014.「유가변동의 국내 거시경제 파급효과 분석」, 에너지경제연구원.

천소라·정규철. 2021.「최근 유가 상승의 국내 경제 파급효과」,『KDI 경제전망』, 2021년 상반기.

KDI Journal of Economic Policy 2025, 47(3):89-114
https://dx.doi.org/10.23895/kdijep.2025.47.3.89

Efficiency Effects of Regulations on Unfair Subcontracting Behaviors†

By YONG HYEON YANG*

This paper investigates the efficiency effects of governing vertical relationships by analyzing the incentives of firms to engage in exclusive contracts. In particular, the analysis focuses on the subcontracting context. When a downstream firm possesses a superior bargaining position, upstream subcontractors do not prefer an exclusive contract, even when it is efficient, as such a contract lowers their bargaining power even further, ultimately leading to lower profits. It can therefore enhance efficiency to encourage upstream firms to engage in an exclusive contract by limiting bargaining power abuses by superior downstream firms. The paper discusses the required flexibility of such a regulation as well as the evaluation of the current regulation based on the analysis.

Key Words: Subcontracting, Efficiency, Hold-up, Bargaining Power, Exclusive Contract
JEL Code: L13, L14, L42

I. Introduction

The Korea Fair Trade Commission (KFTC hereafter) is a competition authority, but it also promotes fair transactions in vertical relationships by enforcing four acts, including the "Fair Transactions in Subcontracting Act" (the Subcontracting Act hereafter). It can be regarded as a contradiction for a competition authority to enforce these acts (see Choi, 2023, for example). If the purpose of these acts is limited to protecting small firms, it would not be desirable for KFTC to be held responsible for governing vertical relationships. It can be justified, however, if these acts also contribute to competition-friendly trade environments. This paper

* Fellow, Korea Development Institute (E-mail: yangyh@kdi.re.kr)
* Received: 2025. 2. 2
* Referee Process Started: 2025. 2. 10
* Referee Reports Completed: 2025. 5. 26
† This paper is an extension of Chapter 3 in Yang, 2017, *Preventing Unfair Subcontracting Behaviors*, Policy Study 2017-11, KDI (in Korean). I thank anonymous referees for their useful comments and insights. All remaining errors are mine.

TABLE 1—NUMBER OF UNFAIR SUBCONTRACTING BEHAVIOR CASES FROM 2014 TO 2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Finalized	1,486	1,942	1,657	1,296	1,818	1,373	1,166	1,431	841	1,145
Ruled Illegal	911	1,358	1,035	782	874	680	538	993	446	786

Source: fairdata.go.kr (latest access on 23 Jan 2025)

investigates the efficiency effects of governing vertical relationships by analyzing the incentives that drive firms to utilize exclusive contracts. In particular, the analysis focuses on the subcontracting context.

The Subcontracting Act aims to reduce unfair subcontracting practices.[1] The number of unfair practices that have been ruled illegal has decreased and stabilized recently, partly due to the successful enforcement of the Act. Unfair practices are compelled through abuse of a superior position.[2] Unfair requests would not be accepted if there were small differences in bargaining power. The Subcontracting Act is indeed a special act, conceptualizing the abuse of a superior position in the "Monopoly Regulation and Fair Trade Act"[3] in the subcontracting context. It is not always the case that a downstream firm is in a superior position in a subcontracting relationship.[4] A downstream firm smaller than a subcontractor may not successfully enforce its desired terms and conditions. For these reasons, the Subcontracting Act makes it clear that the Act applies to subcontracting transactions in which the sales of a downstream firm exceed that of a subcontractor.[5] Given that this paper focuses on the efficiency effects of Subcontracting Act, it is assumed throughout the paper that a downstream firm has a superior bargaining position.

Subcontracting transactions sometimes entail exclusivity, which enlarges gaps in the bargaining power between the parties. In some cases, such differences in bargaining power are fully exploited. When a downstream firm possesses a superior position in bargaining, it can be tempted to squeeze profits out of subcontractors. Upstream subcontractors that may be exploited would not prefer exclusive relationships. Hence, cases can exist in which such exploitative abuse must be deemed unreasonable and prohibited in order to promote exclusive subcontracting trades.

The appropriate question here is what behaviors must be prohibited. There can be a debate over which value must be assigned more weight between fairness and efficiency, but there must be unanimous agreement over the prohibition of behaviors that undermine both fairness and efficiency. In this regard, this paper investigates

[1]The Subcontracting Act was enacted in December of 1984 and entered into force in April of 1985. At that time, unfair practices were increasing in subcontracting transactions which had been used intensively in the manufacturing sector since 1975.

[2]Lee and Lee (2012) show that differences in bargaining power have a significant impact on the frequency of unreasonable pricing.

[3]Article 45, Clause 1, Item 6 of "Monopoly Regulation and Fair Trade Act" regards the misuse of a superior position in transactions as illegal.

[4]For example, a fashion designer who wants to produce clothes may request textile companies to manufacture them according to a certain design. A cosmetics producer may want to outsource manufacturing tasks to large companies after finishing the planning and designing stages of the production process.

[5]More specifically, Article 2 of the Act says that the Act applies to the cases where (i) a downstream firm is not a small and medium-sized enterprise (SME, hereafter) and a subcontractor is an SME, or (ii) a downstream firm is an SME and has a higher sales volume than a subcontractor who is also an SME.

whether enhancing fairness can lead to higher efficiency. More specifically, this paper presents a scenario in which the prohibition of exploitative behaviors promotes an exclusive contract that is efficient. To this end, it is necessary to begin by asking why and when an exclusive contract would be more efficient in the context of subcontracting, and then to investigate what behaviors prevent an efficient contract from being realized.

The theory of exclusive dealing provides a clue with regard to answering the questions above. Section 2 begins with why and when an exclusive contract is more efficient. Essentially, an exclusive contract mitigates some costs and facilitates certain actions, thus enhancing efficiency. Obviously, it is not always the case that efficiency is promoted by exclusivity, but the central problem is that an exclusive contract may not be made even when it increases efficiency, and the theory of exclusive dealing says that this is due to a hold-up problem. By an analogous logic, there is a case in which an exclusive contract reduces costs but lowers the profits of subcontractors.

Section 3 shows theoretically that this can indeed occur. When two downstream firms have higher bargaining power than two upstream firms, an exclusive contract lowers the bargaining power of the upstream firms even further, yielding them lower profits. This is why upstream firms do not want to enter into an exclusive contract and thus why efficiency is not achieved. Downstream firms can incentivize upstream firms to engage in an efficient contract by guaranteeing them higher profits, which improves efficiency, but they may fail to do so when they are not able to make a long-term commitment.

This result has several policy implications. Section 4 discusses an appropriate form of regulation consistent with the result, suggesting that the Subcontracting Act must be revised toward this form. Issues related to implementation are also explored. Section 5 concludes the paper.

II. Exclusive Dealing

It is useful to refer to the theory of exclusive dealing in order to see whether limiting the bargaining power of a downstream firm against subcontractors would enhance efficiency by any chance. Exclusive dealing is a way of transacting that excludes competitors on one or both sides of the trade. Exclusive dealing exists in many industries. For example, Costco accepts only VISA credit cards internationally, and only the Hyundai card in Korea. It had accepted only American Express cards internationally, and only the Samsung card in Korea before. It claims that exclusive dealing is an effective means of lowering transaction fees (including multilateral interchange fees) and consequently the prices of its commodities.

Exclusive dealing has pro-competitive effects as well as anti-competitive effects. First, it promotes ex-ante competition between potential transaction partners, i.e., competition for exclusive dealing (Klein and Murphy, 2008; ICN, 2013), especially when it leads to a decrease in the price of the final good, as is the case for Costco. Second, it enables a more efficient way to make a transaction by reducing various transaction costs. Third, it facilitates investments in related products, such as

security, leading to an increase in the quality of the final good. Fourth, more innovation can be expected ex-ante for a better product both in the final good market and in the intermediate good market, as driven partially by the first effect. Fifth, relationship-specific investments are enabled so as to enhance efficiency (Che and Hausch, 1999; ICN, 2013; Abbott, 2018).[6] The second and the third effects are related to relationship-specific investments in the sense that costs may decrease and the quality may increase further when such investments are made.

On the other hand, exclusive dealing degrades the quality of competing goods (Zenger, 2010) both in the final good market and in the intermediate good market, which lessens the competitive pressure ex post. It may weaken price competition in the both markets ex post as well. Some markets can be foreclosed in the sense that competing firms may exit or the entry of potential competitors may be deterred (Bernheim and Whinston, 1998; Nurski and Verboven, 2016; Abbott, 2018; Nocke and Rey, 2018), which further lessens competition. It may also lead to less innovation in the long run (ICN, 2013). This is exactly why competition authorities are regulating exclusive dealing as a potentially anti-competitive behavior.

It is not very clear in general whether exclusive dealing is pro-competitive or anti-competitive, and its competition impact must be evaluated on a case-by-case basis (Zenger, 2010; ICN, 2013; Abbott, 2018). It is, however, usually beneficial to the coalition of the firms regardless of its competition impact.[7] Nevertheless, exclusive dealing is agreed upon in fewer occasions than is desired by the coalition, as some firms are wary of the potential for a hold-up situation. It is claimed in Klein *et al.* (1978) and Klein (1988) that relationship-specific investments which can increase the total profit of firms trading with each other are not made up to an efficient level. Relationship-specific investments have no value in trades with other firms, meaning that firms making such investments must accept less favorable terms. Hence, firms may not make such investments even when the investments are beneficial to the coalition. This does not hold only for relationship-specific investments, but also for more flexible forms of exclusive contracts.

In subcontracting transactions, cost efficiency is one of the pro-competitive effects of an exclusive contract, and is considered as the most important factor. The cost of production increases with the number of transaction partners. Such an increase in the cost may have many different causes, among them being transaction costs that subcontractors must incur when making negotiations with different partners. In addition, subcontractors may need to build and maintain additional facilities if they want to supply products to other downstream firms who may request different functions and compatibilities for their parts. If subcontractors opt to develop universal products that are compatible with many final products, doing so can also cost more per unit of production as compared to producing a single-purpose product.

In spite of such cost advantages, subcontractors do not always prefer an exclusive contract with downstream firms, as they are wary of the hold-up possibility again, as in relationship-specific investments. Subcontractors are usually in an inferior

[6]In the same context, Abbott (2018) takes an example that interbrand free riding is prevented when a gasoline dealer sells only one supplier's brand exclusively.

[7]Even when it is anti-competitive, it gives a higher level of surplus to the coalition but has a negative welfare effect on the other players that outweighs the increase in the surplus.

position when bargaining with downstream firms, and an exclusive contract may put them in an even weaker position when there are no other choices available. If their profit decreases under an exclusive contract, they will not want to enter into an exclusive contract, which consequently undermines efficiency. It would be meaningful to see when this occurs and to suggest policy interventions that restore efficient outcomes in such cases. While a theoretical analysis with an assumption on the cost function is provided in the next section, a more general perspective is discussed below.

Consider first a case in which upstream firms have a linear cost function, as in Hart and Tirole (1990). There is no hold-up problem in this case if upstream firms take the price as given,[8] as upstream firms would earn zero under non-exclusive transactions as well. Suppose instead that upstream firms have a convex cost function and that an exclusive contract shifts the cost function downward. The profit of upstream firms may then increase or decrease under an exclusive contract depending on how the cost function shifts and on how much the quantity traded increases. Figure 1 shows both possibilities when the cost is a quadratic function. Note that whether and how much the quantity traded increases depends upon the impact of exclusivity on bargaining power as well as upon production technologies and competition schemes.

While an exclusive contract can be used strategically for market foreclosure, unfair practices that fall under the Subcontracting Act have little to do with such purposes. Hence, I rule out the possibility of foreclosure by ensuring in the theoretical analysis that a downstream firm always faces competition regardless of whether it has an exclusive contract. This also shuts down upstream firms' competition for exclusive partnerships with a monopolist downstream firm as in Bernheim and Whinston (1998) and Mills (2017). Therefore, the analysis highlights the sole effect of an exclusive contract on the profits of upstream firms, free from the possibility of monopolization in the downstream market and the monopoly power of downstream firms.

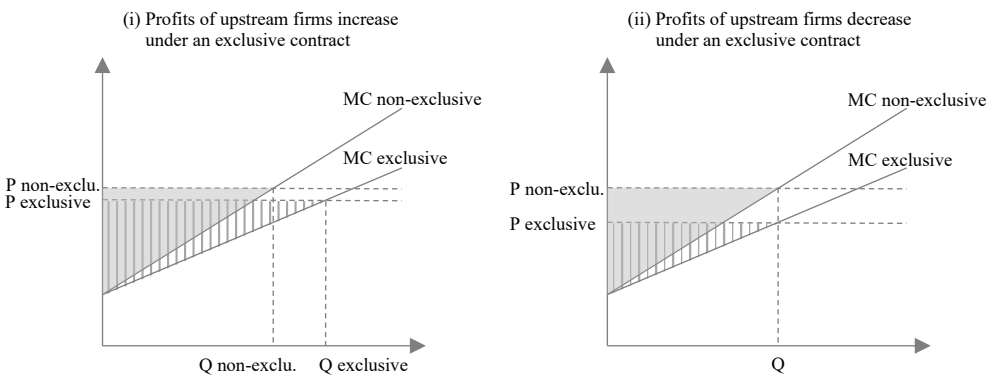

FIGURE 1. CHANGES IN THE PROFITS OF UPSTREAM FIRMS DUE TO AN EXCLUSIVE CONTRACT

[8]Hart and Tirole (1990) consider three cases, two of which assume bargaining over the gains from trade between upstream and downstream firms.

III. Theoretical Analysis

Suppose there are two downstream firms D_1 and D_2 and two upstream firms U_1 and U_2 in the supply chain. A downstream firm uses one unit of an intermediate good produced by upstream firms in order to produce one unit of a final good. Suppose further that final goods produced by the two downstream firms are identical in the sense that they are a perfect substitute for each other.[9] Assume that the demand function for the final products is given by $p = 1 - Q,$ where $Q = q_1 + q_2.$ Assume also that the cost of upstream firms is a quadratic function of their quantity, as follows[10]:

$$c(q_U) = \frac{1}{2} k q_U{}^2,$$

where k denotes the (inverse of) cost efficiency. k only depends on the exclusivity of the contract; that is, k is identical across upstream firms making the same decisions regarding exclusivity. $k = \bar{k}$ when they sell their products to all downstream firms and $k = \underline{k}$ when they make an exclusive contract with one downstream firm. $\underline{k} < \bar{k},$ meaning that exclusive contracts improve cost efficiency. Assume $\bar{k} \leq 2$ so that an equilibrium exists. For convenience purposes only, assume that the marginal cost of downstream firms is 0.

A. *Absence of an Exclusive Contract*

When there is no exclusive contract, the timing of decisions is as follows: Downstream firm *i* offers unit price u_i to upstream firms.[11] The offers are publicly known to all players. In the next stage, downstream firms compete in the final good market in a Cournot fashion. Upstream firms are profit-maximizing,[12] and downstream firms purchase only as many intermediate goods as they need to produce the final good at the unit price they offered in the previous stage.[13] There is also the assumption that upstream firms produce exactly the same amount as each other when

[9]The assumption of identical final goods is reasonable when exclusive contracts reduce transaction costs, but it may not hold when relationship-specific investments drive costs down. In the latter case, the result of this paper can be regarded as an approximation to the equilibrium in the real world. The more substitutable the final goods are, the more accurate the approximation would be.

[10]Given that this paper does not consider the possibility of foreclosure, a fixed cost does not play any role and is thus assumed to be zero.

[11]Upstream firms may offer prices in some markets, and there can be certain types of bargaining in others. It is modelled in this paper that downstream firms offer and upstream firms take it as given because the situation considered here is a subcontracting transaction where downstream firms have superior bargaining power. Chen and Riordan (2007) consider a model in which upstream firms make an offer, assuming that upstream firms have superior bargaining power. In addition, de Fontenay and Gans (2005; 2014) study a case in which all agents have some bargaining power and bargain bilaterally.

[12]This means that upstream firms supply their products as long as the unit price is no less than their marginal cost, ruling out the possibility that downstream firms force upstream firms to supply an amount that does not maximize their profits.

[13]It can be alternatively modelled such that downstream firms buy intermediate goods first and determine the quantity of the final good under capacity constraints. As one of the referees pointed out, modelling in such a way yields the same outcome under appropriate assumptions.

the demand for intermediate goods is less than their optimal level of production.

It is not straightforward to obtain the equilibrium in the model above. There are two constraints that do not exist in the standard Cournot competition model. The first is that the quantities produced by downstream firms may not exceed the quantities produced by upstream firms. Hence, downstream firms may not be able to buy as many intermediate goods as desired when they offer too low a unit price. The second constraint is that a downstream firm which offers a lower unit price will be supplied with the intermediate goods later than the other downstream firm, as upstream firms will supply their products to the latter first. This means that the former may not be able to optimally respond to the choice of the latter.

Begin with the Cournot equilibrium without these two constraints. Downstream firm i's profit function is

$$\pi_i(q_i) = (p - u_i)q_i = (1 - q_1 - q_2 - u_i)q_i.$$

Accordingly, the best response function is obtained as

$$q_i = \frac{1}{2}(1 - q_j - u_i) \quad \text{where} \quad j \neq i.$$

Therefore, the unconstrained Cournot equilibrium is

$$q_i^{uc} = \frac{1}{3}(1 - 2u_i + u_j) \quad \text{where} \quad j \neq i$$

$$p^{uc} = \frac{1}{3}(1 + u_i + u_j).$$

Coming back to the original model, there is a constraint that the quantities produced by downstream firms may not exceed the quantities produced by upstream firms. Focusing on the symmetric equilibrium that the unit price is given $u = u_1 = u_2$, each upstream firm would produce as much as

$$q_U = \frac{u}{\bar{k}}$$

because its profit function is written as

$$\pi_U(q_U) = uq_U - \frac{1}{2}\bar{k}q_U^2.$$

Therefore, upstream firms would match the demand from downstream firms as long as the demand is less than or equal to $\frac{u}{\bar{k}}$, or equivalently,

$$q_i \leq \frac{u}{\bar{k}}.$$

It is easy to see that an offer with $q_i < \frac{u}{\bar{k}}$ may not form an equilibrium, because if

this were the case, any downstream firm will be better off by lowering u by a small amount, which increases its quantity and decreases its cost without increasing the possibility that it may not be able to be supplied less than desired. Indeed, $q_i = \frac{u}{\bar{k}}$ holds at the equilibrium; thus,

$$u_1^* = u_2^* = \frac{\bar{k}}{\bar{k}+3}$$

$$q_1^* = q_2^* = \frac{1}{\bar{k}+3}$$

$$p^* = \frac{\bar{k}+1}{\bar{k}+3}.$$

Of course, it is still necessary to show that there is no equilibrium with $q_i > \frac{u}{\bar{k}}$ for some *i* and that there is no asymmetric equilibrium. This leads to the following lemma:

Lemma 1. Assume $\bar{k} \le 2$. When upstream firms do not make an exclusive contract with any downstream firm, the unique equilibrium offers made by downstream firms can be expressed as follows:

$$u_1 = u_2 = u^* \equiv \frac{\bar{k}}{\bar{k}+3},$$

and the Cournot equilibrium in the final product market is

$$q_1 = q_2 = q^* \equiv \frac{1}{\bar{k}+3}$$

$$p^* \equiv \frac{\bar{k}+1}{\bar{k}+3}.$$

Proof. See Appendix.

B. *Under Exclusive Contracts*

Now consider the case in which each of upstream firms make an exclusive contract with one downstream firm. Due to exclusivity of the contract, upstream firms may not sell their intermediate products to the other downstream firm offering a higher unit price. Therefore, downstream firms would not take into account the possibility that their rival's offer affects their capacity constraint when they make an offer to the subcontractor with which they exclusively trade. Because their subcontracting upstream firm would supply q_i as long as $q_i \le \frac{u_i}{\underline{k}}$, downstream firms cannot produce

q_i when offering $u_i < \underline{k}q_i$ but have no reason to offer $u_i > \underline{k}q_i$. Hence, $q_i = \frac{u_i}{\underline{k}}$ holds. The offers are publicly known to all players. The profit of downstream firms can now be written as a function of u_i only:

$$\pi_i(u_i) = (p - u_i)q_i(u_i) = \left(1 - \frac{u_i}{\underline{k}} - \frac{u_j}{\underline{k}} - u_i\right)\frac{u_i}{\underline{k}}, \quad \text{where} \quad j \neq i.$$

Solving the first-order conditions of downstream firms yields

$$u_1^{**} = u_2^{**} = \frac{\underline{k}}{2\underline{k}+3},$$

which is different from the equilibrium offers when upstream firms may sell their products to any downstream firm. This gives the following lemma:

Lemma 2. When upstream firms make an exclusive contract with one downstream firm each, the equilibrium offers made by downstream firms are

$$u_1 = u_2 = u^{**} \equiv \frac{\underline{k}}{2\underline{k}+3}$$

and the corresponding Cournot equilibrium in the final product market is

$$q_1 = q_2 = q^{**} \equiv \frac{1}{2\underline{k}+3}$$

$$p^{**} = \frac{2\underline{k}+1}{2\underline{k}+3}.$$

It is easy to see that u_i is always lower under exclusivity, or equivalently $u^{**} < u^*$. Note first that $\frac{\overline{k}}{2\overline{k}+3} < \frac{\overline{k}}{\overline{k}+3}$. Given that $\frac{k}{2k+3}$ is increasing in k, and $\underline{k} < \overline{k}$, it follows that $u^{**} < u^*$. On the other hand, q_i may be larger or smaller under exclusivity depending on how much cost efficiency will be improved by an exclusive contract. $q^{**} > q^*$ when $\underline{k} < \frac{1}{2}\overline{k}$, and $q^{**} \leq q^*$ otherwise. p moves exactly in the opposite direction.

The central reason that the equilibrium offers and quantities are different from those under non-exclusive trades is that downstream firms who want to produce more must increase u_i in proportion to q_i under an exclusive contract. In contrast, when they buy intermediate goods non-exclusively, offering u_i slightly higher (than

u_j) enables them to increase q_i by much more than the amount u_i increased.[14] Therefore, when a trade occurs at the exclusivity equilibrium quantities (as in Lemma 2) under non-exclusive relationships, downstream firms have an incentive to deviate by increasing their quantities.

The most interesting question is whether upstream firms would have an incentive to make an exclusive contract with downstream firms. The equilibrium profit of upstream firms under each condition can be written as follows:

$$\pi_U^* = u^* q^* - \frac{1}{2}\bar{k}q^{*2} = \frac{\bar{k}}{2\left(\bar{k}+3\right)^2}$$

$$\pi_U^{**} = u^{**} q^{**} - \frac{1}{2}\underline{k}q^{**2} = \frac{\underline{k}}{2\left(2\underline{k}+3\right)^2}$$

As noted earlier, u_i is lower under exclusivity. However, the cost is also lower as $\underline{k} < \bar{k}$, so one may guess that upstream firms would be better off under certain conditions. The following proposition shows that such a condition does not exist.

Proposition 1. Suppose that upstream firms have a cost function of $c(q) = \frac{1}{2}\underline{k}q^2$ under an exclusive contract and that its cost is $c(q) = \frac{1}{2}\bar{k}q^2$ under non-exclusivity with $\underline{k} < \bar{k} \leq 2$. Upstream firms are strictly worse off when they enter into an exclusive contract.

Proof. See Appendix.

The proposition above has the following implications. An exclusive contract may enhance efficiency by reducing costs as well as inducing innovation, but some trading partners may not prefer an exclusive contract to non-exclusive trades. Specifically in this model, an exclusive contract reduces production costs (as well as transaction costs that are increasing in quantity), but no upstream firm wants to make an exclusive contract. It can be easily checked that there are some conditions under which social welfare is greater under an exclusive contract than under non-exclusivity; therefore, it follows that a socially more desirable exclusive contract may be avoided by upstream firms.[15]

Upstream firms prefer non-exclusive trades because they must accept unfavorable terms and conditions under an exclusive contract. When they have an outside option,

[14]The total supply of intermediate goods may not increase when the incentive constraints of upstream firms are binding. For example, suppose $\bar{k} = 1$ and both downstream firms produce $q_1 = q_2 = 0.2$ with $u_1 = u_2 = 0.2$. In this case, upstream firms have no incentive to produce more than 0.2 each; thus, even if one downstream firm wants to buy more, the total supply of intermediate goods would be fixed at 0.4. However, a downstream firm can buy more by offering an infinitesimally higher u_i, resulting in the other firm buying less.

[15]This statement is implied by Proposition 1, which entirely depends on the specification of the model, but shows that efficiency may not be achieved under some circumstances.

they have some bargaining power against downstream firms even though downstream firms make an offer on the unit price. They may supply their products first to a downstream firm who offers the highest unit price and then to one who offers the second highest, and so on, which prevents downstream firms from offering too low a unit price. However, when they exclusively trade with one firm, they have no other choice but to accept that firm's offer. This gives downstream firms more bargaining power compared to that under non-exclusivity.

C. *Offering Incentives for Exclusivity*

Downstream firms would voluntarily attempt to incentivize upstream firms to engage in an exclusive contract. One way is to offer a higher unit price so that upstream firms can earn as much profit as they earn when they do not make an exclusive contract.

Consider a one-period game in which downstream firms offer a unit price for exclusive intermediate goods that they will commit to, and then upstream firms sequentially decide whether to make an exclusive contract with one downstream firm.[16] To avoid coordination failures, suppose that upstream firm 1 (U_1) decides first and U_2 decides second and that when U_1 chooses not to make an exclusive contract but U_2 chooses to do so, U_1 has another chance to make a decision. If no exclusive contract is made, downstream firms offer a unit price for non-exclusive intermediate goods, in which case the equilibrium forms as in Lemma 1. If only one exclusive contract is made, a downstream firm who fails to make an exclusive contract offers a unit price for non-exclusive intermediate goods, which can be supplied only by an upstream firm who also fails to make an exclusive contract. In the final stage of the game, downstream firms engage in Cournot-style competition in the final product market. The timing of the decision can be summarized as follows:

(stage 1) D_1 and D_2 make corresponding offers u_1 and u_2 for an exclusive contract.
(stage 2) U_1 chooses to make an exclusive contract with D_1 or D_2, or none.
(stage 3) U_2 chooses among downstream firms left uncontracted, or none.
(stage 3-1) If U_1 chooses none and U_2 chooses one, U_1 has another chance to choose.
(stage 4) Uncontracted downstream firms offer a unit price for non-exclusivity.
(stage 5) Downstream firms compete a la Cournot in the final goods market. Intermediate goods are purchased and final goods are produced.

The following lemma shows the subgame perfect equilibrium of the above game.

[16]The same result ensues, differing only in the equilibrium payoffs, when assuming that upstream firms decide simultaneously, which means that the result in this paper is robust to choice of the model.

Lemma 3. Offering $u_1 = u_2 = u^{***}$ constitutes a symmetric subgame perfect equilibrium of the game offering a committed unit price for exclusive intermediate goods, where u^{***} is the smallest value that satisfies the following inequality:

$$\frac{u^{***}\left(1-u^{***}\right)}{3} - \frac{1}{2}\underline{k}\left(\frac{1-u^{***}}{3}\right)^2 \geq \frac{\overline{k}}{2\left(\overline{k}+3\right)^2}$$

Proof. See Appendix.

The lemma above shows that there exists a unit price that makes upstream firms under an exclusive contract as well off as when they do not make an exclusive contract. This leads to the following proposition:

Proposition 2. Suppose that downstream firms offer a unit price for exclusive intermediate goods that they will commit to, with upstream firms then sequentially deciding whether to make an exclusive contract with one of the downstream firms. There always exists an equilibrium where an exclusive contract is made and upstream firms are as well off as under non-exclusive trades.

Proof. See Appendix.

The proposition above demonstrates how downstream firms can incentivize upstream firms to engage in an exclusive contract so that more efficient ways of production and/or transactions can be utilized. Under this equilibrium, upstream firms are apparently better off than when they do not have any choice but to make an exclusive contract (as in Lemma 2). It is easy to check that downstream firms are also better off. The equilibrium quantities in the final product market may be larger or smaller depending on $\overline{k}$ and $\underline{k}$, and the social welfare may also correspondingly be higher and lower.[17]

What seems unclear is whether social welfare is higher at the equilibrium where upstream firms willingly engage in an exclusive contract (as in Lemma 3) compared to that where upstream firms do not choose exclusivity (as in Lemma 1). It is clear that upstream firms earn the same profit because downstream firms choose such a unit price and that downstream firms make more profits. In fact, the equilibrium quantities are larger and the equilibrium price is lower, as is shown by the following lemma. Accordingly, social welfare is also higher.

[17]Equilibrium quantities are usually larger under the equilibrium of Lemma 3 compared to that of Lemma 2, but it could be the other way around when $\underline{k}$ is very close to 0, in which case q^{**} is very close to $\frac{1}{3}$ but $q^{***} = \frac{1-u^{***}}{3}$ (see the proof of Lemma 3) is clearly smaller than $\frac{1}{3}$, as u^{***} is bounded away from 0 by the condition of Lemma 3.

Lemma 4. The equilibria under the conditions in Lemmas 1 and 3 are compared to each other as follows:

$$u^{**} < u^{***} < u^{*}, q^{*} < q^{***}, \text{and } p^{***} < p^{*}$$

Proof. See Appendix.

This implies the following proposition.

Proposition 3. Social welfare is higher at the symmetric equilibrium, where downstream firms incentivize upstream firms to engage in an exclusive contract compared to that where firms do not make an exclusive contract.

The problem is that such a voluntary exclusive contract may not appear when trading continues for multiple periods. If firms can successfully enter into a long-term contract, downstream firms can incentivize upstream firms to engage in an exclusive contract by committing to a higher unit price for every period. What would happen, however, if there are certain practical difficulties that arise when making a long-term contract? The following proposition presents a pessimistic outcome.

Proposition 4. Suppose that the unit price offered by downstream firms can be committed to only for the first period and that upstream firms are prevented from returning to non-exclusive products once they choose to produce exclusive ones. If upstream firms supply their products for T periods, there always exist a discount rate $\beta < 1$ and T for which upstream firms do not make an exclusive contract as long as $\underline{k} > 0$.

Proof. When an upstream firm does not choose exclusivity, its profit will be π_U^* for T periods. When an exclusive contract is made, let π_U^{1st} denote the first period profit guaranteed to the upstream firm. As downstream firms will enforce $u_1 = u_2 = u^{**}$ from the second period on, the profit of the upstream firm will be

$$\pi_U^{1st} + \sum_{t=2}^{T} \beta^{t-1} \pi_U^{**} = \pi_U^{1st} + \sum_{t=2}^{T} \beta^{t-1} \frac{\underline{k}}{2\left(2\underline{k}+3\right)^2} .$$

π_U^{1st} cannot be greater than $\frac{1}{2\left(\underline{k}+6\right)}$ given that $qu - \frac{1}{2}\underline{k}q^2$ is maximized when $u = \frac{\underline{k}+3}{\underline{k}+6}$ and $q = \frac{1-u}{3} < \frac{u}{\underline{k}}$, yielding $\pi_u^{1st} = \frac{1}{2\left(\underline{k}+6\right)}$. To incentivize upstream firms, it must be

$$\pi_U^{1st} + \sum_{t=2}^{T} \beta^{t-1} \pi_U^{**} \geq \sum_{t=1}^{T} \beta^{t-1} \pi_U^{*}$$

or equivalently,

$$\pi_U^{1st} - \pi_U^* \geq \sum_{t=2}^{T} \beta^{t-1} \left(\pi_U^* - \pi_U^{**} \right).$$

As β goes to 1 and T goes to infinity, the above condition does not hold because $\pi_U^* - \pi_U^{**} > 0$ when $\bar{k} > 0$. **Q.E.D.**

The proposition above means that in most cases, downstream firms may fail to incentivize upstream firms to engage in an exclusive contract. For example, when $\bar{k} = 2$ and $\underline{k} = 1$, upstream firms do not want exclusivity, even at the values as low as $\beta = 0.9$ and $T = 3$. When $\bar{k} = 0.1$ and $\underline{k} = 0$, an exclusive contract is not preferred at $\beta = 0.99$ and $T = 18$ as well as at $\beta = 0.95$ and $T = 32$.

It is important to discuss the assumptions in Proposition 4. One may wonder about the validity of the assumption that downstream firms can commit to the unit price only for the first period. It is not impossible for them to commit for longer periods by making a long-term contract. However, a long-term contract has its own vulnerability in that when market circumstances change rather quickly, a competing firm not subject to a long-term contract may aggressively lower its price and thus capture the market.[18] Uncertainties regarding market conditions are translated into incompleteness of the contract in the literature, and it is often assumed that no long-run commitment is possible. For example, Tirole (1986) assumes that the parties cannot constrain future negotiations, explaining why it is a valid assumption. He also points out that price fixing for a long term is in general inefficient ex post and thus subject to renegotiation. Hence, downstream firms may not want to commit for an overly long term, in which case Proposition 4 can have implications pertaining to the feasibility of an exclusive contract.

One may think it is too restrictive to assume that upstream firms may not return to non-exclusive products once they choose to produce exclusive ones. If they choose to end an exclusive contract, however, there is much to lose. They may already have made relationship-specific investments on a large scale to produce exclusive intermediate goods efficiently, in which case they need to incur sunk costs in order to end the relationship. Such investments include not only production facilities but also intangible assets such as the learning of tacit knowledge specific to the relationship, and the building of a friendly relationship. They must incur more transaction costs to build new trade partnerships with other buyers. Therefore, it is not impossible to return to non-exclusivity but it may be very costly to do so.

IV. Policy Implications

A. *Regulation and Efficiency*

The analysis in the previous section implies that an exclusive contract can be

[18]This does not apply only to downstream firms but also to upstream firms. Upstream firms may want to raise the unit price when the price of raw materials increases, but it would be more difficult to do so under a long-term contract.

avoided by firms with lower bargaining power even when exclusivity reduces costs. The rationale behind this is the contention that an exclusive contract is subject to hold-up problems. Parties in an inferior position with regard to transactions, who are upstream firms in a subcontracting context, may have to accept less favorable terms and conditions under exclusivity than under non-exclusive trades, as they can no longer switch to a different transaction partner. In the model, upstream firms who choose an exclusive contract must accept a lower unit price and earn less profit.

This hold-up problem can be overcome through commitments by firms with higher bargaining power. In the model, downstream firms can guarantee upstream firms a higher unit price to make an exclusive contract, yielding higher social surplus. But what if the commitment does not last long? Downstream firms may fail to incentivize upstream firms when the contract lasts for a longer time without commitment to the higher unit price. Many firms are reluctant to be tied up by an inflexible long-term contract,[19] meaning that an exclusive contract may not be entered into even when it is more efficient.

Limiting abuse of a superior position in transactions may enhance efficiency in this context. If downstream firms are prevented from cutting a unit price from the initial level, upstream firms would have the incentive to enter into an exclusive contract, as the commitment for the first period is extended by the regulation to later periods. Hence, downstream firms can enjoy an increase in efficiency from the exclusive contract, which includes a production cost reduction, reduced transaction costs, and so on. The total quantity is also increased and the price is reduced, resulting in higher social surplus.

Such an intervention, however, should not be a strict and inflexible regulation. An inflexible regulation has the same effect as a voluntary long-term commitment, which would have been made if beneficial to the transacting parties on both sides. There is a good reason for a commitment to be agreed upon only over the short term. Market conditions can change quickly due to competition and innovation and due to business cycles and non-economic shocks. Downstream firms would not want to bear sunk costs that are too high in order to flexibly respond to changes in market conditions, and neither would upstream firms.

Therefore, the regulation must be designed to make reasonable hurdles for downstream firms with regard to cutting unit prices. More specifically, downstream firms may cut a unit price only if they can justify the reason to do so. For example, a price cut would be justified if it boosts demand for the final product by lowering its price, and as a result, leads to larger sales and greater joint profits in the end. A price cut would also be reasonable if competitors have already gained price competitiveness by responding to decreases in the prices of raw materials for intermediate goods. A price cut is unavoidable if the firm would have to shut down its facilities and exit the market without it.

There is a difference between allowing a price cut only for a justifiable reason and prohibiting an undue price cut. From a legal perspective, the former prohibits a price cut in principle but allows a cut when downstream firms can justify it. In other words, the burden of proof is levied on the firms who practice the behavior. In contrast, the

[19]Abbott (2018) states that "Long-term, flexible contracts can minimize costs and risks to both parties of dealing with future uncertainties."

latter case allows a price cut unless the government proves it undue. Under this regime, a price cut may not be illegal if its magnitude is too small to have an impact on upstream firms. In this sense, the latter is more lenient towards downstream firms than the former. Considering the effects on the efficiency of the outcome, price cuts must be prohibited in principle so that upstream firms are encouraged to enter into an exclusive contract and increase their efficiency without fear of the hold-up problem.

In order to highlight the usefulness of this policy, it is helpful to discuss other policies to reduce bargaining power differences. There are some policies to boost the bargaining power of subcontractors. One way is industrial policies to raise the technical level of subcontractors.[20] This method is most desirable in the sense that it benefits both subcontractors and downstream firms and, consequently, the industry and the national economy. However, R&D cannot be successful for all firms, meaning that the effects of the policies would be limited to a small number of firms.

Another way is promotion policies to diversify transaction partners. It is unusual for a subcontractor to sell its products to many downstream firms in sectors where subcontracting prevails.[21] If a subcontractor can trade with more downstream firms, its relative bargaining power will increase. There are, however, certain practical barriers and an efficiency problem. First, there are relatively a small number of downstream firms compared to upstream firms in such sectors, meaning that it is not easy to find another downstream firm to transact with, as there are many subcontractors already working with such firms.[22] Hence, it is recommended that subcontractors export their products. As this is also challenging, there are relatively few firms who have been successful in diversifying their transaction partners.

The greatest weakness of the policy to diversify transaction partners is the efficiency problem. Such a policy reduces differences in bargaining power but raises costs, as the cost increases with the number of transaction partners, as was discussed in Section 2. If a policy increases the profit of some parties but undermines efficiency, it would not be regarded as a desirable policy.[23] Such a policy would be dominated by policies that incentivize subcontractors to stay in an efficient exclusive contract, which is to limit the abuse of a superior position by a downstream firm.

To summarize, the diversification policy is relatively less useful, and the R&D policy has a limited impact in terms of the scope of the potential beneficiaries due to difficulties and uncertainties related to R&D, although success in R&D produces the most desirable outcome. Therefore, the government must not only induce subcontractors to invest in R&D and raise their technical level, but it also has a reason to regulate bargaining power abuses by downstream firms in order to reduce bargaining power differences.

[20]For example, ASML possesses a high bargaining power over Samsung, TSMC, and Intel.

[21]There are several causes of this phenomenon, and one of them is that the government induced such a structure in the mid-1970s, as it was thought to be an efficient means of manufacturing. The introduction of the "Promoting Vertical Structure of SME Act" in 1975 was one of the related policies.

[22]This is why SMEs attempt to sell their products to overseas companies.

[23]Guaranteeing the profits of SMEs may have its own dynamic efficiency effect in the sense that doing so would help SMEs grow and thus cause the economy to become more dynamic. However, it would more desirable if a policy also preserves other efficiencies at the same time.

B. *Issues in Implementation*

Abuses of a superior position are regulated by the Subcontracting Act. More specifically, there are 24 clauses[24] in the Act which penalize unfair subcontracting behaviors. Among them, Article 4 regulates undue price setting behaviors. Item 1 of Article 4 states that downstream firms (outsourcing firms) should not set subcontracting prices at a level lower than the usual price paid for the same or similar products. Item 2 specifies certain behaviors that are deemed to be undue price setting. For example, it is illegal to cut a unit price by a uniform rate without justification. It is also illegal to discriminate some subcontractors in price setting from others without justification.

The spirit of Article 4 is broadly consistent with the implications of the theoretical analysis in the previous section. The Article prevents downstream firms from cutting prices but allows some types of price cutting in justifiable cases. However, it is not consistent with the theoretical implications in some aspects. I discuss three such points in more details below.

First, Article 4 uniformly applies to all subcontractors, including non-exclusive ones. The theoretical analysis shows that exclusivity lowers the bargaining power of upstream firms further, making them accept less favorable terms and conditions and earn less profit. Hence, it would be more reasonable to protect exclusive subcontractors from broader ranges of price-cutting behaviors. This means that some price-cutting behaviors do not have to be prevented if they are conducted against non-exclusive subcontractors. In principle, non-exclusive subcontractors are free to choose transaction partners and thus have no reason to accept an undue price offer. A practical problem is that only a small number of subcontractors are free to choose their transaction partners. In most cases, subcontractors have trouble finding different transaction partners despite the fact that they may trade with more than one downstream firm. In this sense, many subcontractors have an exclusivity constraint to some extent, even if not entirely. Therefore, Article 4 must be applied differently to subcontractors depending on the extent of the exclusivity of their transactions.

Second, some types of price-cutting behaviors are not regulated even though regulating such behaviors against exclusive subcontractors enhances efficiency. While Item 2-1 of Article 4 bans a unit price reduction at a uniform rate, there is no other statement that prohibits any price cut from the initial level. This means that downstream firms may cut prices at a non-uniform rate. The possibility of such behavior may discourage subcontractors from entering into an exclusive contract and realizing efficient outcomes, according to the theoretical analysis in the previous section. Hence, it would be more desirable to prohibit any price cut from the initial level without justification if the trade is entirely exclusive on the subcontractor's side.

Third, price discrimination does not have to be regulated if price cuts are prohibited in principle. Item 1 bans setting prices lower than usual, and Item 2-3 prohibits price discrimination between subcontractors. But, there is little evidence that price discrimination undermines efficiency.[25] One possibility is that some

[24]Unfair subcontracting behaviors that violate Articles 3, 3-4, 3-5, 4, 5, 6, 7, 8, 9, 10, 11, 12, 12-2, 12-3, 13, 13-2, 13-3, 14, 15, 16, 16-2, 17, 18, and 20 are subject to fine. Violation of other clauses including Articles 19 and 25 is also penalized, but they have nothing to do with subcontracting behaviors.

[25]When an upstream firm has superior bargaining power and discriminates between downstream firms in terms

promising subcontractors reduce their R&D expenditures if they expect that they will be offered a lower price than their competitors after successfully reducing costs. Nonetheless, this does not occur if downstream firms are banned from lowering prices from the initial level, as suggested above. The same reasoning applies to other possibilities as well. It is difficult to think of a case in which efficient outcomes are deterred by price discrimination when downstream firms are prohibited from lowering prices from the initial level without justifiable reasons.

V. Concluding Remarks

This paper shows that it can enhance efficiencies to limit the abuse of superior bargaining power by downstream firms in subcontracting trades. Such a regulation encourages upstream firms to engage in an efficient exclusive contract, which reduces production costs as well as transaction costs. When upstream firms are incentivized to enter into such an exclusive contract, social welfare increases as total production increases, equilibrium prices decrease, and costs shift downward compared to the case in which upstream firms trade with downstream firms in a non-exclusive relationship.

The result does not mean that regulations always increase efficiency, however. First, an inflexible regulation is effectively identical to compelling a long-term commitment which would have been voluntarily made if it would produce efficient outcomes. Thus, the regulation must be applied with some flexibility, allowing exceptions when justified. Second, the result applies only to cases in which downstream firms have superior bargaining power and an exclusive contract further expands the gap in bargaining power. The regulation would have a different effect when upstream firms have some bargaining power against the downstream firm or when upstream firms trade with the downstream firm in a less exclusive relationship. Third, the result depends on the production technologies. The theoretical analysis assumes that the cost function of upstream firms takes a quadratic form. It can be extended to a more general set of production technologies that exhibit a decreasing return to scale, but not to those representing a constant return to scale or an increasing return to scale. All of these limitations must be considered when enforcing the regulation.

The analysis in this paper focuses on unfair pricing behaviors. The Subcontracting Act prohibits other types of unfair subcontracting behaviors as well. For example, behaviors that are in contrast with the terms of a contract or that fail the duty of good faith are prohibited. These include unreasonable cancellations of contracts (Article 8), failures to report inspection results (Article 9), unreasonable returns of products (Article 10), failures to make payments (Article 13), failures to pay tax refunds (Article 15), and unexpected in-kind payments (Article 17). Behaviors that make unreasonable requests to subcontractors are prohibited as well. These behaviors may also discourage upstream firms from entering into an exclusive contract by an analogous logic, meaning that it may improve efficiency to regulate them. However, there are also

of prices, competition in the final product market may be distorted. However, even in such a situation, it is not obvious that competition is distorted, meaning that price discrimination should not be prohibited per se but should be regulated on a rule-of-reason basis.

paternalistic regulations unrelated to efficiency, such as Article 6 which specifies how timely and in what size payments must be made. These regulations must be evaluated and enforced under different criteria, such as inclusive growth.

This paper makes a clear contribution to the literature in that it suggests a better regulation to encourage firms to enter into exclusive contracts when doing so is efficient. Hart and Tirole (1990) analyze firms' incentives for vertical integration, which has effects similar to those of an exclusive contract, but they do not consider the possibility that vertical integration reduces production costs, instead focusing on anti-competitive effects. They find a condition under which vertical integration occurs and show that it forecloses competitors from the market and thus results in lower social surplus. Bernheim and Whinston (1998) examine firms' incentives to engage in exclusive dealing when it may increase efficiency, but they also focus on its foreclosure effects. They find a condition under which exclusive dealing occurs and show that it leads to welfare losses but that banning it does not always increase social welfare.

Not analyzed in this paper is whether unfair pricing behaviors by downstream firms reduce investments by subcontractors. This issue has been examined in many studies of contract theory, such as Tirole (1986) and Che and Hausch (1999), for example. Incorporating such an investment incentive into the model may augment the efficiency enhancing effect of the regulation to limit abuse of superior bargaining power by downstream firms. On the other hand, downstream firms may also make investments in relationship-specific assets, in which case the regulation would have an ambiguous effect on the joint surplus. Moreover, such investments may be made through a voluntary agreement between downstream firms and subcontractors. It requires a more sophisticated analysis to incorporate such incentives into the model.

APPENDIX

Proofs

Proof of Lemma 1.

By backward induction, let us find the optimal production of upstream firms when D_1 and D_2 demand q_1 and q_2, respectively. Let $u_2 \le u_1 < 1$ without loss of generality. Then, upstream firms supply their intermediate goods to D_1 first and D_2 next. When they produce a very low amount q_U, they sell only to D_1 at u_1, meaning that their profit will be $u_1 q_U - \frac{1}{2}\bar{k}q_U^2$. When they produce more than q_1, they sell q_1 to D_1 at u_1 and the rest to D_2 at u_2. Accordingly, the profit would be $u_1 \cdot \frac{1}{2}q_1 + u_2\left(q_U - \frac{1}{2}q_1\right) - \frac{1}{2}\bar{k}q_U^2$ if upstream firms split the demand equally. As it is assumed that upstream firms produce amounts identical to each other when the demand for intermediate goods is less than their optimal level of production, the profit function of each upstream firm with q_1, q_2, u_1 and u_2 given is

$$\pi_U(q_U) = \begin{cases} u_1 q_U - \frac{1}{2}\bar{k}q_U^2 & \text{if } q_U \le \frac{1}{2}q_1 \\ u_2 q_U - \frac{1}{2}\bar{k}q_U^2 + (u_1 - u_2)\cdot\frac{1}{2}q_1 & \text{if } \frac{1}{2}q_1 < q_U \le \frac{1}{2}(q_1 + q_2) \end{cases}.$$

Hence, their optimal production is

$$q_U(q_1, q_2, u_1, u_2 \mid u_2 \le u_1) = \begin{cases} \min\left(\frac{1}{2}q_1, \frac{u_1}{\bar{k}}\right) & \text{if } u_2 \le \bar{k}\cdot\frac{1}{2}q_1 \\ \min\left(\frac{1}{2}q_1 + \frac{1}{2}q_2, \frac{u_2}{\bar{k}}\right) & \text{if } u_2 > \bar{k}\cdot\frac{1}{2}q_1 \end{cases},$$

which means that when u_2 is very low, upstream firms supply only to D_1, but when u_2 is high enough, they supply to D_2 as well.

Let us find first the equilibrium output when u_2 is very high so upstream firms produce all of the quantities demanded, that is, when $\frac{1}{2}q_1 + \frac{1}{2}q_2 \le \frac{u_2}{\bar{k}}$. In this case, downstream firms produce an unconstrained Cournot equilibrium output $q_i^{uc} = \frac{1}{3}(1 - 2u_i + u_j)$ where $j \ne i$. First, $\frac{1}{2}q_1 + \frac{1}{2}q_2 < \frac{u_2}{\bar{k}}$ cannot be an equilibrium condition, as if so, D_2 can profitably lower u_2. Second, $u_1 > u_2$ cannot be an equilibrium condition, as if so, lowering u_1 raises q_1, leaving the total quantity

$q_1+q_2=\frac{2u_2}{\bar{k}}$ and the price unchanged, and thus gives more profit to D_1. Then, the only possibility is that $q_1=q_2=\frac{u_1}{\bar{k}}=\frac{u_2}{\bar{k}}$ holds. Solving this with the Cournot equilibrium output condition yields $u_1^*=u_2^*=\frac{\bar{k}}{\bar{k}+3}$ and $q_1^*=q_2^*=\frac{1}{\bar{k}+3}$, $p^*=\frac{\bar{k}+1}{\bar{k}+3}$.

To show that no one wants to deviate, suppose D_1 raises u_1 such that $\frac{\bar{k}}{\bar{k}+3}=u_2^*<u_1^d$. The unconstrained Cournot equilibrium is $q_1^{uc}=\frac{1-2u_1^d+u_2^*}{3}$ and $q_2^{uc}=\frac{1+u_1^d-2u_2^*}{3}$, which is feasible given that $\frac{1}{2}q_1^{uc}+\frac{1}{2}q_2^{uc}<\frac{u_2^*}{\bar{k}}=\frac{1}{\bar{k}+3}$. D_1 now earns $\pi_1^d=\frac{\left(1-2u_1^d+u_2^*\right)^2}{9}<\frac{\left(1-u_2^*\right)^2}{9}=\pi_1^*$ and as such D_1 has no incentive to raise u_1. If D_2 lowers u_2 so that $u_2^d<u_1^*=\frac{\bar{k}}{\bar{k}+3}$, upstream firms produce $\frac{u_2^d}{\bar{k}}$ each and supply D_1 first and D_2 with the rest, leading to $q_2=\frac{2u_2^d}{\bar{k}}-q_1$. Given u_1^* and u_2^d, D_1's best response function is $q_1=\frac{1-q_2-u_1^*}{2}$, which leads to the constrained Cournot equilibrium $q_1^c=1-\frac{2u_2^d}{\bar{k}}-u_1^*$ and $q_2^c=-1+\frac{4u_2^d}{\bar{k}}+u_1^*$ when $\bar{k}\cdot\frac{1}{2}q_1^c<u_2^d\le u_1^*$. D_2's profit is then

$$\pi_2^d\left(u_1^*,u_2^d\right)=\left(1-q_1-q_2-u_2^d\right)q_2=\left(1-\frac{2u_2^d}{\bar{k}}-u_2^d\right)\left(-1+\frac{4u_2^d}{\bar{k}}+u_1^*\right)$$

and thus its marginal profit at $u_2=u_2^*$ is

$$\frac{d\pi_2\left(u_1^*,u_2^*\right)}{du_2}=\left(-\frac{2}{\bar{k}}-1\right)\left(-1+\frac{4u_2^*}{\bar{k}}+u_1^*\right)+\left(1-\frac{2u_2^*}{\bar{k}}-u_2^*\right)\cdot\frac{4}{\bar{k}}=\frac{2-\bar{k}}{\bar{k}\left(\bar{k}+3\right)},$$

which is non-negative as $\bar{k}\le 2$. Therefore, D_2 has no incentive to lower u_2, which confirms that $u_1^*=u_2^*=\frac{\bar{k}}{\bar{k}+3}$ and $q_1^*=q_2^*=\frac{1}{\bar{k}+3}$ form an equilibrium.

Next, let us search for an equilibrium in which upstream firms produce less than the quantities demanded. It is clear that there is no equilibrium in which D_2 produces nothing, as it can deviate to earn a positive profit by offering some $u_2<p$. The only possibility is that D_2 offers u_2 such that $\bar{k}\cdot\frac{1}{2}q_1<u_2\le u_1$ and produces a positive

amount. $u_2 < u_1$ cannot be an equilibrium condition, as if so, D_1 can profitably lower u_1. To see this, recall that the constrained Cournot equilibrium is $q_1^c = 1 - \frac{2u_2}{\bar{k}} - u_1$ and $q_2^c = -1 + \frac{4u_2}{\bar{k}} + u_1$ when $\bar{k} \cdot \frac{1}{2} q_1 < u_2 < u_1$. D_1's profit is then $\pi_1 = \left(1 - \frac{2u_2}{\bar{k}} - u_1\right)^2$, meaning that D_1 can earn more by lowering u_1 towards u_2. However, if $u_1 = u_2$ and upstream firms have an incentive to produce more than the quantities demanded, either D_1 or D_2 has an incentive to offer a higher unit price. To see this, note first that D_1 wants to be supplied $1 - \frac{2u_2}{\bar{k}} - u_1$ when $u_2 \le u_1$. Suppose $u_1 = u_2$ and D_1 is supplied less than the corresponding demand; that is, $q_1 < 1 - \frac{2u_2}{\bar{k}} - u_1$. In such a case, its profit is

$$\underline{\pi_1} = (p - u_1) q_1 = \left(1 - \frac{2u_2}{\bar{k}} - u_1\right) q_1 < \left(1 - \frac{2u_2}{\bar{k}} - u_1\right)^2 = \left(1 - \frac{2u_2}{\bar{k}} - u_2\right)^2.$$

D_1 can find ε such that offering $u_1^d = u_2 + \varepsilon > u_2$ gives

$$\pi_1^\varepsilon = \left(1 - \frac{2u_2}{\bar{k}} - u_1^d\right)^2 = \left(1 - \frac{2u_2}{\bar{k}} - u_2 - \varepsilon\right)^2 > \underline{\pi_1}.$$

Suppose $u_1 = u_2$ and D_1 is supplied as a priority, in contrast. In this case, D_2 has an incentive to offer a higher u_2 likewise. Therefore, there is no equilibrium in which upstream firms produce less than the quantities demanded, and the unique equilibrium is $u_1^* = u_2^* = \frac{\bar{k}}{\bar{k} + 3}$. **Q.E.D.**

Proof of Proposition 1.

It follows from Lemmas 1 and 2 that

$$\pi_U^{**} - \pi_U^* = \frac{\underline{k}}{2(2\underline{k} + 3)^2} - \frac{\bar{k}}{2(\bar{k} + 3)^2} = \left[\frac{\underline{k}}{2(2\underline{k} + 3)^2} - \frac{\underline{k}}{2(\underline{k} + 3)^2}\right] + \left[\frac{\underline{k}}{2(\underline{k} + 3)^2} - \frac{\bar{k}}{2(\bar{k} + 3)^2}\right].$$

The first component of the right-hand side is always non-positive for $\underline{k} \ge 0$, and the second component is always negative for $\underline{k} < \bar{k} \le 2$ given that

$$\frac{d}{dk}\left[\frac{k}{2(k+3)^2}\right] = \frac{3 - k}{2(k+3)^3} > 0$$

for $k < 3$. **Q.E.D.**

Proof of Lemma 3.

Note first that when U_1 chooses an exclusive contract with a downstream firm, U_2 has no reason to reject an exclusive contract with the other downstream firm, as there is no other downstream firm to transact with, so rejecting exclusivity does not change its bargaining position but only prevents it from lowering its marginal cost. When one of the offers u_1 and u_2 is attractive enough, U_1 will make an exclusive contract, and so will U_2. When none of the offers is attractive, U_1 will choose non-exclusivity because it believes U_2 will do so. This occurs because when U_1 chooses none in stage 2, U_2 faces the same offers in stage 3 previously presented to U_1. Hence, U_2 makes the same decision that U_1 made. Note that stage 3-1 ensures that U_2 makes the same decision with U_1, as if U_1 has no chance to reconsider, U_2 may have an incentive to choose exclusivity and put U_1 in less favorable terms. This reasoning implies that U_1 will make a decision in stage 2 by comparing its payoff when both upstream firms choose exclusivity to that when both choose non-exclusivity.

The proof begins by checking whether $q_1 = q_2 = \frac{u_1}{\underline{k}} = \frac{u_2}{\underline{k}}$ holds at the equilibrium, in which an exclusive contract is made. Suppose so, then the profit of upstream firm U_1 would be $\pi_{U_1} = u_1 \cdot \frac{u_1}{\underline{k}} - \frac{1}{2}\underline{k}\left(\frac{u_1}{\underline{k}}\right)^2$. It must be $\pi_{U_1} = \pi_U^*$, because if $\pi_{U_1} < \pi_U^*$, U_1 would not have chosen exclusivity, but if $\pi_{U_1} > \pi_U^*$, downstream firm D_1 would have offered a lower u_1 to increase its profit. It follows from $\pi_{U_1} = \pi_U^*$ that

$$\frac{u_1^2}{\underline{k}} = \frac{\overline{k}}{\left(\overline{k}+3\right)^2}$$

or

$$u_1 = \frac{\sqrt{\underline{k}\overline{k}}}{\overline{k}+3} .$$

Consider an unconstrained Cournot equilibrium output when $u_1 = u_2 = \frac{\sqrt{\underline{k}\overline{k}}}{\overline{k}+3}$, which is

$$q_1^{uc} = q_2^{uc} = \frac{1-u_1}{3} = \frac{\overline{k}+3-\sqrt{\underline{k}\overline{k}}}{3\left(\overline{k}+3\right)} .$$

Note that the above output is feasible in the sense that it is compatible with the incentive of an upstream firm, or $q_1^{uc} < \frac{u_1}{\underline{k}}$, given that

$$\frac{\bar{k}+3-\sqrt{\underline{k}\bar{k}}}{3\left(\bar{k}+3\right)}-\frac{u_1}{\underline{k}}=\frac{\left(\sqrt{\bar{k}}-\sqrt{\underline{k}}\right)\left(\sqrt{\underline{k}\bar{k}}-3\right)}{3\sqrt{\underline{k}}\left(\bar{k}+3\right)}<0,$$

when $\underline{k}<\bar{k}\le 2$, which contradicts $q_1=\frac{u_1}{\underline{k}}$. Therefore, $q_1=q_2=\frac{u_1}{\underline{k}}=\frac{u_2}{\underline{k}}$ does not hold at the equilibrium, and a symmetric equilibrium, if any, must satisfy $q_1=q_2<\frac{u_1}{\underline{k}}$.

When $q_1=q_2<\frac{u_1}{\underline{k}}$, $q_1=q_2=\frac{1-u_1}{3}$ holds at the Cournot equilibrium. Hence, $u_1=u_2$ form an equilibrium if D_1 offers the lowest u_1 satisfying $\pi_{U_1}\left(u_1\right)\ge\pi_U^*$ or equivalently,

$$\frac{u_1\left(1-u_1\right)}{3}-\frac{1}{2}\underline{k}\left(\frac{1-u_1}{3}\right)^2\ge\frac{\bar{k}}{2\left(\bar{k}+3\right)^2},$$

and D_2 has an incentive to choose $u_2=u_1$. First, such u_1 exists because LHS is continuous in u_1, and LHS < RHS at $u_1=\frac{\sqrt{\underline{k}\bar{k}}}{\bar{k}+3}$, but LHS>RHS at $u_1=\frac{\bar{k}}{\bar{k}+3}$. To see LHS < RHS at $u_1=\frac{\sqrt{\underline{k}\bar{k}}}{\bar{k}+3}$, note from the above argument that when $u_1=u_2=\frac{\sqrt{\underline{k}\bar{k}}}{\bar{k}+3}$, $q_1=q_2=\frac{1-u_1}{3}<\frac{u_1}{\underline{k}}$ and thus $\pi_U=u_1q_1-\frac{1}{2}\underline{k}q_1^2<\frac{1}{2}\frac{u_1^2}{\underline{k}}=\frac{\bar{k}}{2\left(\bar{k}+3\right)^2}=\pi_U^*$.

Second, D_2 does not have an incentive to deviate from $u_2=u_1=u^{***}$, as shown below. If it offers a higher u_2, q_2 is smaller at the Cournot equilibrium, meaning that D_2 becomes worse off. If it offers a lower u_2, q_1 is smaller at the Cournot equilibrium and thus U_1 would not enter into an exclusive contract with D_1 at u_1, nor with D_2 offering a lower u_2. U_2 would make the same decision, meaning that D_2 ends up with a non-exclusive equilibrium payoff, which is less than the payoff when offering $u_2=u_1=u^{***}$. **Q.E.D.**

Proof of Proposition 2.

It directly follows from Lemma 3 that at the equilibrium in which downstream firms offer $u_1=u_2=u^{***}$, an exclusive contract is entered into and upstream firms earn $\pi_U\left(u^{***}\right)=\pi_U^*$. **Q.E.D.**

Proof of Lemma 4.

It is clear from the proof of Lemma 3 that $\frac{\sqrt{\underline{k}\bar{k}}}{\bar{k}+3} < u^{***} < u^{*} = \frac{\bar{k}}{\bar{k}+3}$. It is easy to see $\frac{\sqrt{\underline{k}}}{\underline{k}+3} < \frac{\sqrt{\bar{k}}}{\bar{k}+3}$ when $\underline{k} < \bar{k} \le 2$, and thus $u^{**} = \frac{\underline{k}}{2\underline{k}+3} < \frac{\underline{k}}{\underline{k}+3} < \frac{\sqrt{\underline{k}\bar{k}}}{\bar{k}+3} < u^{***}$. Now it follows that $q^{***} = \frac{1-u^{***}}{3} > \frac{1-u^{*}}{3} = q^{*}$ and that $p^{***} = 1-2q^{***} < 1-2q^{*} = p^{*}$.

Q.E.D.

REFERENCES

Abbott, A. 2018. "Exclusive Dealing and Competition: A US FTC View," Presentation materials at the ICN workshop, Stellenbosch, South Africa, November 2.

Bernheim, B. D. and M. Whinston. 1998. "Exclusive Dealing," *Journal of Political Economy*, 106(1): 64-103.

Che, Y. and D. Hausch. 1999. "Cooperative Investments and the Value of Contracting," *The American Economic Review*, 89(1): 125-147.

Chen, Y. and M. Riordan. 2007. "Vertical integration, exclusive dealing, and ex post cartelization," *RAND Journal of Economics*, 38(1): 1-21.

Choi, B. 2023. *Regulation vs Market*, Gagyanal Publishing (in Korean).

de Fontenay, C. and J. Gans. 2005. "Vertical Integration in the Presence of Upstream Competition," *RAND Journal of Economics*, 36(3): 544-572.

de Fontenay, C. and J. Gans. 2014. "Bilateral Bargaining with Externalities," *The Journal of Industrial Economics*, 62(4): 756-788.

Hart, O. and J. Tirole. 1990. "Vertical Integration and Market Foreclosure," *Brookings Papers on Economic Activity: Microeconomics*: 205-286.

ICN (International Competition Network). 2013. "Exclusive Dealing," *Unilateral Conduct Workbook* Chapter 5, Presented at the 12th Annual ICN Conference, Warsaw, Poland, April, 2013.

Klein, B. 1988. "Vertical Integration as Organizational Ownership: The Fisher Body-General Motors Relationship Revisited," *Journal of Law, Economics, and Organization*, 4(1): 199-213.

Klein, B., R. Crawford, and A. Alchian. 1978. "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," *The Journal of Law and Economics*, 21(2): 297-326.

Klein, B. and K. Murphy. 2008. "Exclusive Dealing Intensifies Competition for Distribution," *Antitrust Law Journal*, 75(2): 433-466.

Lee, S. and H. Lee. 2012. *Policy Issues for Fair Subcontract*, Policy Study 2012-09, Korea Development Institute (in Korean).

Mills, D. 2017. "Buyer-Induced Exclusive Dealing," *Southern Economic Journal*, 84(1): 66-81.

Nocke, V. and P. Rey. 2018. "Exclusive dealing and vertical integration in interlocking relationships," *Journal of Economic Theory*, 177: 183-221.

Nurski, L. and F. Verboven. 2016. "Exclusive Dealing as a Barrier to Entry? Evidence from Automobiles," *Review of Economic Studies*, 83: 1156-1188.

Tirole, J. 1986. "Procurement and Renegotiation," *Journal of Political Economy*, 94(2): 235-259.

Yang, Y. 2017. *Preventing Unfair Subcontracting Behaviors*, Policy Study 2017-11, Korea Development Institute (in Korean).

Zenger, H. 2010. "When Does Exclusive Dealing Intensify Competition for Distribution? Comment on Klein and Murphy," *Antitrust Law Journal*, 77(1): 205-211.

LITERATURE IN KOREAN

양용현. 2017. 『불공정 하도급행위 개선을 위한 정책과제』, 정책연구시리즈 2017-11, 한국개발연구원.

이수일·이호준. 2012. 『하도급거래의 공정성 제고를 위한 제도개선과제』, 정책연구시리즈 2012-09, 한국개발연구원.

최병선. 2023. 『규제 vs 시장』, 가갸날.

KDI Journal of Economic Policy 2025, 47(3):115-128
https://dx.doi.org/10.23895/kdijep.2025.47.3.115

Sharing Economic Rents with Workers? Evidence from Matched Employer-Employee Data in Vietnam†

By NOBUAKI YAMASHITA*

Utilising matched employer-employee data from Vietnamese small and medium enterprises (SMEs) surveys spanning the time frame of 2007-2015, we investigate the extent to which firms share economic rents with their employees through wage adjustments. Our analysis reveals rent-sharing elasticity of 0.08-0.1, demonstrating that small firms with limited market power engage in rent sharing in response to increased economic rents, measured as value added per employee. This rent sharing is prominent if a worker is related to an owner and is engaged in non-production jobs. However, the analysis based on worker panel data indicates caution against interpreting the results as causal evidence.

Key Words: Rent Sharing, Profits, Vietnam, Small and Medium Enterprises (SMEs), Matched Employer-Employee Data
JEL Code: J31, J46, O12

I. Introduction

There has been a resurgence of interest in understanding how economic rents are shared between workers and firms (Card *et al*., 2018; Bell *et al*., 2024). This has been partly driven by a growing body of evidence indicating the persistence of imperfect competition in the labour market, whereby firms play a significant role setting individual wages (Manning, 2021). Furthermore, greater accessibility to linked employer-employee datasets has contributed to a revival of empirical studies, making it possible to investigate rent sharing between workers and firms in greater depth (Guiso *et al*. 2005; Guertzgen 2009; Juhn *et al*., 2018).

* Corresponding author. Aoyama Gakuin University, Swinburne University of Technology, ANU (E-mail: nobuaki.yamashita@gmail.com)
* Received: 2024. 8. 13
* Referee Process Started: 2024. 8. 14
* Referee Reports Completed: 2025. 3. 25
† This work was supported by JSPS KAKENHI Grant Number JP24K00256 as well as the Aoyama Gakuin University Research Institute.

We contribute to this literature by examining rent sharing by small and medium enterprises (SMEs) in a dynamic emerging economy, in this case Vietnam (McCaig and Pavcnik, 2018). In a companion paper, Yamashita and Ha (2025) examined rent sharing for firms engaged with global value chains (GVC). This paper expands the scope of this work by extending the coverage of data and the period. Our dataset provides a rare opportunity to investigate the extent of rent sharing among SMEs using a rich source of information pertaining to firms and employee attributes.

We estimate the degree of individual wage regression with value added per employee as an indicator of economic rent, together with firm-level and individual-level wage predictors. To account for the unobserved dimensions of individual wage variations, we apply panel firm fixed effects as well as worker fixed effects. While less desirable, we use lagged value added as the primary source in our identification strategy.

Our empirical analysis is guided by the following three intertwined theoretical perspectives (Blanchflower *et al*., 1996; Bell *et al*., 2024). The first is rent sharing mediated by the bargaining of a labour union (Breda, 2015). This has been tested in several countries, including Vietnam. However, in the complex system of the Vietnamese economy, a trade union was found to have limited bargaining power to capture part of economic rent (Bach *et al*. 2021). The second approach recognises market power in a monopsonistic model. This assumes that firms face an upward-sloping supply curve within which favourable demand shocks translate into a rise in rents, wages and employment (see recent work on this approach by Lamadon *et al*., 2022). The third class of theoretical frameworks discerns rent sharing through the lenses of incentive pay. In particular, a small body of evidence suggests that workers' wages are somehow shielded from unfavourable fluctuations in demand shocks (Guiso *et al*., 2005; Juhn *et al*., 2018). Guiso *et al*. (2005) systematically tested the notion of the role of the firm as an insurance provider against risks using a matched employer-employee dataset. The key insight is that firms provide insurance to workers, offering them flat compensation against idiosyncratic shocks in economic rents. This suggests that firms do not necessarily engage in rent sharing, even in good times.

Our analysis suggests that wage elasticity is in the range of 0.08-0.10, which is aligned with other elasticity estimates between 0.05 and 0.20, as surveyed by Card *et al*. (2018). This finding suggests that small firms even with limited market power would share economic rents with employees. A further analysis reveals that rent sharing is more pronounced if a worker is related to owners or has a non-production job. We find no statistical difference in rent sharing between exporters and non-exporters. This represents a sharp contrast to existing studies that find pass-through from rents to wages in the case of exporters (Verhoogen, 2008; Bustos, 2011; Frías *et al*., 2022; Krishna *et al*., 2014; Macis and Schivardi, 2016). The differences in the methods and the working sample (ours is SMEs, whereas the others focus on larger exporting firms) are attributable to this contrast in findings. More importantly, once we introduce worker fixed effects, which absorb time-invariant characteristics (such as unobserved innate skills and abilities), rent sharing is no longer observed. Corroborating with the above findings, rent sharing in our analysis is largely driven by workers' (observed and unobserved) attributes. Hence, we cannot robustly claim

that our findings are causal. Nevertheless, our results highlight an important heterogeneous aspect of rent sharing and offer new evidence that small firms with limited market power share economic rents even in the context of a less robust institutional environment to support workers.

Finding rent sharing for small firms offers a contrasting view that wages are given because firms are too small to set wages. A positive shock in productivity or demand is conventionally assumed to be absorbed via an employment adjustment rather than reflected in a wage adjustment in a competitive market (Bach *et al*., 2021). A further analysis reveals that this observed rent sharing is largely driven by workers' attributes (in particular, the relationships among owners and those with non-production jobs). This defines the importance of modelling a richer dimension of workers' attributes when determining the degree of rent sharing.

II. Empirical Strategy

Our empirical framework follows studies on conventional rent sharing by regressing individual workers' wages on worker and firm attributes using matched employer-employee data (Guiso *et al*., 2005; Macis and Schivardi, 2016; Juhn *et al*., 2018; Verhoogen, 2008; Bell *et al*., 2024). We consider the following wage regression:

$$\ln(w)_{ijt} = \alpha \ln(R_{jt-1}) + X_{i,t}\phi + \delta_t + \delta_j + \varepsilon_{ijt}, \quad (1)$$

where the subscripts denote the following: i for workers, j for firms, and t for year. Both year and firm fixed effects (δ_t, δ_j) are controlled.

In this formulation, the variable of interest R is economic rent, represented by value added (VA) per employee. Our interest is to estimate wage elasticity with respect to changes in economic rent, R. Conceptually, value added is an ideal measure rather than profit because it represents the exact rent available after subtracting costs from revenues (Juhn *et al*., 2018).

A vector of employee attributes (gender, age, job tenures, level of education and on-the-job training) is subsumed in X. The inclusion of a conventional set of demographic and educational variables for workers controls the return of human capital investment in the wage equation.

The immediate concern in Equation (1) is the endogeneity issue between wages (w) and rents (R). The attainment of an effective instrumental variable (IV) remains a contentious issue in the literature, especially in the context of the employer-employee datasets (Card *et al*., 2018; Bell *et al*., 2024). In the ideal context, one should be able to identify firm-specific shocks that translate into wages mediated by rents. However, such a valid instrument has seldom been forthcoming. One promising approach in this endeavour is to use the economic value of innovations (e.g., captured by the excess return in the stock market following a patent grant) as a rent generation instrument (Van Reenen, 1996). While effective, this method by design cannot be implemented in the current study, as the data only cover SMEs, and

none of them are listed on the stock market.

Against this backdrop, we proceeded to estimate Equation (1) under the assumption that shocks take time to be reflected on economic rent impacting wages, as in the case of multiyear contracts. In practice, we use the lagged value of value added (VA) to exert causal effects, influencing the current wages (to be explained further in the data section below).

III. SME data [1]

The data used for this study were extracted from the Survey of Small and Medium Enterprises (SME) of manufacturing industries in Vietnam, as jointly conducted and administered by the Central Institute for Economic Management, the University of Copenhagen and the United Nations University World Institute for Development Economics Research (WIDER) as a biennial interval survey, starting in 2005 and ending in 2015. [2]

SME data have two modules. The first is the enterprise survey, containing information pertaining to firms' characteristics, including sector affiliation, year of creation, the average number of employees, sales, capital investment, wage bills, and the value of exports and imports. This module is panel data with a unique firm identifier. Each wave of the survey covered approximately 2,500 SMEs in ten provinces, which are spread across three regions of Vietnam, i.e., the north (Ha Noi, Ha Tay, Phu Tho, and Hai Phong), south (Ho Chi Minh, Long An, and Khanh Hoa) and central (Nghe An, Quang Nam, and Lam Dong) regions. The surveyed enterprises include households, informal firms, private firms, co-operatives, and limited liability firms, which are represented in each province (Trifković, 2017). Regarding the sampling design, a representative sample of registered household and non-household firms in manufacturing was drawn from the 2002 Establishment Census and the Industrial Survey 2004-2006 of the General Statistics Office of Vietnam (GSO) under a stratified sampling procedure.

The second module constitutes the employee survey from around 400-500 firms, randomly selected from the enterprise module. [3] This employee module includes information about each worker's attributes, consisting of weekly or monthly wages, annual gross earnings (including irregular payments such as overtime, shift work, and bonuses), gender, marital status, educational attainment, prior experience, tenure in the current enterprise, and the category of six different occupations (managers, professionals, service, office, sales, and production workers). This information is available for between one and seven employees.

This study uses both enterprise and employee modules from the survey years of 2007, 2009, 2011, 2013, and 2015. Several notes are in order in the data processing stage. First, the main wage data at an individual level consist of monthly wage

[1] This section is drawn from Yamashita and Ha (2025). A more comprehensive description is offered in Trifković (2017).

[2] https://www.econ.ku.dk/derg/links/vietnam/; https://www.wider.unu.edu/database/viet-nam-data

[3] Hence the double randomization from the firm and employee surveys.

recorded at the time of the survey year (usually in June). The survey data also provide working hours. Hence, in principle, it is possible to construct hourly wages. However, there is little variation in the monthly working hours reported in the original survey data. We decided to use the monthly wage rates. It should also be noted that individual wage data correspond to the survey year (*s*), while firm-level economic accounts (including value added) correspond to the mean values of s-2 and s-1. For example, the 2015 survey included (monthly) individual wages corresponding to the survey year (i.e., 2015) and economic accounts corresponding to 2014 and 2013. For simplicity, we denote the lagged firm-level economic account variables as t-1. Third, the employee data can only be a panel for the adjacent surveys (i.e., for the periods 2011-2013 and 2013-2015).

A. *Descriptive Statistics*

Table 1 details the sample size with column (1) indicating the number of firms, which has consistently been around 400 since the 2007 survey. Column (2) lists the number of employees, which serves as the sample size for our individual wage regression estimations.

Table 2 illustrates the distribution of firms by 2-digit industry. Notably, fabricated metal, food, and wood product industries comprise approximately half of the total number of firms. This concentration across industries illustrates that the sampled firms usually operate in relatively more labour-intensive industries.

Table 3 presents the basic statistics of the firm-level variables. We document the summary statistics according to four different firm types, referred to here as all, family, exporter, and non-exporter types. Family firms operate as household businesses, presumably primarily under family member control. Exporting firms are defined if firms record any positive export sales at least one year during the sample period, and non-exporting firms are all other firms without positive export sales.

The average size (measured by the number of employees) is 20 (with a median of 8). In the World Bank's definition, this sample consists of small firms with to 50 employees, whereas microenterprises are firms with up to ten employees and medium enterprises have up to 300 employees.

As expected, family firms are on average the smallest group of firms with average employment of six workers. Exporting firms, in contrast, have average employment of 66. At the same time, if one considers value added per employee as an indicator of firm-level productivity, exporters are the most efficient group of firms, as documented well in the literature (Bernard and Jensen, 1999).

Table 4 likewise splits the sample according to firm type and shows employee-level variables for each. Individual (monthly) wages in family firms are relatively low compared to those in other firm types. Perhaps this is a reflection of the low-wage industries (often, informal sectors) in which family firms operate (Steer and Sen, 2010). Wages for exporter firms stand as the highest in comparison. This is partly explained by having a relatively more educated and presumably more skilled workforce (on average, 74% of workers at least with a high school diploma). This contrasts with the average 42% of workers with a high school diploma in family firms.

TABLE 1—NUMBER OF FIRMS AND EMPLOYEES IN THE MATCHED EMPLOYER-EMPLOYEE DATA

	(1)	(2)
Survey year	Firms count	Employees count
2007	413	806
2009	401	1,032
2011	462	1,153
2013	448	1,236
2015	408	1,078
Total	2,132	5,305

Notes: Based on SME data.

TABLE 2—NUMBER OF FIRMS ACCORDING TO THE 2-DIGIT VIETNAM STANDARD INDUSTRY CLASSIFICATION

	# of firm	Share %
Fabricated metal products	401	18.8
Foods	392	18.4
Wood and of products of wood and cork	239	11.2
Furniture	158	7.4
Rubber and plastic products	142	6.7
Wearing apparel	123	5.8
Non-metallic mineral products	113	5.3
Paper and paper products	74	3.5
Weaving	73	3.4
Printing and reproduction of recorded media	65	3.0
Beverages	50	2.3
Other electrical equipment	44	2.1
Leather and related products	42	2.0
Metals	37	1.7
Other chemical products	34	1.6
Electrical appliances	34	1.6
Motor vehicles	21	1.0
Other industries	90	4.2
Total	2,132	100.0

Notes: Based on SME data, Vietnam.

TABLE 3—SUMMARY STATISTICS FIRM-LEVEL VARIABLES

All	N	Mean	SD	Median
Size	2,128	20	35	8
Profits	2,128	28.37	60.55	15.60
Revenue	2,128	203.24	1245.25	94.27
Remuneration	2,128	16.51	11.97	14.37
Value added	2,128	45.34	65.45	30.67

Family	N	Mean	SD	Median
Size	1,092	6	6	5
Profits	1,092	20.65	35.22	14.56
Revenue	1,092	115.96	209.33	81.43
Remuneration	1,092	12.67	9.39	11.09
Value added	1,092	33.35	40.54	26.38

Exporter	N	Mean	SD	Median
Size	190	66	68	47
Profits	190	51.96	106.80	24.91
Revenue	190	406.80	1,311.77	190.89
Remuneration	190	26.43	23.85	20.22
Value added	190	79.70	117.99	47.57

Non-exporter	N	Mean	SD	Median
Size	1,938	16	25	7
Profits	1,938	26.06	53.42	15.25
Revenue	1,938	183.29	1237.09	90.25
Remuneration	1,938	15.53	9.56	13.93
Value added	1,938	41.98	56.73	29.98

Notes: Based on SME data. Size refers to the number of (full-time) employees. Profit is profit per employee (million dong). Revenue is total revenue per employee (million dong). Remuneration is total wage bills per employee (million Dong). Value added is value added per employee (million Dong). All accounting values are converted into their corresponding real value according to the 2005 CPI as the base year. All refers to the full sample; family is ownership identified as a household business; exporter refers to an exporting firm (if positive export sales are recorded for at least one survey year); and non-exporter refers to all other firms not classified as exporters.

TABLE 4—SUMMARY STATISTICS, EMPLOYEE-LEVEL VARIABLES

All	N	Mean	SD	Median
Gender	5,287	0.59	0.49	1
Education	5,287	0.6	0.49	1
Age	5,287	32.92	9.74	31
Training	5,287	0.4	0.49	0
Tenure	3,452	6.02	5.11	5
Wage (monthly)	5,287	1,650.35	782.74	1,496.56

Family	N	Mean	SD	Median
Gender	1,753	0.71	0.45	1
Education	1,753	0.42	0.49	0
Age	1,753	32.1	10.01	30
Training	1,753	0.37	0.48	0
Tenure	1,085	6.12	5.57	4
Wage (monthly)	1,753	1,468.14	667.04	1,395.61

Exporter	N	Mean	SD	Median
Gender	688	0.44	0.50	0
Education	688	0.74	0.44	1
Age	688	33.49	9.41	32
Training	688	0.48	0.50	0
Tenure	394	5.85	4.21	5
Wage (monthly)	688	1,861.3	888.44	1,666.39

Non-exporter	N	Mean	SD	Median
Gender	4,599	0.61	0.49	1
Education	4,599	0.58	0.49	1
Age	4,599	32.84	9.79	31
Training	4,599	0.39	0.49	0
Tenure	3,058	6.04	5.21	5
Wage (monthly)	4,599	1,618.79	760.77	1,488.65

Notes: Based on SME data. Gender is a dummy taking a value of one if the worker is male. Education is a dummy taking a value of one if a worker has at least a high school diploma. Age is the age of a worker. Training is a dummy variable that takes a value of one if on-the-job training is provided. Tenure is the length of service in years at the current firm. Wage (in 1,000 Vietnamese Dong) is the real monthly wage recorded in June.

IV. Results

A. *Baseline Results*

Table 5 presents the benchmark results. We only report the variable of value added per employee (a proxy for firm-level economic rent). In column (1), the wage equation is estimated only with value added. In column (2), the model includes both firm controls (the number of employees and the capital and labour ratio) as well as worker-level controls (gender dummy, education dummy, age, job training dummy, job tenure, and real (monthly) wage rate, together with year and firm fixed effects.

The estimated coefficient for rent sharing in column (1) is 0.082, showing statistical significance. This implies that on average a 10% increase in economic rent (value added per employee) is associated with a 0.8% increase in the wage rate of an individual employee. This benchmark estimate conforms within the estimates of other studies in the range of 0.05 and 0.20 with regard to the rent-sharing elasticity found in the literature (Card *et al*., 2018).

The inclusion of firm and employee attributes increases wage elasticity to 0.1 (column 2). In the subsequent regressions, we include a two-period lag of value

TABLE 5—ESTIMATION OF THE RENT-SHARING MODEL FOR THE SURVEY PERIOD 2007-2015

	Dependent variable: Wages					
	(1)	(2)	(3)	(4)	(5)	(6)
Value added (VA) $_{t-1}$	0.0822***	0.1028***	0.0738**	0.0983***		
	(0.021)	(0.022)	(0.032)	(0.037)		
Value Added (VA) $_{t-2}$			0.0086	0.0041		
			(0.029)	(0.029)		
Value Added [a] (t-1) $_{t-1}$					0.0305**	0.0408***
					(0.012)	(0.013)
Firm controls	-	Y	-	Y	-	Y
Employee controls	-	Y	-	Y	-	Y
Firm Fes	Y	Y	Y	Y	Y	Y
Year Fes	Y	Y	Y	Y	Y	Y
R-squared	0.5	0.5	0.5	0.5	0.5	0.5
Number of firms	1,008	1,008	598	598	1,004	1,004
Obs.	5,287	5,287	3,004	3,004	5,215	5,215

Notes: All models are estimated by ordinary least squares with standard errors clustered according to the firm type in parentheses. The dependent variable is the log of the real wage rate at the individual worker level. Value Added (VA) is the real value added per employee with a one-period lag (t-1) and a two period-lag as t-2. VA[a] is defined by subtracting total wage bills from value added. Firm controls include relevant firm-level variables, the log of the number of employees and the log of capital and labour ratio. Employee controls include worker-level variables, in this case gender, education age, training and tenure (see Table 4 for definitions of these variables). Year and firm fixed effects are included in all regressions. *** denotes 1% significance; ** denotes 5% significance.

added without (column 3) and with firm and workers controls (column 4). While further lags are statistically insignificant, a one-period lagged value added sustains as a positive sign with statistical significance.

In columns (5) and (6), we redefined value added because it typically includes total wage bills. This could exacerbate endogeneity by creating linkages between value added and residual wage in Equation (1). To mitigate this concern, we subtract total wage bills from value added and use it as a rent variable. As expected, the redefined value added shows lower wage elasticity (0.03 in column 5 and 0.04 in column 6). However, the estimates preserve statistical significance with the standard test.

Overall, the benchmark estimates in Table 5 show that there is evidence of rent sharing among small firms after controlling for firm and worker-level controls. In the further analysis below, we explore several dimensions of heterogeneity in firms' and workers' attributes.

B. *Heterogeneity*

In Table 6, we provide the rent-sharing estimate by introducing a dummy variable to reflect a set consisting of firm and worker heterogeneity. An interaction term between rents and various indicators of firm ownership and worker attributes should indicate heterogeneity in rent sharing. In all regressions, we have included firm and worker control variables together with firm and year fixed effects.

Most notably, in column (3), the results indicate that if a worker is related to the owner (i.e., is a family member), wage elasticity is greater compared to those of workers without such family connections. Similarly, rent sharing appears to be prevalent depending on the type of job. The estimates in column (5) suggest that wage elasticity is greater for non-production workers (such as sales, services and managerial jobs) than for production workers.

While our analysis reveals that exporters pay higher wage levels on average (Table 2), the responsiveness of wages to changes in firm performance (wage elasticity) is statistically indistinguishable between exporting and non-exporting firms (column 4). This finding diverges from previous studies that have demonstrated strong rent-sharing by exporting firms. These studies typically leverage quasi-natural experiments, such as plausibly exogenous shocks in the form of, for instance, exchange rate devaluations and trade liberalisation (Verhoogen, 2008; Bustos, 2011; Frías *et al*., 2022; Krishna *et al*., 2014; Macis and Schivardi 2016). Furthermore, our research focuses on small and medium-sized enterprises (SMEs), whereas the cited studies predominantly examine larger exporting firms (e.g., those with at least 50 employees), which may be more productive and skill-intensive. Such larger exporters may be in a better position to benefit from positive demand shocks. These methodological and sample differences may limit our ability to detect significant rent-sharing effects.

In columns (6) and (7), we have introduced an interaction term with the role of worker unions and the presence of formal wage contracts. It could be the case that having a formal contractual agreement between employers and employees limits any further fluctuations in wages and economic rent. This may restrict any deviation from

TABLE 6—RENT SHARING BY TYPE OF ENTERPRISE AND WORKER FOR THE PERIOD OF 2007-2015

	Dependent variable: Wages						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Value Added $(VA)_{t-1}$	0.1031***	0.1034***	0.1091***	0.1120***	0.1078***	0.1204***	0.1130***
	(0.022)	(0.022)	(0.022)	(0.025)	(0.023)	(0.023)	(0.020)
VA_{t-1} * Family firm	-0.0022						
	(0.009)						
VA_{t-1}* Corporate firm		-0.0097					
		(0.007)					
VA_{t-1}* Related to owners			0.0064***				
			(0.002)				
VA_{t-1} * Exporters				-0.0559			
				(0.047)			
VA_{t-1} * Non-production workers					0.0129***		
					(0.001)		
VA_{t-1} * Contract						-0.0581	
						(0.032)	
VA_{t-1} * Union							-0.0794
							(0.060)
Firm controls	Y	Y	Y	Y	Y	Y	Y
Employee controls	Y	Y	Y	Y	Y	Y	Y
R-squared	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Number of firms	1,008	1,008	598	598	1,004	1,008	1,008
Obs.	5,287	5,287	3,004	3,004	5,215	5,287	5,287

Notes: All models are estimated by ordinary least squares with standard errors clustered according to the firm type in parentheses. The dependent variable is the log of real wage rates at the individual worker level; Value Added (VA) is the real value added per employee with a one-period lag (t-1). Firm controls include relevant firm-level variables, the log of the number of employees and the log of capital and labour ratio; Employee controls include worker-level variables, specifically gender, education age, training and tenure (see Table 4 for definitions of these variable). Family firms represent the legal status of these firms as household establishments/businesses. Corporate firms include private firms (sole proprietorships), partnerships, collectives/cooperatives, limited liability companies, joint-stock companies with state capital, joint-stock companies without state capital, joint ventures with foreign capital, state enterprises (central), and state enterprises (local). Related to owners is a dummy variable coded as one if a worker is an owner, related to an owner living in the same household, or related to an owner but not living in the same household. Exporter refers to an exporting firm (if positive export sales are recorded for at least one survey year). Production worker is a dummy variable coded as one if a worker is engaged with production work. Contract is a dummy variable coded as one if a worker has a formal wage contract signed. Union is a dummy variable coded as one if a worker is a member of a trade union. Year and firm fixed effects are included in all regressions. *** denotes 1% significance; ** denotes 5% significance.

the set wage negotiated between employees and employers. Specifically, the employee module of the SME survey asks if workers receive any formal contracts in a yes-or-no binary survey question.[4] We also split the sample according to the coverage of labour unions at the worker level (column 7). In neither case did we find that having a wage contract or union membership facilitates rent sharing with employees, possibly because having such mediation instruments could shield workers from idiosyncratic shocks while preserving wage stability. A lack of rent sharing for union members echoes the finding of Bach *et al*. (2021) in their study that used the same SME dataset used here. In any case, rent sharing occurs regardless of the institutional setting and whether wage bargaining is facilitated by trade unions or not (Card *et al*., 2018).

C. *Stayer Sample*

In the last segment of the analysis, we explore the panel structure of the employee dataset, allowing us to control for unobserved worker heterogeneity. By focusing on employees who are observed within the same firm over the survey period, we can

TABLE 7—RENT SHARING FOR THE STAYER SAMPLE

	(1)	(2)
Panel A: Period 2011–13		
Value Added $(VA)_{t-1}$	0.1009	0.0996
	(0.077)	(0.131)
Firm controls	Y	Y
Individual controls	Y	Y
Worker FEs		Y
N of unique firms	121	121
Obs.	464	464
Panel B: Period 2013–15		
Value Added $(VA)_{t-1}$	0.1431***	0.1006
	(0.045)	(0.111)
Firm controls	Y	Y
Individual controls	Y	Y
Worker Fes		Y
N of unique firms	142	142
Obs.	284	284

Notes: The dependent variable is the log of the real wage rate at the individual worker level; Value Added (VA) is the real value added per employee with a one-period lag (t-1). Firm controls include relevant firm-level variables, the log of the number of employees and the log of capital and labour ratio. Employee controls include worker-level variables, specifically gender, education age, training and tenure (see Table 4 for definitions of these variables).

[4] The exact question is 'Do you have a formal (written down) labour contract?' The binary response of 'Yes' or 'No' is recorded.

reduce potential bias related to unobserved skill differences and innate abilities. Therefore, we limit our analysis to employees who appear in multiple surveys. However, as noted in the data section, one issue that arises when using the panel component of employee data is that we can only identify repeatedly surveyed employees if they appeared only in adjacent surveys (e.g., it is only possible to identify the panel of workers either in 2011-13 or 2013-15). In practice, wage regression (Equation 1) now includes worker-fixed effects, δ_i, which would absorb all time-invariant components among workers.

Our empirical results for the stayer sample are presented in Table 7, which is divided into Panel A (2011-13) and Panel B (2013-15). Column (1) reports the estimated wage regression, leveraging the panel structure of workers but omitting worker fixed effects. In Panel B, we find a statistically significant positive effect of rent sharing. However, when we include worker fixed effects, this effect disappears (column 2 of Panel B). This indicates that worker fixed effects account for the primary source of individual wage variation. The restricted sample of stayers, while closer to the ideal dataset for causal evidence, necessarily reduces the number of observations, potentially lowering the statistical power. Consequently, we refrain from strongly claiming a causal interpretation of our findings with regard to rent sharing.

V. Conclusion

This paper examined the extent of rent sharing within the context of one of the most dynamic emerging economies, Vietnam. Empowering a matched employer-employee dataset, we estimated wage elasticity with respect to economic rents. The benchmark estimates indicate a rent-sharing coefficient of 0.08-0.1, falling within the range of the elasticities documented in prior studies (Card *et al*., 2018). Furthermore, our analysis revealed that the observed rent sharing is more pronounced if a worker is related to an owner or has a non-production occupation. While we do not show any statistical difference in rent sharing between exporters and non-exporters, our study suggests the presence of rent sharing even for small firms with limited market power. However, we caution against claiming our results are causal evidence because rent sharing is no longer observed as soon as we introduce worker fixed effects. Despite this limitation, our study demonstrates the presence of rent sharing by small firms in the context of weaker institutional settings. There is a need for further research on this topic, especially that which uses a richer dataset source capable of capturing several dimensions of worker and firm attributes and their effects on rent sharing.

References

Bach, T. N., C. Q. Le, and T. V. Nguyen. 2021. "Rent Sharing, Investment, and Collective Bargaining: Evidence from Employee-Level Data in Vietnam," *The Developing Economies*, 59: 3-38.

Bell, B., P. Bukowski, and S. Machin, 2024. "The Decline in Rent Sharing," *Journal of Labor Economics*, 42(3): 683-716. https://doi.org/10.1086/724570.

Bernard, A. B., and J. Bradford Jensen. 1999. "Exceptional Exporter Performance: Cause, Effect, or Both?" *Journal of International Economics*, 47(1): 1-25.

Blanchflower, D. G., A. J. Oswald, and P. Sanfey. 1996. "Wages, Profits, and Rent-Sharing," *The Quarterly Journal of Economics*, 111(1): 227-251.

Breda, T. 2015. "Firms' Rents, Workers' Bargaining Power and the Union Wage Premium in France," *Economic Journal*, 125: 1616-1652.

Bustos, P. 2011. "Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinian firms," *American Economic Review* 101(1): 304-340.

Card, D., A. R. Cardoso, J. Heining, and P. Kline. 2018. "Firms and Labor Market Inequality: Evidence and Some Theory," *Journal of Labor Economics*, 36: 13-70.

Frías, J. A., D. S. Kaplan, E. Verhoogen, and D. Alfaro-Serrano. 2024 "Exports and Wage Premia: Evidence from Mexican Employer-Employee Data," *Review of Economics Statistics*, 106(2): 305-321. https://doi.org/10.1162/rest_a_01178.

Guertzgen, N. 2009. "Rent-Sharing and Collective Bargaining Coverage: Evidence from Linked Employer-Employee Data," *The Scandinavian Journal of Economics*, 111(2): 323-349.

Guiso, L., L. Pistaferri, and F. Schivardi. 2005. "Insurance within the Firm," *Journal of Political Economy*, 113(5): 1054-1087. https://doi.org/10.1086/432136.

Juhn, C., K. McCue, H. Monti, and B. Pierce. 2018. "Firm Performance and the Volatility of Worker Earnings," *Journal of Labor Economics*, 36(S1): S99-S131.

Krishna, P., J. P. Poole, and M. Z. Senses. 2014. "Wage Effects of Trade Reform with Endogenous Worker Mobility," *Journal of International Economics*, 93(2): 239-252.

Lamadon, Thibaut, Magne Mogstad, and Bradley Setzler. 2022. "Imperfect Competition, Compensating Differentials, and Rent Sharing in the US Labor Market," *American Economic Review*, 112(1): 169-212.

Macis, Mario and Fabiano Schivardi. 2016. "Exports and Wages: Rent Sharing, Workforce Composition or Returns to Skills?" *Journal of Labour Economics*, 34(4): 945-978.

Manning, A. 2021. "Monopsony in Labor Markets: A Review," *ILR Review*, 74(1): 3-26. https://doi.org/10.1177/0019793920922499.

McCaig, B. and N. Pavcnik. 2018. "Export Markets and Labor Allocation in a Low-Income Country," *American Economic Review*, 108(7): 1899-1941.

Steer, L. and K. Sen. 2010. "Formal and Informal Institutions in a Transition Economy: The Case of Vietnam," *World Development*, 38(11): 1603-1615.

Trifković, Neda. 2017. "Spillover Effects of International Standards: Working Conditions in the Vietnamese SMEs," *World Development*, 97: 79-101.

Van Reenen, J. 1996. "The Creation and Capture of Rents: Wages and Innovation in a Panel of U. K. Companies," *The Quarterly Journal of Economics*, 111(1):195-226. https://doi.org/10.2307/2946662.

Verhoogen, E. A. 2008. "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector," *Quarterly Journal of Economics* 123(2): 489-530.

Yamashita, N. and D. Ha. 2025. "Participation in Global Value Chains and Rent Sharing by Small Firms in Vietnam," *Asian Economic Journal*, 39(1): 75–97. https://doi.org/10.1111/asej.12348.

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
韓國開發研究

Registration Number 세종 바00002호
Printed on August, 28, 2025
Published on August, 31, 2025
Published by Dongchul Cho, President of KDI
Printed by Hyundai Artcom

Price : 3,000 KRW
@Korea Development Institute 2025
Registered on March, 13, 1979

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

53
9 772586 299000
ISSN 2586-2995