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Contents

List of Tables

List of Figures

I

Introduction

1 Background

State enterprises are "extended arms of government." The efficiency of state-owned enterprises (SOEs) is as important as that of the government, because they act on behalf of the government. For this reason, the government and the National Assembly invest great amounts of materials and human resources in raising the operational efficiency of SOEs[1].

Accurate diagnosis and assessment of management conditions is a prerequisite to the formulation of plans that can improve the efficiency of these enterprises. Unlike private enterprises, state enterprises cannot be fairly evaluated for organization efficiency on the basis of financial statements and market evaluations[2].

Unlike the performance of private enterprises, the performance of SOEs is affected by monopolistic rent[3] and indirect subsidies provided by the government, in addition to the efficiency of the organization itself. Mathe-

1) A case in point is the management evaluation that is conducted every year on over 100 state enterprises.

2) For example, market-based public corporations operate in much the same way that private corporations do.

3) If a private company enjoys a monopolistic status, it means, in many cases, that the company is efficient enough to win the fierce competition in the market. In this sense, monopolistic rent is a concept that does not necessarily run counter to efficiency in case of private companies. However, this logic does not apply to state enterprises because in most cases, state enterprises gain a monopolistic status as a result of legal provisions or policy decisions by the government.

matically, this can be expressed as follows:

Performance of state enterprises= f(efficiency, rent, subsidies)

To make public corporations more competitive, the government should first identify and quantify the impact of factors such as efficiency, rent and subsidies, upon public corporations' performance.

When state enterprises raise funds by issuing debt, they often benefit from the gap between the interest rates they pay and the actual market interest rates, or the interest rates that private corporations should pay on corporate bonds that they issue under similar conditions. This gap represents interest cost that state enterprises can save and which can therefore be considered a financial subsidy in the form of an implicit debt guarantee. The primary purpose of this research is to identify the existence and size of this type of government subsidy.

This research is motivated by a desire to address the problem of excessive public debt incurred by state enterprises, which has emerged as one of the greatest controversies in designing policies for these enterprises over the past four or five years.

Excessive debt by public enterprises is a symbol of inefficiency in the public sector and, more importantly, it undermines the financial soundness of the government. This research is meaningful and necessary for two reasons. First, excessive focus on the size and causes of public debt can cause another form of inefficiency, because government officials will likely be tempted to offer solutions that they deem feasible or executable. The problem, however, is that even government officials lack access to private information such as the optimal amount of debt for other organizations, including other state enterprises, to benchmark in order to determine the government's optimal size of debt. Second, causes of debt should be identified and analyzed in order to prescribe viable solutions to the excessive debt held by government agencies.

State enterprises tend to be incentivized to accumulate more debt than is optimal because they have privileges that private corporations lack, especially when raising funds. This phenomenon will be analyzed from the perspective of moral hazard and externalities.

The approach of this study is heavily influenced by existing academic

research (e.g., Strahan 2013, one of the most comprehensive literary studies on the topic of "too big to fail" (TBTF), as treated by the US Federal Reserve Board and the US Congress over the past 10 years.

Scholars (Acharya et al. 2013, Balasubramnian & Cyree 2012, 2014) and policy makers concluded that the best way to correct the inefficiency that arises from TBTF is to eliminate the market's expectation that the government will rescue large financial institutions by extending guarantees when they face the risk of failure. This research applies the same approach to debt held by state enterprises in Korea and attempts to identify efficient ways to manage their debt.

2 Major Conclusions

The size of subsidies that state enterprises receive from the government when raising funds is estimated via the following three steps.

A credit-rating-determining model is designed, based on existing academic research. The key is to design the model to generate a reasonable estimate of the actual credit rating of a state enterprise in the absence of a government guarantee.

The model is based on the hypothesis that no government guarantee is available to private companies, and applies the most widely accepted theory in economics and financial management, which holds that the default risk and credit rating of a corporation are determined by firm-specific risks and market risk. A regression analysis was performed, using data from private corporations to assess the impact of firm-specific risks and market risk on credit rating. Then the risks were replaced with risks specific to state enterprises to estimate the default risk and credit ratings of state enterprises in the absence of government guarantees.

The same method was used to estimate the yields of bonds issued by state enterprises without government guarantees. Credit ratings and bond yields were estimated in two steps, because the yields of bonds issued by public enterprises are affected by the credit ratings of the issuing public enterprises and because government guarantee is already factored into the credit ratings.

A reasonable estimate of bond yields without government guarantee is possible only after eliminating the effects of government guarantee from the existing credit ratings. An estimate is obtained based on private corporations' data, as a benchmark model.

Finally, the estimated bond yield was compared to the actual yield to obtain the yield spread (i.e., the estimated yield of a state enterprise or the actual yield), which was multiplied by the amount of bonds issued by the state enterprise for each year to calculate the financing cost saved by the enterprise. In other words, the saved cost of interest is considered a subsidy that the government has provided to the state enterprise.

Using these steps, this research has yielded the following key conclusions.

First, the average credit rating of public corporations produced according to the benchmark model for private companies was A0. This rating was four notches lower than AA+, the actual credit rating, and this result was statistically significant. Surprisingly, the estimated average credit rating of public corporations was lower than that of private corporations.

Second, the estimated bond yield to maturity (or "the degree of risk for bonds issued by public corporations") for public corporations averaged 5.45%. The spread against the actual yield to maturity shows that public corporations had an average gain of approximately 1.76% in their bond yields.

The estimated yield to maturity of state enterprises that benefit from explicit provisions for deficit recovery was 5.97% with a 2.33% difference from the actual yield, and the yield spread was larger than that of state enterprises that were not covered by a deficit recovery scheme. There was a yield spread of 0.94% even for public corporations, to which the provisions of deficit recovery did not apply. When the provisions of deficit recovery are considered as an explicit government guarantee, these results can be interpreted as follows.

Explicit provisions of financial support from the government allow public corporations to issue bonds at a lower cost than their private-sector counterparts under the same conditions. Even public corporations that are not eligible for this financial support benefit from these provisions as free riders, albeit to a lesser degree. This means that public enterprises benefit from a preferential status because market participants rule out the possibility that public enterprises can fail.

Third, public corporations are estimated to have saved a total of 6.84 trillion from 2007 to 2015, by taking advantage of the government's implicit guarantee in the process of raising funds via bond issuances. In other words, they received an average sum of 760 billion in subsidies each year.

According to this research, if a public enterprise issues corporate bonds worth 100 million won, the funding cost is estimated to be around 1.5 million won lower than for a private corporation under the same conditions.

Four policy alternatives are suggested in this research to reduce moral hazard and negative externalities that may arise from the government's implicit guarantees.

The first alternative is internalization through imposition of corrective tax. The paper will explain how the size of an optimal corrective tax, the most critical factor in taxation, can be determined by the market.

The second alternative is to charge a fee for government guarantees to recover the subsidy provided to state enterprises.

The third option is to recover implicit subsidies from the recipient public corporations in the form of dividends. The amount of a subsidy can be determined by a specific formula, it can be used as the lower bound for the dividend that the public corporation should pay to the government, and the government can demand the amount when the corporation decides to pay dividends.

Finally, instead of the government actually providing a subsidy, the estimated amount of a subsidy can be determined in the process of conducting a preliminary feasibility assessment for a project that will be financed by bond issuance. Whether the project should be pursued can be decided based on the results of treating the estimated subsidy as a cost[4].

4) In another approach, the discount rate that is used for a preliminary feasibility assessment or a cost–benefit analysis can be replaced by the estimated yield in case of no government guarantee, as provided in this research. Cost–benefit analysis can produce more accurate results and excessively risky investments can be avoided because risks specific to the individual public corporation are factored in.

Ⅱ

Preceding Research

1 Domestic Research on State Enterprises' Debt

Most research that academia and state-owned research institutes have conducted regarding debts held by state enterprises has focused on the size of the debt and the causes of the growing debt amount.

〈Table Ⅱ-1〉 **Causes of Growth in State Enterprises' Debt and Preceding Research on Policy Responses**

Scholars/ Government	Causes of Growth in Debt	Policy Responses
Kim Young-shin (2012)	Weakened independence of state enterprises and moral hazard	Monitoring by the National Assembly and privatization of non-viable public corporations
Park Jung-soo (2013)	National crisis management, future -oriented investments, execution of national policy projects, provision of low-cost pubic services	Broader application of the separate accounting system, rationalization of cost recovery for public services, greater effectiveness of preliminary feasibility assessment and mid-term financial management improvement plans, an improved management assessment system
Park Jin & Huh Gyeong-sun (2013)	Policy projects, regulation of public services fees, inefficiency of public institutions	·Increased fees for public services, scale-down of policy projects, more government support

〈Table II-1〉 **Continued**

Scholars/ Government	Causes of Growth in Debt	Policy Responses
Jo Young-cheol & Kim Jae-hwan (2011)	Analysis of legal basis for financial debt issuance, the decision-making system, ceilings, and so forth, from the perspective of public corporations' financial soundness	Some public corporations issue bonds when their capital is impaired, no legal basis for raising funds, bond issuance ceilings are excessively high, thus eroding financial health
Kim Sang-hun (2014)	Reckless management is identified as a cause of growing debt and problems are raised with regards to a single approach to debt reduction for different organizations	Integrated management of government debt, enhanced feasibility of projects and investments, long-term financial management plans and phased management, regulation of aggregate debt amount, organization of a special committee under the National Assembly, changes to how hea
National Assembly Budget Office (2013)	Causes of growing debt held by different groups of public enterprises, including investments in overseas resources development projects	Preparation of separate financial statements for policy projects and projects of individual public organizations under the separate accounting rules, excessive debts associated with policy projects are factored in the performance assessment of the relevant government ministries
Ha Se-jung et al. (2014)	There is a statistically significant correlation between most of the previously suggested debt-causing factors and debt	Debt-reduction plans need to be customized to fit the type of debt (of the organization? or debt.

Sources: Ha Se-jung, Oh Young-min, & Ra Young-jae "Policy Responses for Sustainable Debt Management by Public Enterprises", Korea Institute of Public Finance, 2014. Partly revised excerpts from the paper.

2 Research on TBTF in Other Countries

Most related studies in other countries have focused on moral hazard in financial institutions that is caused by deposit insurance systems. The financial gain from low interest rates that apply to large financial institutions that are "too big to fail" is treated as a non-budgeted subsidy. The purpose of this research is to estimate the size of such subsidies and analyze factors that affect their amounts.

〈Table II-2〉 **Preceding Research on TBTF**

Scholar/ Government	Targets of Analysis and Methodology	Conclusions
Ueda and di Mauro(2013)	• Credit ratings of around 895 banks in 95 countries	• Even the expectations of a bailout alone lowered the funding cost for SIFIs, with no government guarantee prior to crisis
GAO (2014)	• 42 different regression analysis formulas were used, examines if large financial institutions benefit from lowered cost of bond issuance, by analyzing bond spreads	• Whatever regression analysis formula is used, large financial institutions benefited from reduced funding cost before 2008, but the outcomes vary depending on the formula in 2013
Lambert et al. (2014)	• Contingent claims analysis approach and rating-based approach are used to estimate the value of subsidies granted to systematically important banks (SIBs) in major countries	• According to the contingent claims analysis approach, around 90 bpts in the euro zone and 15 bpts in the U.S.; according to the rating-based approach, 60 bpts for distressed SIBs and 75 bpts in the U.S.
Tsesmelidakis and Merton (2012)	• Structural model-based methodology, 74 US financial institutions from 2007 to 2010	• The wealth transferred to shareholders and creditors via implicit guarantees are $129 billion and $ 236, respectively
Crippen (2001)	• Calculate the amount of subsidies generated by implicit government guarantees provided by Fannie Mae, Freddie Mac, and FHLB (including various forms of tax benefits)	• Subsidies provided to government-sponsored enterprises (GSEs) including Fannie Mae totaled 13.6 billion dollars in 2000; approximately 5.0 billion dollars of the subsidies ended up with GSEs

Ⅲ

Theoretical Approaches

1 Moral Hazard: Excessive Risk-Taking

Moral hazard results from information asymmetry that prohibits one party to a contract from observing the other party's actions. The most typical case of moral hazard, which is often discussed in standard microeconomics textbooks, is insurance. The moral hazard of TBTFs, however, which will be discussed in this paper, is structurally different from traditional moral hazards.

First, who creates moral hazard? The answer is clear in the private fire insurance market. Moral hazard associated with TBTF is caused by financial institutions, and specifically by the shareholders and creditors of financial institutions.

Next, who will benefit the most? While individual shareholders may face consequences including capital reduction after a bailout, institutional investors can profit from a bailout because they can recoup a portion of their investments, even if their monitoring efforts were less than optimal.

Moral hazard issues involving state enterprises, which will be discussed in this paper, differ in nature from the moral hazards of large financial institutions. The too-big-to-fail myth, which posits that state enterprises will not be permitted to fail regardless of the magnitude of damage that a failed state enterprise can inflict on the markets, will be discussed later in more detail.

2 Externalities

Excessive debts incurred by public corporations can be viewed from the viewpoint of external effects or externalities. Government guarantees to cover potential losses that a public corporation may sustain can create positive external effects when a project pursued by the public corporation is not fairly assessed[5], and is thus unlikely to attract sufficient investments due to underdevelopment of the capital markets or severe information asymmetry.

Kocherlakota (2010) argues that when the market becomes aware that a bailout is inevitable for a financial institution, both the financial institution and investors have few incentives to internalize their risks and may take more risks than they otherwise would, thus posing a threat to the market. In this way, implicit government guarantees for public corporations can cause negative external effects.

Even though a government guarantee does not entail actual costs until a default occurs, it causes problems including excessive debt, over-investment, moral hazard, and crowding out of private investments, which constitute the cost of TBTF. Accordingly, TBTF will be examined as a negative externality in this paper.

5) A case in point is fruit farm. The more fruit trees the owner of a fruit farm plants, the more the bee keepers in the same neighborhood can benefit (social benefit), but the fruit farm owner tends to plant fewer trees than the socially optimal number of trees because doing so does not directly benefit the farm owner. Can this logic apply to projects of public enterprises? It is not likely for two reasons. First, there is a high chance that social benefits are adequately taken into consideration in preliminary feasibility assessments. Second, government guarantees may have been already factored into the discount rates that investors in public corporations use in their cost–benefit analyses of the target corporations. In other words, government guarantees have a positive impact on valuation of investments.

Ⅳ

Overview of Bond Issuance by State Enterprises and Government Support

1 Bond Issuance by State Enterprises

State enterprises had a combined debt of approximately 520 trillion won at the end of 2014 (according to a press release dated April 30, 2015 from the Ministry of Strategy and Finance). A large portion of this debt is financial and requires interest payments. Public corporations raise funds by issuing debt according to the laws governing their establishment and the provisions of their articles of incorporation, but in most cases the board of directors is entrusted to determine the specific terms of bond issuance.[6)]

2 Mandatory Deficit Recovery for State Enterprises

There are "legal provisions that require the government to make up for a deficit of a state enterprise if the enterprise does not have sufficient retained earnings to cover the deficit."[7)]

6) Lee Eun-gyeong, "Financial Debt Issuance Ceiling for State Enterprises, and Issues and Future Tasks Surrounding the Decision-Making System", National Assembly Budget Office, 2012

7) Huh Won-jae, "Mandatory Deficit Recovery for State Enterprises that Hurts National Finance ", KERI column, 2014

〈Table IV-1〉 **Debt Issuance Ceiling for State Enterprises**

	Legal Basis	Debt Issuance Ceiling
Korea Coal Corporation	Korea Coal Corporation Act	Equal to capital and reserves
Busan Port Authority	Busan Port Authority Act	4 times capital and reserves
Incheon International Airport Authority	Incheon International Airport Corporation Act	4 times capital and reserves
Incheon Port Authority	Port Authority Act	4 times capital and reserves
Jeju Free International City Development Center	Special Act on the Establishment of Jeju Special Self-Governing Province and the Development of Free International City	No ceiling (2006.2.21.)
KOGAS	Korea Gas Corporation Act	4 times capital and reserves
Korea Airports Corporation	Korea Airports Corporation Act	4 times capital and reserves
Korea Tourism Organization	Korea Tourism Organization Act	4 times capital and reserves
Korea Resources Corporation	Korea Resources Corporation Act	4 times capital and reserves
Korea Expressway Corporation	Korea Expressway Corporation Act	4 times capital and reserves
Korea Broadcast Advertising Corp.	Korea Broadcast Advertising Corp. Act	No regulations on debt issuance but borrowings are subject to regulations.
Korea National Oil Corporation	Korea National Oil Corporation	2 times as much as capital and reserves
Kwater	Korea Water Resources Corporation Act	2 times as much as capital and reserves
Korea Electric Power Corporation	Korea Electric Power Corporation Act	4 times as much as capital and reserves
Korea Minting, Security Printing and ID Card Operating Corp.	Korea Minting, Security Printing and ID Card Operating Corp. Act	No regulations on debt issuance but borrowings are subject to regulations.
Korea District Heating Corp.	Korea District Heating Corp. Act	2 times as much as capital and reserves
Korea Railroad Corp.	Korea Railroad Corp. Act	2 times as much as capital and reserves
Yeosu Gwanyang Port Authority	Yeosu Gwanyang Port Authority Act	2 times as much as capital and reserves
Korea Land and Housing Corp.	Korea Land and Housing Corp. Act	No ceiling

Note: The articles of incorporation of Korea Appraisal Board include provisions on debt issuance.
Source: Lee Eun-gyeong, Financial Debt Issuance Ceiling for State Enterprises, and Issues and Future Tasks Surrounding the Decision-Making System, 2012

Two types of legal provisions exist regarding deficit recovery; deficit recovery can be either mandatory or optional. Deficit recovery is not a direct guarantee for bond issuance by state enterprises, but for investors it can be considered an indirect guarantee that is equivalent to a direct guarantee because, practically, the government's deficit recovery eliminates the possibility that the bond-issuing state enterprise will default.

〈Table IV-2〉 **List of State Enterprises Related to Mandatory Deficit Recovery Duty**

Institution		Related Legal Provisions	Contents on Deficit Recovery
Semi Market-based State Enterprise	Korea Coal Corp.	Article 12 of Korea Coal Corporation Act	Article 12(Profit reserve) ② If there is loss incurred during the annual balancing of accounts, the institution shall recoup the loss with its profit reserve in accordance with Section 1 no.2, but for the remaining amount of loss after recovery the government may recoup the loss.
	Korea Resources Corp.	Article 15 of KORES Act	Article 15(Profit and loss) ② If there is loss incurred upon annual balancing of accounts, the institution shall recoup the loss amount with business expansion reserve in accordance with Section 1 no.3, and if insufficient with the reserve, it can be recouped with the profit reserve in accordance with Section 1 no. 2, and if insufficient with this profit reserve the government may recoup the loss
Semi Market-based State Enterprise	Korea Land and Housing Corp.	Article 11 of Korea LH Act	Article 11(Profit and loss) ② If there is loss incurred upon annual balancing of accounts, the institution shall recoup the loss amount with business expansion reserve in accordance with Section 1 no.2, and if insufficient with the reserve the remaining loss can be recouped with its profit reserve in accordance with same section no.2 , and the remaining will be recouped by the government. However, subjects for deficit recovery are limited to loss incurred from public utility that is defined by the president's command, such as the industrial complex construction business according to 'Special Act on Housing Construction'.

〈Table IV-2〉 **Continued**

Institution		Related Legal Provisions	Contents on Deficit Recovery
Entrusted execution–type quasi–government organizations	Korea Trade–Investment Promotion Agency	Article 12 of Korea Grade–Investment Promotion Agency Act	Article 12 (Disposal of Profit and Loss) (2) When KOTRA has sustained a loss after settlement of its accounts for a business year, it shall make up the loss with a reserve pursuant to paragraph (1) 3, and if the reserve is insufficient to make up the loss, it shall make up the loss with earned surplus reserve pursuant to paragraph (1) 2, and the Government may make up a shortage which occurs despite KOTRA having made up the loss.
	Korea Student Aid Foundation	Article 23 of Act on the Establishment of the Korea Scholarship Foundation	Article 23 (Appropriation of Profin and Loss) (2) If there is a loss in the settlement of each business year, the Foundation may cover with a reserve fund under Paragraph (1). Where the reserve fund is insufficient to cover it, the Government may cover it.
Fund–m	Korea Credit Guarantee Fund	Article 41 of Credit Guarantee Fund Act	Article 41 (Coverage of Losses) (2) Where any loss is incurred at the book–closing of the Fund, it shall be covered by the reserves under paragraph (1), and if the relevant reserves are insufficient to cover such loss, the Government shall cover it.
	Korea Technology Finance Corp.	Article 45 of Korea Technology Credit Guqrantee FUnd Act	Article 45 (Coverage of Losses) (2) When any loss is incurred at the book–closing of the Corporation, it shall be covered by the reserves under paragraph (1), and when the reserves are insufficient to cover such loss, the Government shall cover it.
anaging quasi governm ent organizati ons	Small and Medium Business Corp.	Article 66–2 of Small and Medium Enterprises Promotion Act	Article 66–2 (Formulation of Draft Plan for Fund Operation and Settlement of Accounts of Fund)
	Korea Trade Insuranc e Corporati on	Article 36 of Trade Insurance Act	Article 36 (Settlement of Profits and Losses) (2) Any loss accrued as a result of settlement of accounts of the Fund shall be covered by the reserve fund under paragraph (1), and if the reserve fund is insufficient to cover such deficit, the shortages shall be covered by the Government.

〈Table IV-2〉 **Continued**

Institution		Related Legal Provisions	Contents on Deficit Recovery
anaging quasi governm ent organiza tions	Korea Housing Finance Corp.	Article 51 of Korea Housing Finance Corporation Act	Article 51 (Coverage of Losses) When any loss has incurred at the closing of books of the Corporation, it shall be covered by the reserve accumulated in accordance with subparagraph 1 of Article 50, and, when such reserve is insufficient, the Government shall cover it.
Other public organiza tions	Korea Finance Corp.	Article 31 of Korea Finance Corporation Act	Article 31 (Compensation of Losses) The Corporation's net loss on the settlement of accounts shall be compensated with reserves each fiscal year, but the deficiency in the reserves, if any, shall be compensated by the Government.
	The Export–Im port Bank of Korea	Article 37 of Export–Import Bank of Korea Act	Article 37 (Compensation for Amount of Loss) The Export–Import Bank shall compensate for net loss of final accounts with the reserve each business year, and the Government shall compensate for the loss when the reserve is insufficient.
	Industrial Bank of Korea	Article 43 of Industrial Bank of Korea Act	Article 43 (Making–up for Losses) The Industrial Bank of Korea's net losses in each fiscal year shall be made up by reserve funds; and, if such net losses remain even after being made up by reserve funds, the Government shall make up for the remaining losses.
	Korea Developm ent Bank	Article 44 of Korea Development Bank Act	Article 44 (Setoff of Losses) (1) The annual net losses of the Korea Development Bank shall be offset each fiscal year by the reserve, and shall be compensated by the Government if the reserve is insufficient.

Source: Jo Young–cheol · Kim Jae–hwan, 「Bond Issuance by Deficit Recovery–Eligible SOEs and Legal Tasks」 ,National Assembly Budget Office, 2011

〈Table IV-3〉 **Private Credit Rating Agencies' Criteria for Evaluation of Government Support to State Enterprises**

[Criteria for Evaluation of Possible Government (including Local Governments) on an as-needed basis]					
	P1	P2	P3	P4	P5
Legal and institutional protection and control	Individual acts regulating the target corporation exist and framework acts governing the business and operations, control, etc., are also in place.	The target corporation is governed by the framework act or a separate set of regulations on its establishment, operations, and all other business activities.	The target corporation is governed by administrative orders or rules instead of higher-level laws or ordinances, or only particular aspects of its business are regulated by laws or ordinances.	The possibility of protection exists only in the nominal sense and effective legal and institutional protection and control is inadequate.	N.A.
Level of actual control by government (central and local governments)	Multiple tools of control are available and these tools are effective and clearly defined.	Tools of control are comprehensive or limited, but they are effective and clearly defined.	Tools of control exist but only as a matter of formality and thus are not clearly defined.	Tools of control are inadequate.	N.A.
Ownership structure (Stake, %)	90~100	50~90	25~50	10~25	〈10
Public benefits and impact of the business on government policy	Generally, the business is highly beneficial to the public and has a highly significant impact on government policy.	The business is fairly beneficial to the public and has a relatively significant impact on government policy, but it varies according to individual projects.	The business is of a public nature, but it remains subject to change according to the policy of the government (including local governments).	The business does not have a strong public nature and it does not have much impact on government policy.	N.A.
Possibility of privatization and restructuring	Given the nature of the business, it is not eligible for privatization and the possibility remains very low that its status can be weakened by restructuring.	Some of the business areas overlap or compete with those of the private sector, but, overall, the possibility of its status weakened by privatization or restructuring remains low.	The possibility of privatization (restructuring) depends on policy of the government (including local governments).	Given the nature of the business, competition with the private sector is inevitable and privatization (restructuring) is expected in the future.	Privatization (restructuring) is under way through sale of businesses and stakes, and buyback of publicly held stakes.

[Criteria for Evaluation of Possible Government (including Local Governments) on an as-needed basis]					
	P1	P2	P3	P4	P5
Support and performance	Substantial and stable support is provided by the central or local governments if the need for support arises in the course of performing the target business.	Some support is provided by the central or local governments if the need for support arises in the course of performing the target business, but it is somewhat lacking in stability, suitability and adequacy.	The central or local governments provide support on a short-term basis, but it is not of much help because the support is not relevant to or appropriate for the target business.	Support has been provided by the central or local governments, but it is insignificant.	No support has been provided by the central or local government.

[Possibility of Government Support (including local governments) in case of emergencies]							
Corporation	Actual Credit Rating	Legal and institutional protection and control	Level of control actually exercised by the government (including local governments)	Ownership structure (stake holding ratio)	Public benefits and impact of the business on government policy	Possibility of privatization and restructuring	Support and perfor-mance
Korea Electric Power Corporation	AAA	P1	P1	P2	P1	P1	P1
Korea Railroad Corp.	AAA	P1	P1	P1	P1	P1	P1
Incheon International Airport Corporation	AAA	P1	P1	P1	P1	P1	P1
Korea Gas Corporation	AAA	P1	P1	P2	P1	P1	P1
Korea Coal Corporation	AA+	P1	P1	P1	P1	P1	P1
Korea Land and Housing Corp.	AAA	P1	P1	P1	P1	P1	P1

Note: The table shows the mapping results for 6 public corporations out of all public corporations assigned an effective credit rating by a credit rating agency.
Sources: Korea Investors Service, "2015 Handbook of State Enterprises", 2015

3 Evaluation by Private Credit Rating Agencies

From the perspective of market participants, the above-mentioned provisions regarding deficit recovery are not the only factors to be considered when assessing the risk of bonds issued by public corporations. Generally, the credit ratings of corporations have a primary impact on how market participants perceive the risks associated with such corporations. This paper, therefore, will apply the credit rating methodologies that private credit rating agencies employ to public corporations.

According to Korea Investors Service (2015), major considerations in evaluating the credit worthiness of public corporations include general financial indicators such as the stability of business operations and profitability and the possibility of government support if a need arises. Specific indicators of possible government support are ① legal and institutional protection and control, ② the level of control that the government has over the corporation, ③ ownership structure, ④ public benefits and the impact of the business on government policy, ⑤ possibility of privatization and restructuring, and ⑥ support and performance. Six public corporations were rated the same, but Korea Electric Power Corporation and Korea Gas Corporation were rated one level lower (P2) in the area of ownership structure after they were privatized.

4 Risk-Weighting for Bonds Issued by Public Corporations

The largest buyers of bonds issued by public corporations are domestic institutional investors such as banks and insurance companies. One of the reasons that these institutional investors prefer bonds issued by public corporations is the risk weight assigned to this type of investment asset under new BIS rules. State enterprises are given a zero-risk weight because their deficits can be covered with financial support from the government under relevant laws and, therefore, these public corporations are rated the same as the government.

〈Table IV-4〉 **Impact of Legally-Required Deficit Recovery on Standard Credit Ratings and Risk Weight**

State enterprises eligible for deficit recovery by the government under legal provisions	Standard Credit Rating	AAA~AA–
	Risk Weight	0%
State enterprises not eligible for deficit recovery by the government	Standard Credit Rating	AAA~AA–
	Risk Weight	20%

Source: National Assembly Budget Office, "Fiscal Year 2014 Settlement of Accounts for State Enterprises," 2015.

Institutional investors prefer bonds issued by public corporations partly because in Korea maturities of corporate bonds are relatively short, making it difficult for institutional investors to hold them for an extended period of time.

Accordingly, if the government intentionally regulates the aggregate volume of bonds issued by public corporations, it may reduce the size of the corporate bond market, regardless of the government's intentions.

V

Research Data and Basic Statistics

1

This research used the data set on domestic bonds provided by Korea Asset Pricing, which includes daily bond prices, yields, interest cycles, payment methods, and other data indicating the characteristics of bonds from 2007 to 2015.

A. Baseline Group (private corporations)

The target bonds in this research are publicly offered senior corporate bonds that belong to Group 70. The benchmark is composed of bonds issued by private companies without an explicit or implicit guarantee by the central or local governments. Accordingly, Group 10 (treasury bonds), Group 20 (municipal bonds), and Group 40 (MSB) were not included in the baseline group for analysis. Group 30, bonds issued by organizations such as public entities or institutions that were established by special laws, was also excluded from analysis because the relevant comparison is with bonds issued by private companies.

B. Target Public Organizations

This research analyzes 35 public organizations, which are defined according to the relevant acts governing the operations of public organizations.

〈Table V-1〉 **Description of the Data Set**

Data Type	Definition	Data Type	Definition
Group1)	10: treasury bonds, 20: municipal bonds, 30: special bonds, 40: MSB, 50: bank bonds (senior), 51: bank bonds (subordinated), 60: other financial bonds (senior), 61: other financial bonds (subordinated), 70: corporate bonds (public, senior), 71: corporate bonds (public, subordinated), 80: corporate bonds (private, senior), 81: (private, subordinated), 90: ABS (senior), 91: ABS (subordinated)	Credit Ratings	110:AAA, 121:AA+, 122:AA0, 123:AA–, 131:A+, 132:A0, 133:A–, 211:BBB+, 212:BBB0, 213:BBB–, 221:BB+, 222:BB0, 223:BB–, 231:B+, 232:B0, 233:B–, 311: CCC+, 310:CCC, 313:CCC–, 321:CC+, 320:CC0,323:CC–, 331:C+, 330:C0, 333: C–
Code	Standard code used by KRX	Type of call & put options	0: normal, 1: call, 2: put, 3: call & put
Nominal rate	Coupon rate	Issuer (initial)	Issuer code
Priority	1: senior, 2: mezzanine, 3: subordinated, 4: junior subordinated.	Issued amount	Amount of issued bonds (unit: won)
Guarantee	1: guarantee, 2: partial guarantee, 3: secured (asset securitization), 4: unsecured, 5: government guarantee (KDIC bonds)	Outstanding balance	Outstanding balance (unit: won)
Interest type	11: discounted, 12: compound, 13: coupon, 14: simple, 15: compound 5/simple 2, 19: fixed – others, 21: floating, 29: floating–others, 99: others	Valued price	Valued price (unit: won)
Interest payment cycle	interest payment cycle indicated monthly	Yield	Yield (unit: %)
Date of issue	Date of issue	Duration	Duration
Korean code name	Code name	Convexity	convex
Maturity	Maturity	Par value	Par value (unit: won)
Coupon	Coupon		

Note: 1. See Appendix for more details on the groups of bonds
Source: Korea Asset Pricing

〈Table V-2〉 **2015 Definition of Public Corporation and Public Corporations Included in the Data Set**

Type	Name of Organization
Market–based public corporations (13)	**(Definition)** 2 trillion won in assets. 85% or more of the total revenues generated by the organization itself. **(Organization)** Korea Gas Corporation, Korea National Oil Corporation, Korea Electric Power Corporation, Korea Resources Corporation, Korea District Heating Corporation, Incheon International Airport Corporation, Busan Port Authority, Korea South–East Power Co., Korea Southern Power Co., Korea East–West Power Co., Lt, Korea Western Power Co., Ltd, Korea Hydro and Nuclear Power Co, Ltd, Korea Midland Power Co., Ltd
Semi market–based (11)	**(Definition)** Public corporations that are not market–based. **(Organization)** Korea Expressway Corporation, Korea Land and Housing Corp, Korea Coal Corporation, Yeosu Gwanyang Port Authority (Korea Container Terminal Authority), Jeju Free International City Development Center, Kwater, Korea Railroad Corp., Incheon Port Authority, Ulsan Port Authority
Fund–managing quasi government organizations (5)	**(Definition)** Quasi government organizations that manage a fund or are entrusted with the management of a fund under the National Finance Act. **(Organization)** Korea Workers' Compensation and Welfare Service, Korea Asset Management Corporation, Korea Insurance Corporation, Korea Housing Finance Corporation, Small and Medium Business Corporation
Entrusted execution–type quasi–government organizations (4)	**(Definition)** Quasi government organizations that are not fund management–type quasi government organizations **(Organization)** Korea Student Aid Foundation, Korea Rural Communicy Corporation, Korea Industrial Complex Corp., Korea Rail Network Authority
Other public organizations (2)	**(Definition)** public institutions that are not public corporations or quasi government organizations **(Organization)** Korea Export–Import Bank of Korea, Korea Finance Corporation

Note: Public corporation is defined as follows: "an organization designated by the Minister of Strategy and Finance, that is a public institution with 50 or more permanent employees and 1/2 or more of its total revenues generated by its own business"
Source: the Ministry of Government Legislation, Article 5 of the Act on the Management of Public Institutions

2 Basic Statistics

A. Total Bond Issues

The combined value of bonds issued by public institutions from 2007 to 2015, which were included in this research amounted to approximately 443 trillion won, with an annual average of 49 trillion won.

B. 12 Priority Public Institutions

The value of the corporate bonds issued by 12 public institutions designated by the government as priority targets for debt management and

〈Table V-3〉 **Bonds Issued by Public and Private Corporations**

(Unit: million won)

Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
All public institutions	28,182,300	48,995,100	64,626,700	66,275,300	54,641,000	69,416,200	52,751,500	41,342,400	7,147,400	433,377,900
Market-based public corporations	3,534,000	8,710,000	11,200,000	9,840,000	12,152,000	13,184,000	12,508,000	6,156,000	1,008,000	78,292,000
Semi market-based public corporations	2,809,600	6,960,000	16,200,000	20,424,000	17,472,000	16,864,000	13,662,000	10,829,000	700,200	105,920,800
Fund-managing quasi government organizations	3,648,000	12,274,000	12,528,000	10,731,000	6,075,000	28,392,000	10,716,000	2,852,000	840,000	88,056,000
Entrusted execution-type quasi government organizations	1,435,500	2,055,900	2,373,300	4,136,600	5,672,400	6,020,700	6,292,000	3,998,400	540,000	32,524,800
Other public institutions	16,755,200	18,995,200	22,325,400	21,143,700	13,269,600	4,955,500	9,573,500	17,507,000	4,059,200	128,584,300
Private corporations	21,112,000	24,806,000	43,565,900	45,008,000	58,812,600	60,911,400	45,747,000	32,028,000	5,498,800	337,489,700

Type	All public corporations	Market-based	Semi market-based	Fund management-type	Entrusted execution-type	Others
Panel A	433,377,900	78,292,000	105,920,800	88,056,000	88,056,000	128,584,3005

Panel B	Public corporations eligible for explicit deficit recovery	Public corporations not eligible for deficit recovery
	226,182,473	207,195,427

reduction totals approximately 275 trillion won, which represents about 60% of the total value of bonds issued by the 40 public institutions included in the research. This means that 12 public institutions raised approximately 30 trillion won on average via bond issuance each year, and each institution issued a total of approximately 23 trillion won worth of bonds in the 9 years.

C. Credit Rating

1) Average Yield to Maturity

The average yield to maturity for all bonds in the sample group is 4.32%. The average yield to maturity for bonds issued by public corporations is 3.69%, and the average for bonds of private corporations is 5.05%, with a statistically significant gap of 1.36%. This gap represents a risk premium for holding bonds issued by private corporations that tend to have a higher default risk than corporate corporations.

〈Table V-5〉 **Yield to Maturity for Bonds Issued by Public and Private Corporations**

	Total	Public Corporations	Private Corporations	Gap (P-value)
	4.32% (22,246)	3.69% (11,953)	5.05%*** (10,293)	1.36%p (0.0000)
2007		5.33% (998)	6.33%*** (957)	1.00%p (0.0000)
2008		5.91% (1,029)	7.80%*** (912)	1.89%p (0.0000)
2009		3.96% (1,193)	6.87*** (908)	2.91%p (0.0000)
2010		3.80% (1,528)	6.00%** (881)	2.20%p (0.0000)
2011		3.97% (1,556)	5.16%*** (1,245)	1.19%p (0.0000)
2012		3.54% (1,053)	4.47%*** (1,385)	0.93%p (0.0000)
2013		3.07% (1,207)	3.81%*** (1,405)	0.74%p (0.0000)
2014		2.89% (1,715)	3.77%*** (1,364)	0.88%p (0.0000)
2015		2.16% (1,674)	3.34%*** (1,236)	1.18%p (0.0000)

〈Table V-4〉 **Bond Issuance by 12 Public Institutions**

(Unit: million won)

Organization	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Korea Gas Corporation	1,404,000	3,209,600	2,310,000	2,730,000	2,898,000	1,781,000	3,050,000	1,230,000	210,000	18,822,600
Korea National Oil Corporation	No bond issuance	No bond issuance	100,000	No bond issuance	200,000	No bond issuance	No bond issuance	No bond issuance	No bond issuance	300,000
Korea Electric Power Corporation	2,016,000	5,301,000	6,825,000	5,740,000	4,752,000	7,056,000	3,939,000	1,140,000	No bond issuance	36,769,000
Korea Coal Corporation	30,000	No bond issuance	300,000	50,000	No bond issuance	No bond issuance	No bond issuance	100,000	No bond issuance	480,000
Korea Resources Corporation	No bond issuance	No bond issuance	No bond issuance	No bond issuance	200,000	No bond issuance	200,000	No bond issuance	No bond issuance	400,000
Korea Expressway Corporation	1,995,000	2,938,000	2,925,000	3,654,000	3,312,000	2,921,000	2,900,000	1,840,000	140,000	22,625,000
Kwater	No bond issuance	No bond issuance	648,900	3,524,400	4,315,000	1,075,800	933,600	731,700	83,400	11,312,800
Korea Railroad Corp.	650,000	640,000	2,363,000	1,728,000	1,452,000	1,680,000	1,320,000	2,730,000	No bond issuance	12,563,000
Korea Land and Housing Corp.	7,257,000	10,159,200	17,514,000	11,288,000	7,878,000	11,110,000	8,251,800	5,357,200	449,000	79,264,200
Korea Rail Network Authority	1,435,500	1,715,700	2,044,000	3,105,000	3,213,000	3,013,000	3,525,000	1,141,000	110,000	19,302,200
Korea Insurance Corporation	2,720,000	8,800,000	5,880,000	6,840,000	1,980,000	24,820,000	7,620,000	1,010,000	600,000	60,270,000
Korea Student Aid Foundation	No bond issuance	No bond issuance	1,250,000	2,400,000	2,168,900	2,420,000	2,028,800	2,451,800	430,200	13,149,700

Source: Korea Asset Pricing

2) Yield to Maturity for Bonds of Public Corporations

Yields to maturity for bonds of public corporations averaged around 3%, regardless of the type of bond (i.e., market-based, semi market-based, fund management, or entrusted execution), and eligibility for deficit recovery did not significantly alter yield.[8)]

〈Table V-6〉 **Basic Statistics on Yield to Maturity for Bonds of Public Corporations**

	Average	Standard Deviation	Minimum Value	Medium Value	Maximum Value
All Public Corporations	3.69%	1.27%	0.10%	3.51%	23.59%

〈Table V-7〉 **Analysis of Yields to Maturity for Bonds of Public Corporations**

	All Public Corporations	Market–based	Semi market–based	Fund management–type	Entrusted execution–type	Other
Panel A	3.69% (11,953)	3.57% (1,849)	3.63% (3,577)	3.37% (909)	3.54% (987)	3.88% (4,631)
Panel B	Explicit deficit recovery–eligible corporations			Corporations not eligible for deficit recovery		
	3.64% (4,727)			3.77% (7,226)		

Note: Figures in parenthesis indicate the number of bonds in the sample.

8) The difference in yield to maturity between explicit subsidy recipient public corporations and it was statistically significant. However, the difference was only 0.13%, which is considered as negligible in this research.

3) Other Data

The table below defines other types of data that are necessary for the estimation of credit ratings and yields to maturity, and their basic statistics. Corporate financial data has been collected from Data Guide, ALIO, and business reports published by individual corporations.

〈Table V-8〉 **Basic Statistics for Estimated Credit Ratings**

Financial Data	All	Public Corporations	Private Corporations	Gap between Public and Private Corporations (P–value)
Operating margin (Operating profit/ sales)	6.55% (20,772)	10.18%*** (11,757)	1.83% (9,015)	8.35% (0.0000)
Borrowed capital (total liabilities/ total assets)	83.38% (20,960)	94.20%*** (11,879)	69.22% (9,081)	24.98% (0.0000)
Interest coverage ratio (Operating profit/ interest cost)	4.84 (18,745)	3.53 (10,950)	6.67** (7,795)	3.14 (0.0247)

VI

Results of Empirical Analysis

1 Estimated Credit Ratings

This research used the following credit rating estimation model, with references to Campbell and Taksler (2004)[9], Chen, Lesmond, and Wei (2007)[10], and the definitions and implications of individual variables are described in the table below.

Credit rating = β_0 + β_1 · 3 year treasury bond yield
+ β_2 The yield spread between long- and short-term treasury bonds (10-year treasury bond - 3-year treasury bond)
+ β_3 Interest coverage ratio dummy.
+ β_4 Operating income to sales ratio
+ β_5 Borrowed capital ratio (liabilities to assets ratio)

In this model, the coefficient for each variable was estimated based on the statistics of publicly offered senior corporate bonds that belong to Group 70. Data from individual public institutions was included in the estimation model to estimate credit ratings.

9) Campbell, J., & Taksler, G. (2004). Equity volatility and corporate bond yields. Journal of Finance.

10) Chen, L., Lesmond, D. A., & Wei, J. (2007). Corporate yield spreads and bond liquidity. The Journal of Finance, 62(1), pp.119–149.

The average credit rating for public corporations was estimated at A0 (or a score of 20.60). It is around four levels below the actual credit rating of AA+, and this gap is statistically significant. The estimated credit rating for public corporations was lower than that of private corporations, presumably due to the low interest coverage ratio.

Public corporations were classified into different types to compare the gaps between actual and estimated credit ratings. Corporations in the group "Others" exhibited the largest gap (4.73), followed by "Market-based public corporations" with 4.27.

Public corporations displayed similar trends over the years, regardless of their type. Ratings fell to a low in 2007 and 2008 in the aftermath of the financial crisis, and continued to rise in the years that followed.

The results were similar when corporations were divided into two groups according to eligibility for explicit deficit recovery.

〈Table VI-1〉 **Definitions of Variables**

Variable	Implications	Definition
Yield on treasury bonds (3–year)	Indicator of market risk	
Yield on 10–year treasury bond–yield on 3–year treasury bond	Long–term expectations that market participants have on the economic outlook	
Interest coverage ratio	Indicator of the company's ability to cover its interest cost with its operating profit or repay debt.	(Sales + interest cost) / interest cost
Operating income to sales ratio	Ratio of operating income to sales, indicator of corporate performance or profitability	Operating income/sales
Borrowed capital ratio	Ratio of liabilities to total assets/indicator of how much a corporation depends on outside capital	Total liabilities / total assets

〈Table VI-2〉 **Ordinary Least Square (OLS) and Results of Regression Analysis of Credit Ratings**

Explanatory Variables (Independent Variables)	Results of Simple OLS Regression Analysis
Yield on treasury bond (3-year maturity)	−0.90*** (0.04)
10-year treasury bond yield−3-year treasury bond yield	0.06 (0.11)
Operating income to sales ratio	0.004 (0.003)
Borrowed capital ratio	0.005 (0.004)
Interest coverage ratio dummy1	1.56*** (0.19)
Interest coverage ratio dummy2	3.34*** (0.24)
Interest coverage ratio dummy3	4.15*** (0.24)
Interest coverage ratio dummy4	4.47*** (0.25)
Constant term	21.63*** (0.35)
Observed value	7,650
R-squared	0.1943

Note: Figures in parentheses indicate robust standard errors

〈Table VI-3〉 **Credit Ratings Estimated by (OLS)**

	Actual Credit Rating	Estimated Credit Rating	Credit Rating for Private Corporations
All Public Corporations	24.98*** (11,955) AA+	20.60 (10,950) A0	21.43 (10,294) A0

〈Table VI-4〉 **Credit Ratings Estimated by (OLS)**

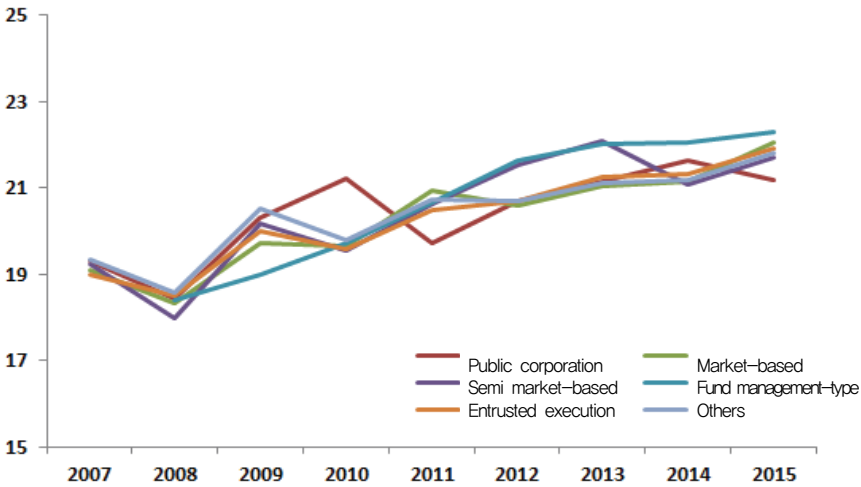
		Actual Credit Rating	Estimated Credit Rating (1)	Gap between Actual and Estimated Credit Ratings
All Public Corporations		24.98*** (11,955) AA+	20.60 (10,950) A0	4.38 A0
Panel A	Market-based	25*** (1,849) AA+	20.73 (1,831) A0	4.27
	Semi market-based	24.99*** (3,579) AA+	20.92 (3,467) A0	4.07
	Fund-managing type	25*** (909) AA+	21.22 (222) A+	3.78
	Entrusted execution-type	25*** (987) AA+	20.79 (981) A0	4.21
	Others	24.97*** (4,631)	20.24 (4,449) A-	4.73
Panel B	Public corporations eligible for explicit deficit recovery	24.99*** (7,226)	20.63 (6,426) A0	4.36
	Public corporations not eligible for explicit deficit recovery	24.97*** (4,729) AA+	20.57 (4,524) A0	4.40

Note: Figures in the parenthesis indicate the number of bonds in the sample.

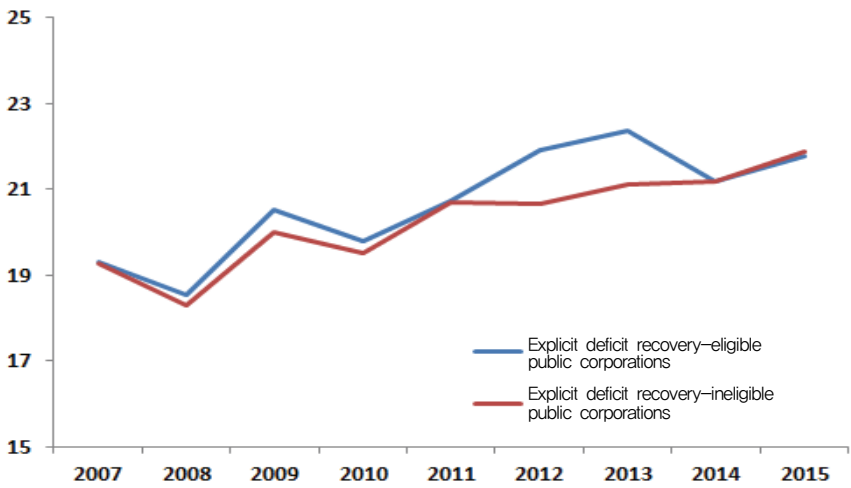
〈Table VI-5〉 **Estimated Credit Ratings by Type of Public Corporation**

	Public corporation	Market–based	Semi market–based	Fund management–type	Entrusted execution–type	Others
2007	19.30 (867)	19.11 (72)	19.25 (149)	No data available	18.98 (35)	19.35 (611)
	BB0	BB0	BB0		BB0	BB0
2008	18.45 (910)	18.32 (99)	17.99 (132)	18.41 (8)	18.50 (49)	18.57 (622)
	BB–	BB–	BB–	BB–	BB0	BB0
2009	20.33 (1,027)	19.72 (137)	20.19 (134)	19.01 (19)	19.99 (63)	20.54 (674)
	BB+	BB+	BB+	BB0	BB+	A–
2010	21.22 (222)	19.67 (155)	19.56 (418)	19.72 (22)	19.59 (77)	19.81 (761)
	A–	BB+	BB+	BB+	BB+	BB+
2011	19.71 (1,433)	20.94 (207)	20.62 (487)	20.67 (23)	20.48 (120)	20.75 (629)
		A–	A–	A–	BB+	A–
2012	20.71 (1,466)	20.61 (237)	21.54 (487)	21.63 (45)	20.70 (128)	20.69 (60)
	A–	A–	A0	A0	A–	A–
2013	21.15 (957)	21.03 (295)	22.09 (537)	22.01 (43)	21.26 (161)	21.12 (64)
	A–	A–	A0	A0	A–	A–
2014	21.62 (1,100)	21.14 (298)	21.08 (564)	22.04 (36)	21.32 (173)	21.18 (539)
	A0	A–	A–	A0	A–	A–
2015	21.17 (1,610)	22.04 (331)	21.69 (559)	22.31 (26)	21.91 (175)	21.81 (489)
	A–	A0	A0	A0	A0	A0

[Figure VI-1] **Changes in Estimated Credit Ratings by Type of Public Corporation**



[Figure VI-2] **Eligibility for Explicit Deficit Recovery and Changes in Estimated Credit Ratings**



〈Table VI-6〉 **Eligibility for Deficit Recovery and Estimated Credit Ratings**

	Public corporations eligible for explicit deficit recovery	Public corporations not eligible for deficit recovery
2007	19.30	19.29
	(588)	(279)
	BB0	BB0
2008	18.53	18.31
	(591)	(319)
	BB0	BB–
2009	20.52	19.99
	(648)	(379)
	A–	BB+
2010	19.79	19.53
	(990)	(443)
	BB+	BB+
2011	20.72	20.69
	(952)	(514)
	A–	A–
2012	21.91	20.66
	(374)	(583)
	A0	A–
2013	22.35	21.11
	(454)	(646)
	A0	A–
2014	21.17	21.17
	(940)	(670)
	A–	A–
2015	21.79	21.89
	(889)	(691)
	A0	A0

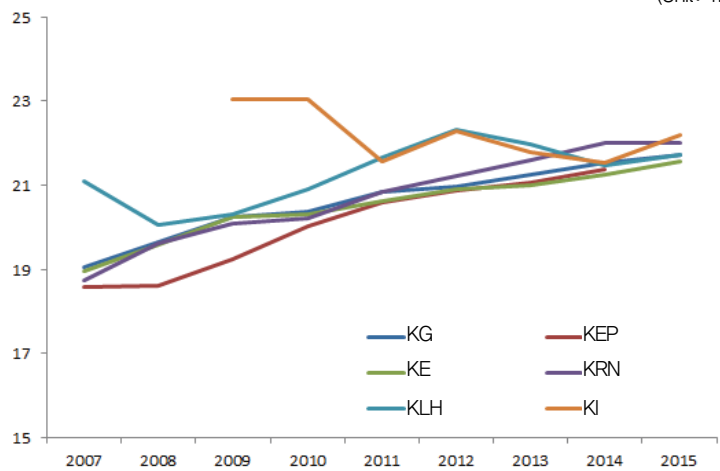
〈Table VI-7〉 **Estimated Credit Ratings of 12 Target Public Institutions**

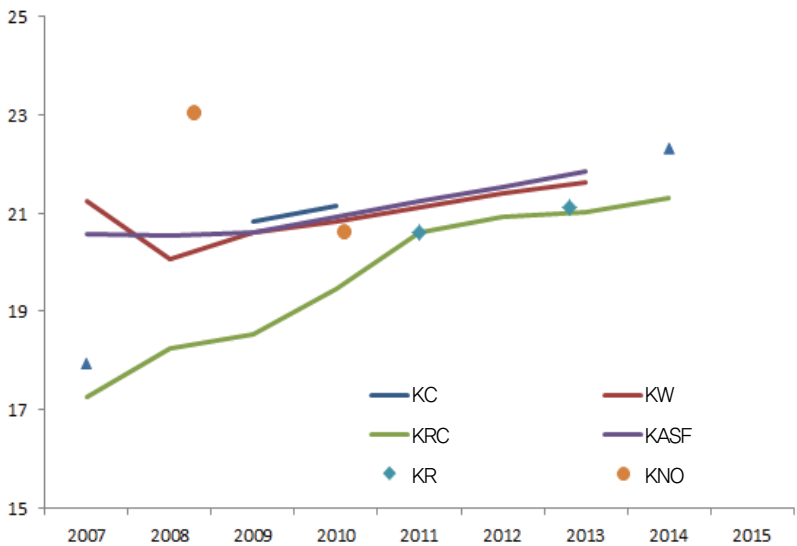
(Unit: million won)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Korea Gas Corporation (KG)	19.05 (25)	19.66 (25)	20.25 (25)	20.38 (25)	20.83 (25)	20.97 (25)	21.24 (25)	21.54 (25)	21.72 (25)
Korea National Oil Corporation (KNO)	No bond issued	23.03 (25)	No bond issued	20.62 (25)	No bond issued	No bond issued	No bond issued	No bond issued	No bond issued
Korea Electric Power Corporation (KEP)	18.59 (25)	18.60 (25)	19.23 (25)	20.04 (25)	20.60 (25)	20.89 (25)	21.07 (25)	21.37 (25)	No bond issued
Korea Coal Corporation(KC)	17.94 (23)	No bond issued	20.83 (24)	21.16 (24)	No bond issued	No bond issued	No bond issued	22.32 (24)	No bond issued
Korea Resources Corporation (KR)	No bond issued	No bond issued	No bond issued	No bond issued	20.62 (25)	No bond issued	21.12 (25)	No bond issued	No bond issued
Korea Expressway Corporation (KE)	18.96 (25)	19.59 (25)	20.25 (25)	20.31 (25)	20.61 (25)	20.91 (25)	21.01 (25)	21.25 (25)	21.56 (25)
Kwater (KW)	No bond issued	No bond issued	21.26 (25)	20.07 (25)	20.61 (25)	20.84 (25)	21.12(25)	21.39 (25)	21.63 (25)
Korea Railroad Corp. (KRC)	17.25 (25)	18.23 (25)	18.52 (25)	19.47 (25)	20.61 (25)	20.93 (25)	21.03 (25)	21.32 (25)	No bond issued
Korea Land and Housing Corp.(KLH)	21.11 (25)	20.06 (25)	20.31 (25)	20.90 (25)	21.67 (25)	22.33 (25)	21.99 (25)	21.48 (25)	21.73 (25)
Korea Rail Network Authority(KRN)	18.73 (25)	19.63 (25)	20.08 (25)	20.22 (25)	20.84 (25)	21.22 (25)	21.60 (25)	22.01 (25)	22.01 (25)
Korea Insurance Corporation(KI)	No bond issued	No bond issued	23.03 (25)	23.03 (25)	21.57 (25)	22.30 (25)	21.79 (25)	21.53 (25)	22.20 (25)
Korea Student Aid Foundation(KSAF)	No bond issued	No bond issued	20.57 (25)	20.53 (25)	20.60 (25)	20.92 (25)	21.26 (25)	21.52 (25)	21.84 (25)

[Figure VI-3] **Changes in Estimated Credit Ratings of 12 Target Public Institutions**

(Unit: million won)





2 Estimated Yields to Maturity

Earlier, estimated credit ratings for public corporations were calculated using the credit rating estimation model. In this section of the paper, estimated credit ratings will be used to estimate yields. This estimation process is largely based on Campbell and Taksler (2004) and Chen, Lesmond, and Wei (2007).

Yield to maturity = β0+β1·remaining maturity, coupon rate, 3-year treasury bond yield
+ β4 the yield spread between 10- and 3-year treasury bonds
+ β5 euro dollar, β6 stock price volatility, β7 estimated credit rating
+ β8 interest coverage ratio dummy, β9 operating income-to-sales ratio
+ β10 borrowed capital ratio

The estimated yield to maturity on bonds of public corporations averaged 5.45%. The spread between actual yields and the estimated yields shows that public corporations benefit from a yield gain of approximately 1.76%.

"Other public institutions" had the largest spread (2.73%), followed by fund management-type corporations (2.18%).

The estimated yield to maturity for explicit deficit recovery-eligible corporations stood at 5.97%, which is 2.33% higher than the actual yield. The yield spread was larger than that for non-eligible corporations.

Individual public corporations' savings on financing costs can be estimated using their estimated yields to maturity and actual yields. Then, if the actual amount of bond issuance is taken into consideration, the amount of implicit subsidy can be calculated.

The amount of the subsidy is proportional to the spread between the estimated yield and the actual spread. The yield spread, therefore, reveals which public corporations benefited most from implicit subsidies, even before the specific amount of the subsidy is determined.

〈Table VI-8〉 **Definitions of Variables**

Variable	Definition & Description	Source
Remaining maturity	Time remaining until the date of principal repayment	Korea Asset Pricing
Coupon	Nominal interest rate	Korea Asset Pricing
3–year treasury bond yield		Bank of Korea
10–year treasury bond yield–3–year treasury bond yield	Slope of the yield curve	Bank of Korea
Spread between Korean won–denominated 90–day CD rate and the 3–month US treasury bond yield	Indicator of demand for short–term liquidity	Bank of Korea/Bloomberg
Spread between 3–month interest rate on euro dollar and the U.S. treasury bond yield (3 months)	Indicator of demand for short–term liquidity	Bloomberg
Stock price volatility	Standard deviation for daily yields of KOSPI 200 Index for one year	Data Guide
Interest coverage ratio	Indicator of the company's ability to pay interest cost with its operating profit or to repay debt	Data Guide
Operating income to sales ratio	Indicator of operating income against sales, business performance or profitability	Data Guide
Borrowed capital ratio	Ratio of liabilities to total asset. indicator of dependence of outside capital	Data Guide

〈Table VI-9〉 **Results of Regression Analysis on Yields to Maturity Using OLS**

Explanatory Variable (Independent Variable)	Results of Simple OLS
Remaining maturity	0.13*** (0.01)
Coupon rate	−0.36*** (0.09)
3−year treasury bond yield	0.77*** (0.11)
10−year treasury bond yield−3−year treasury bond yield	0.94*** (0.22)
Spread between Korean won−denominated 90−day CD rate and 3−month US treasury bond yield	0.30** (0.12)
Spread between 3−month interest rate on euro dollar−3−month US treasury bond yield	1.13*** (0.41)
Stock price volatility	−0.06 (0.10)
Operating income to sales ratio	−0.009 (0.007)
Borrowed capital ratio	0.04*** (0.008)
Credit rating	−0.90*** (0.09)
Interest coverage ratio dummy 1	−2.18*** (0.48)
Interest coverage ratio dummy 2	−1.28*** (0.44)
Interest coverage ratio dummy 3	−0.83** (0.42)
Interest coverage ratio dummy 4	−0.47 (0.45)
Constant term	20.17*** (2.12)
Observed value	7,650
R−squared	0.3071

Note: Figures in parenthesis indicate robust standard errors

〈Table VI-10〉 **Yields to Maturity and Spreads Estimated by OLS**

	Actual yield to maturity	Estimated yield to maturity	Yield to maturity for private corporations
All public corporations	3.69% (11,953)	5.45% (10,950)	5.05% (10,293)
Yield spreads for bonds of public corporations		1.76%p***	

〈Table VI-11〉 **Yields to Maturity Estimated by OLS**

		Actual yield to maturity	Estimated yield to maturity	Yield spread
All public corporations		3.69% (11,953)	5.45% (10,950)	1.76%p
Panel A	Market-based	3.57% (1,849)	4.54% (1,831)	0.97%p
	Quasi market-based	3.63% (3,577)	4.65% (3,467)	1.02%p
	Fund-managing type	3.37% (909)	5.55% (222)	2.18%p
	Entrusted execution-type	3.54% (987)	4.71% (981)	1.17%p
	Others	3.88% (4,631)	6.61% (4,449)	2.73%p
Panel B	Explicit financial support-eligible corporations	3.64% (7,226)	5.97% (6,426)	2.33%p
	Non-eligible corporations	3.77% (4,727)	4.71% (4,524)	0.94%p

Note: Figures in parenthesis indicate the number of bonds in the sample.

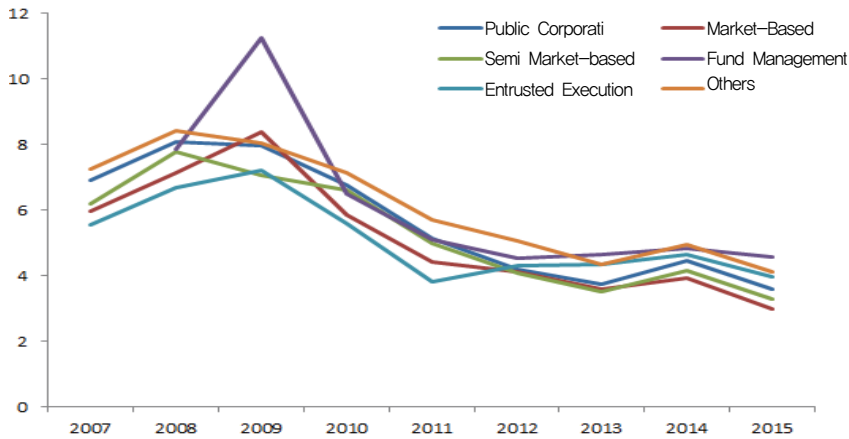
The size of the spread indicates that other public organizations and fund-managing public corporations benefit more from implicit government guarantees than do market-based public corporations.

Similarly, explicit financial support-eligible corporations benefit more than non-eligible corporations. These results appear to contradict the outcomes discussed earlier. In the preceding section of this paper, the gap in credit rating between explicit financial support-eligible corporations and non-eligible corporations was found to be insignificant, but the two groups of corporations differ considerably in terms of yield spread.

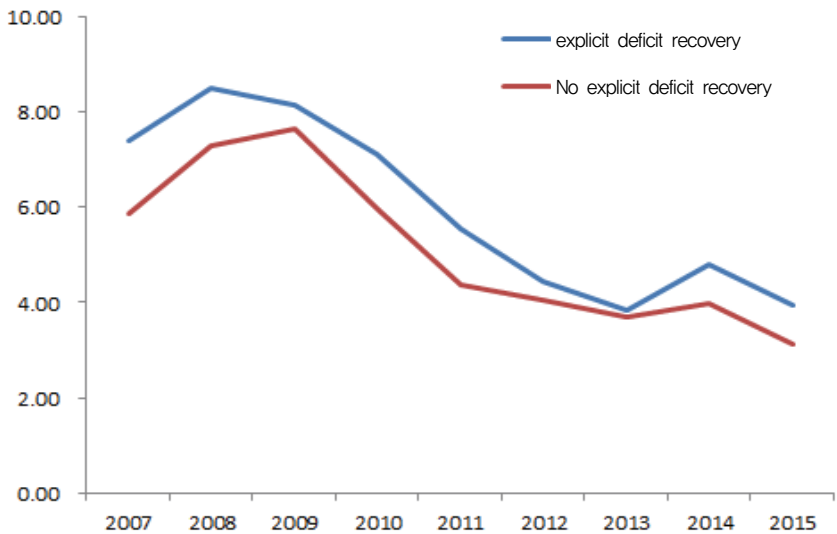
〈Table VI-12〉 **Eligibility for Explicit Deficit Recovery and Estimated Yields to Maturity**

	Explicit financial support–eligible public corporations	Non–eligible public corporations
2007	7.40% (588)	5.85% (279)
2008	8.50% (591)	7.30% (319)
2009	8.15% (648)	7.66% (379)
2010	7.10% (990)	5.96% (443)
2011	5.54% (952)	4.36% (514)
2012	4.44% (374)	4.04% (583)
2013	3.85% (454)	3.68% (646)
2014	4.79% (940)	3.97% (670)
2015	3.94% (889)	3.11% (691)

[Figure VI-4] **Changes in Yields to Maturity by Type of Public Corporation**



[Figure VI-5] **Eligibility for Explicit Deficit Recovery and Estimated Yields to Maturity**



3 Estimation of Implicit Subsidies

As the last step in the estimation process, the size of implicit subsidies granted to individual public corporations are estimated[11] using the estimated yields to maturity obtained earlier.

The size of an implicit subsidy equals the gains in yield created for the recipient public corporation by the government's provision of explicit financial support. The amount of subsidies estimated in this method is as follows.

The financial gains that public corporations made from implicit government guarantees in the process of raising funds from 2007 to 2015 (i.e., saved interest costs) are estimated to be approximately 6.84 trillion won.

Other public institutions received approximately 3.49 trillion won of subsidies in this way, fund-managing public institutions around 1.18 trillion won, and semi-market-based public corporations around 1.05 trillion won. Support-eligible corporations gained around 4.4 trillion via subsidies, and approximately 2.44 trillion won was provided to non-eligible corporations in the same way.

If a public corporation issues corporate bonds worth 100 million won, it is expected to incur approximately 1.5 million won less in costs than its private counterpart under the same conditions.

The cost for other public institutions is estimated to be around 2.71 million won lower than that for private corporations, with all other conditions being equal. Fund-managing public corporations are expected to save around 1.34 million won, and market-based corporations around 1.00 million won, resulting in financial gains. Financial-support-eligible public corporations can reduce their costs by as much as 1.94 million won, and non-eligible corporations by around 1.17 million won.

The estimated amount of annual subsidies began to increase in 2007, reaching a peak of 1.5 trillion won in 2009 before a downward trend began, which continued in the following years.

11) This model is similar to that one used in Crippen (2001).

〈Table VI-13〉 **Amount of Subsidy Estimated by Estimated Credit Ratings**

(Unit: million won)

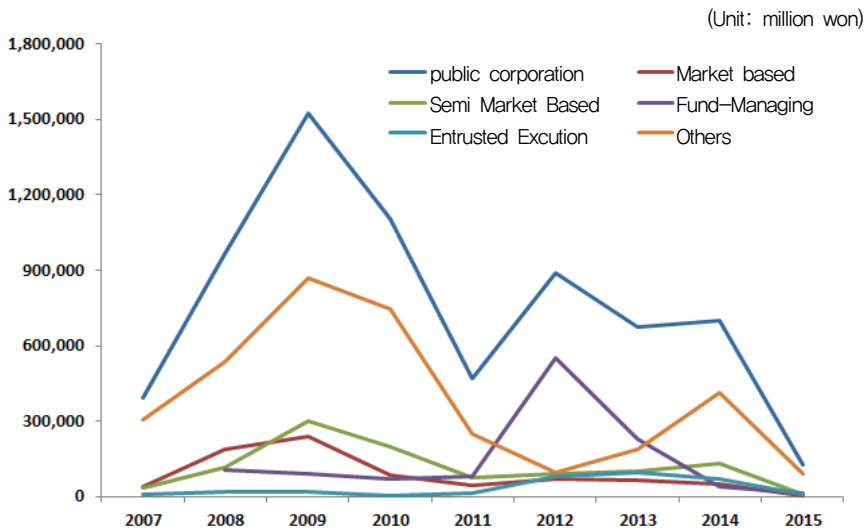
		Estimated credit ratings Implicit subsidy
All Public Corporations		6,842,740
Panel A	Market-based	786,072
	Semi market-based	1,057,672
	Fund-managing type	1,181,300
	Entrusted execution-type	322,396
	Others	3,495,300
Panel B	Explicit financial support-eligible corporations	4,402,000
	Non-eligible corporations	2,440,739

〈Table VI-14〉 **Amount of Subsidies Estimated by Estimated Credit Ratings by Type of Public Corporation (By Year)**

(Unit: million won)

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
All public institutions	391,725	964,232	1,524,881	1,103,622	467,512	888,423	673,727	699,537	129,080	6,842,740
Market-based	38,427	186,405	241,646	85,089	44,024	72,848	63,319	50,238	4,076	786,072
Semi market-based	36,509	116,424	299,479	199,011	77,166	91,255	99,650	130,053	8,124	1,057,672
Fund-managing quasi government organizations	Estimate not available due to insufficient data	104,670	92,739	69,323	82,243	550,280	227,343	38,658	16,044	1,181,300
Entrusted execution-type quasi government organizations	9,228	19,494	20,045	3,238	14,294	79,558	97,017	69,018	10,505	322,396
Others	307,561	537,239	870,972	746,962	249,785	94,482	186,399	411,569	90,331	3,495,300

[Figure VI-6] **Subsidies Estimated by Type of Public Corporation**



Finally, according to an analysis of only 12 major public corporations, KDIC received an estimated 960 million won from 2007 to 2015, followed by Korea Land & Housing Corporation with 670 billion won and KEPCO with around 500 billion won.

If public corporations raise 100 million won via bond issuance, the amount of implicit subsidy, estimated based on the above data, will be as follows.

Compared to private corporations under similar conditions, Korea Coal Corporation can gain an estimated 5.8 million won, KORAIL 2.3 million won, and KEPCO 1.6 million won. The Korea Scholarship Foundation can save around 800,000 won, Korea Land & Housing Corporation 850,000 won, and KEPCO 1.36 million won in interest costs.

〈Table VI-15〉 **Estimated Subsidies to 12 Major Public Corporations Based on Estimated Credit Ratings**

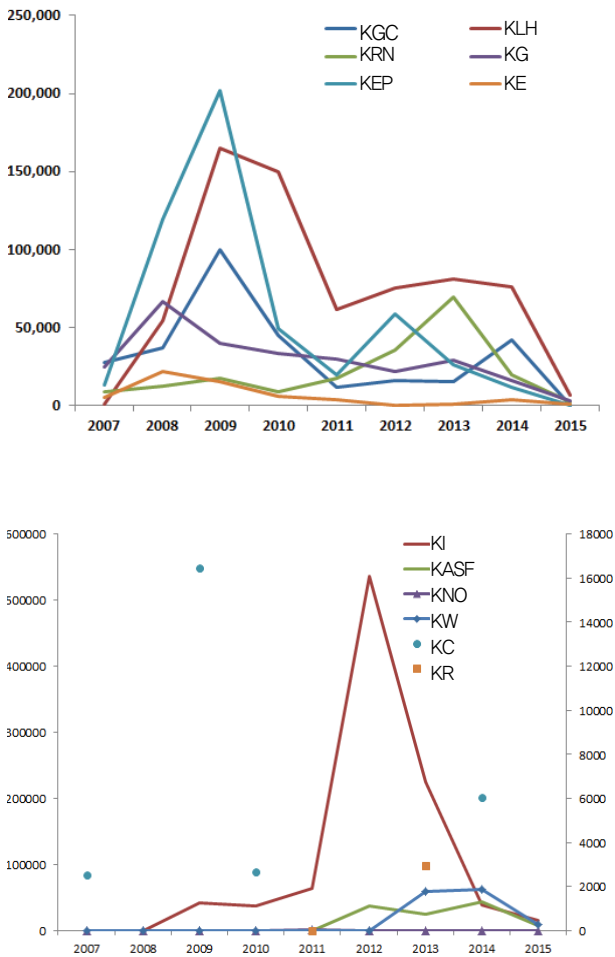
(Unit: million won)

Organization	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Korea Gas Corporation(KG)	24,756	66,653	40,111	33,396	29,797	21,856	28,955	16,343	2,732	264,598
Korea National Oil Corporation(KNO)	No bond issued	No bond issued	0*	No bond issued	1,061	No bond issued	No bond issued	No bond issued	No bond issued	1,061
Korea Electric Power Corporation (KEP)	13,056	119,770	202,016	49,265	19,859	58,777	26,271	11,858	No bond issued	500,871
Korea Coal Corporation (KC)	2,552	No bond issued	16,472	2,688	No bond issued	No bond issued	No bond issued	6,040	No bond issued	27,753
Korea Resources Corporation (KR)	No bond issued	No bond issued	No bond issued	No bond issued	0*	No bond issued	2,975	No bond issued	No bond issued	2,975
Korea Expressway Corporation (KE)	5,592	21,604	15,290	5,808	3,515	50	1,100	3,627	1,196	57,781
Kwater (KW)	No bond issued	No bond issued	0*	0*	0*	0*	1,778	1,880	276	3,934
Korea Railroad Corp.(KRC)	27,602	37,133	100,284	44,994	11,729	16,425	15,540	42,393	No bond issued	296,100
Korea Land and Housing Corp. (KLH)	762	54,664	165,267	149,991	61,976	75,665	81,194	76,112	6,574	672,207
Korea Rail Network Authority (KRNA)	9,228	12,342	17,188	9,168	17,470	35,887	69,303	20,016	2,607	193,211
Korea Insurance Corporation (KIC)	No bond issued	No bond issued	41,944	38,249	64,256	536,544	224,537	38,658	16,044	960,231
Korea Student Aid Foundation (KASF)	No bond issued	No bond issued	706	0*	0*	37,929	24,581	43,742	7,898	114,856

Note: 0* indicates that the actual amount of subsidy is negative. This means that the corporation was at a disadvantage in the process of raising funds because it is a public organization. In other words, it paid higher interest costs, so the amount of subsidy was treated as zero.

[Figure VI-7] **Subsidies to 12 Public Corporations Estimated by Estimated Credit Ratings**

(Unit: million won)



Note: for KEPCO, Kwater, Kocoal, and KORES there are too many missing values so it is on the subsidies line. And line graphs were considered not suitable for these organizations so dispersion graphs were used

VII

Conclusions & Policy Recommendations

1 Summary

Because public corporations raise funds via bond issuance at lower interest rates than private corporations do under the same conditions, due to market expectations of implicit government guarantees, the reduced interest cost was treated as an implicit subsidy (or externalized cost of debt) resulting from government guarantees, and attempts were made to measure the amount of that implicit subsidy.

The results of the analysis confirmed that public corporations can save around 1.5 million won on their funding costs, compared to private corporations under the same conditions, if they issue 100 million won in corporate bonds. This saved cost can be viewed as a government subsidy of 1.5 million won for the issuance of 100 million won in corporate bonds by public corporations. The research also confirmed that the size of the implicit subsidy (or social cost) varied from corporation to corporation, but it exists regardless of the type of public corporation or level of direct financial support provided to the individual corporations.

The following section of the paper offers policy recommendations that can reduce this social cost and reviews the feasibility of these recommendations.

2 Aggregate Control of Debts Held by Public Corporations

Before these policy recommendations are discussed, the aggregate control of debt will be reviewed. The government imposes aggregate control, a debt management approach that has been recently introduced to public corporations, to set debt-equity ratios.

The government (i.e., the Ministry of Strategy and Finance 2014a) plans to reduce the debt-equity ratio of public institutions to 200% by 2017; to this end, it is implementing aggregate control of debt by setting the balance limits for corporate bonds and short-term liquidities (CP, asset-backed short-term bonds).

Aggregate control has positive aspects. First, aggregate control makes it easy for regulators and market participants to monitor public corporations' compliance with policy, thus reducing policy execution cost. Second, aggregate control of debt is an effective policy tool when extraordinary circumstances arise that warrant control. A case in point is the government's demand that large conglomerates keep their debt-equity ratio at 200% or below, issued immediately after the foreign exchange crisis erupted in 1997.

The effectiveness of aggregate control of debt upon public corporations remains uncertain for the following reasons.

First, lack of consistency has been a problem. For the government, the debt-equity ratio is one of the items reviewed in the management evaluation of public corporations. The government has, problematically, abused its authority to manipulate the ratio by citing various reasons for its actions.

Another issue is the optimal debt level. Because of information asymmetry, doubts arise over whether the government is capable of determining the optimal debt level for a particular public corporation. Questions may also be raised as to whether a one-size-fits-all set of guidelines can apply to all public corporations.

Finally, regulations, including aggregate control of debt, can negatively impact capital markets, especially markets for special bonds, even when such an impact is not intended. Obviously, the implementation of aggregate controls will scale down the volume of bonds issued by public corporations, even though

the demand for such bonds remains consistent; consequently, the demand and supply imbalance in the credit markets may worsen (Daewoo Securities 2014).

3 Policy Recommendations for Reduction of Implicit Subsidies

A. Financing via Stock Issuance

Public corporations can be encouraged to issue stocks instead of bonds to raise funds to finance new businesses. It remains controversial whether stock issuances can be affected by implicit government guarantees. However, implicit guarantees cause moral hazard for the fundamental reason that banks' high-risk investments do not impact the recovery of funds by creditors.

In this context, Kim Young-shin (2015) suggested that partial privatization via sale of government stakes in public corporations could be a solution to excessive debts. Some corporations, however, may not be privatized due to the nature of their business, and privatization may stir up controversy among politically interested parties.

Against this backdrop, four policy recommendations will be offered, in addition to privatization; these recommendations vary in details, but have a common thread of internalizing part of the debt-issuing cost that is transferred from the issuing public corporations to third parties.

B. Internalization of Debt Cost via Imposition of Corrective Tax

Because implicit subsidies are treated as a result of negative external effects from government guarantees, a Pigouvian tax can be levied. There have been attempts to impose a corrective tax (also known as a "bank tax") upon large banks to mitigate negative externalities associated with TFTF, and such taxes were intended to correct the negative consequences of implicit guarantees that were granted to financial institutions.

The most salient strength of this approach is that the basis for taxation is clear from an economic perspective. The problem is feasibility. If a corrective

tax is levied, the requirements for the imposition should be clearly prescribed according to the principle of no taxation without law, which is not an easy task. The key issue from an economic perspective is measurement of the negative external effects. One way of measuring is to estimate the amount of implicit subsidy using the method discussed earlier in this paper, or other methods in the preceding research, and then impose a tax equivalent to the estimated amount of the subsidy.

Another approach, suggested by Kocherakota (2010), is to leave the job of determining the optimal tax to the market. The primary ideas for an optimal tax in this approach will be briefly discussed below.

First, the government issues rescue bonds to retail investors. Rescue bonds are issued by individual financial institutions on the condition that the government will pay investors 1/1000th of the transfer that is provided to the financial institution (e.g., Bank of America) in the form of a coupon.

If this rescue bond is a one-year bond, its price is the present value of the interest that will be paid a year later, which is 1/1000th the expected amount of transfer for the financial institution; this calculation can be represented as (1/1000 * expected transfer)/(1+ discount rate). The amount of transfer will be the risk that market participants deem inherent in the financial institution.

For example, if the price is 100,000 won and the discount rate is 10%, the expected amount of transfer can be obtained by using the formula; 100,000 won should be equal to (1/1000*expected transfer)/(1+0.1). In this way, the government can estimate the amount of the expected transfer (or, for example, Bank of America's probability of default), based on the bond price that is set in the market. Finally, the government levies a tax equivalent to 1000th of the price.

The tax serves the interests of society because the financial institution gives back, in the form of tax, the amount of support that it received from the government, or the present value of the future benefit.

In addition, the price of the rescue bond acts as an indicator of the market's valuation of the individual financial institution or the market's expectations of the entire financial market. For example, if investors predict no transfer to Bank of Korea in the near future, then the total amount of the

expected transfer will be zero. In other words, the rescue bond price is zero.

If, however, a sense of crisis begins to prevail, the price will be a positive figure, triggering transactions in the bond. Regulators will take this activity as a sign and watch the financial institution in question closely.

C. Internalization via Guarantee Fee

Implicit subsidies can be recouped via a fee that the government can charge when issuing guarantees. For example, KDIC collects a certain fee set in proportion to the deposit balance from insured banks. Because the government provides similar guarantees (either explicit or implicit) for bonds of public corporations, charging a fee should not be problematic.

Funds can be recovered in various ways. Just as KDIC charges fees on its guaranty services according to the Depositor Protection Act, a legal basis can be created for the government to impose fees on its guarantees.

Other options can be considered to ensure that the fee-setting and implementation system remains flexible. For instance, the government can ensure that when a public corporation issues bonds, a certain amount of money is recouped pursuant to an agreement between the government and the head of the financial institution, and the amount recouped is determined by measuring the amount of implicit subsidies, as discussed earlier. The referenced agreement is a business performance agreement that the government and the heads of public corporations sign pursuant to the Act on the Management of Public Corporations.

The Act requires that public corporations submit 3-year performance goals, annual execution plans, and performance indicators; an action plan for debt management should also be attached.

Fees on implicit government guarantees are then paid to the government as part of the action plan.

“Internalization of debt cost via guarantee fee" provides greater flexibility in execution, because funds are recouped under the terms of a legally-binding contract, as opposed to the imposition of taxes, which may face resistance from taxpayers. Additionally, recovery can be made even if the corporation has not created any profit, unlike recovery via a dividend. It is a more desirable method,

therefore, of internalizing external costs.

Expected problems include the potential infringement of other creditors' rights, because the proposed fee is collected under a contract. If the public corporation has not generated sufficient earnings, the government may get involved in a legal dispute with shareholders or other senior creditors.

D. Internalization of Debt Cost via Dividend

Another alternative is to retrieve implicit subsidies by receiving dividends. Specifically, the amount of the estimated implicit subsidy is the lower bound of the dividend that a recipient corporation should pay the government, and the government can demand a dividend in the same amount as a shareholder when the corporation pays out dividends.

For example, 37 companies were obligated to pay the government dividends in 2014, and some of these companies were also among the list of 12 institutions that were placed under a strict debt management program. The research compared the actual dividends that these companies paid each year with the estimated implicit subsidy that they received from the government to come up with a subsidy-to-dividend ratio.

The results show that the ratio of subsidy against dividend was smaller than 1 in at least one case each year. The lowest ratio was 0.01, which means that only 1/100th of the government subsidy was recouped in the form of a dividend.

Internalization via dividend will probably not infringe upon the rights of other creditors, because external cost is internalized through dividend, which provides a logical basis for the lower bound that can provide dividend guidelines for the government.

The downside to this alternative, however, is that companies that post net losses cannot pay dividends. In addition, it is hard to justify the recovery of guarantee fees for bond issuance through a dividend, which is a capital gain.

〈Table VII-1〉 **Subsidy vs. Dividend for Public Corporations**

Year	Corporation	Amount of Subsidy (100 million won)	Dividend (100 million won)	Subsidy to Dividend Ratio
2007	KEPCO	194.1	1355	6.98
	KOGAS	124.42	228	1.83
	KEC	180.92	7	0.04
	Annual Average	166.48	530.00	
2008	KEPCO	500.13	1016	2.03
	KOGAS	256.86	291	1.13
	KEC	233.82	7	0.03
	Annual Average	330.27	438.00	
2009	Kwater	30.81	219	7.11
	KOGAS	165.57	243	1.47
	KEC	208.32	5	0.02
	KNOC	2.94	1	0.34
	Annual Average	101.91	117.00	
2010	Kwater	265.31	114	0.43
	KOGAS	191.11	160	0.84
	KEC	241.78	3	0.01
	KNOC	13.11	2	0.15
	Annual Average	177.83	69.75	
2011	Kwater	283.1	187	0.66
	KOGAS	181.25	129	0.71
	KEC	217.21	3	0.01
	KORES	13.14	6	0.46
	KORAIL	95.01	513	5.40
	Annual Average	157.94	167.60	
2012	LH	437.56	373	0.85
	Kwater	67.08	470	7.01
	KOGAS	107.31	158	1.47
	KEC	177.78	6	0.03
	Annual Average	197.43	251.75	

〈Table VII-1〉 **Continued**

Year	Corporation	Amount of Subsidy (100 million won)	Dividend (100 million won)	Subsidy to Dividend Ratio
2013	LH	363	715	1.97
	Kwater	53.77	492	9.15
	KOGAS	169.97	340	2.00
	KEC	173.03	2	0.01
	Annual Average	189.94	387.25	
2014	LH	280.52	437	1.56
	Kwater	73.21	592	8.09
	KEC	101.89	2	0.02
	Annual Average	151.87	343.67	
Average		180.13	269.20	

Note: dividend data was cited from "A Study of the Government's Dividend Policy for Government-Invested Corporations" (2014), Research Center for State-Owned Entities of Korea Institute of Public Finance

E. Reflection of Cost in Preliminary Feasibility Assessment

Finally, the estimated subsidy can be incorporated as a cost into the process of a preliminary feasibility assessment, instead of being paid by the government.

Bond issuance by public corporations is merely a way of raising funds that they need to finance business projects. The National Finance Act requires that a preliminary feasibility assessment be performed for new large-scale projects. If the business project of a public institution costs 50 billion won or more and the combined sum of the government's financial support and the institution's share of the project cost exceeds 30 billion won, then the project should be evaluated for its public nature and profitability.

In this case, both the economic and profitability evaluations should include a cost-benefit analysis. The estimated amount of subsidies in this paper can be added to the evaluation to make investment decisions regarding new businesses and necessary adjustments.

F. Other Issues

Another way to scale back implicit government subsidies is to disclose information transparently, to enable market participants to more accurately assess public corporations' debts.

Specifically, domestic credit rating agencies can publish credit ratings of public corporations with implicit government guarantees taken into consideration (the credit ratings currently published to the pubic) and credit ratings assigned without considering such guarantees. In fact, foreign credit rating companies, including Moody's and Fitch, already publish these two types of credit ratings, and domestic credit rating agencies should have no problem following suit.

Note that there are preconditions to the implementation of these four policy alternatives. The government should not impose direct and uniform regulation on the management of public corporations through management evaluations that the government is currently conducting on public corporations. Introducing a new system when a management evaluation system for public institutions is already in place could cause other forms of inefficiency, even if the government’s intentions are good.

Finally, the limitations of this research are as follows. The estimated amount of subsidy is one of many possible estimates, which has been obtained by using a particular model. Consequently, the statistics regarding the size of subsidies in this paper should be understood as indicators that provide insight into the hidden costs associated with public corporations' debt, instead of as definitive calculations.

More research needs to be done on the moral hazard surrounding public corporations' debt, and future research is expected to apply more accurate and sophisticated methodologies to new data.

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