

Credit Guarantee Reform under the New Basel Accord: Implications for SME Lending in Korea †

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Abstract

The objective of the present paper is to evaluate the combined impact of the credit guarantee reform and the new Basel accord upon bank capital requirements in Korea. Utilizing a dataset of bank loan exposures for 5,362 externally audited SMEs, we conduct simulation analyses for various credit guarantee reform scenarios. Key findings can be summarized as follows: First, in the absence of the credit guarantee reform, the new Basel accord does not always lead to the increase in bank capital requirements. While banks are likely to suffer most under the foundation-IRB approach, bank capital requirements may actually fall under the standardized and advanced-IRB approaches as banks can exploit the lower risk weight for guaranteed loans and lower *LGDs* under Basel II. Second, while the credit guarantee reform invariably increases bank capital requirements, its adverse impact can be alleviated under Basel II. This is possible as the reduced risk weight for protected exposures and the SME and retail adjustments for unprotected exposures provide cushions to guard against the adverse impact of the lower guarantee coverage ratio. Third, as for the combined impact, Basel II and credit guarantee reform may not lead to a significant increase in capital requirements. In the most conservative worst case, the BIS capital ratio may fall by approximately 1.7 percentage point under the foundation-IRB approach. However, the net impact is likely to be modest for other approaches. Our findings suggest that the credit guarantee reform may not produce serious adverse impact under Basel II. As a matter of fact, Basle II actually provides a more favorable regulatory environment in undertaking the credit guarantee reform.

JEL Classification No: G21, G28

Keywords: Credit guarantee, Basel accord, SME lending

I. Introduction

SMEs are an important part of economic growth for both developed and developing countries. SMEs are main drivers of economic activity contributing to job creation and sustainable growth. For this reason, in many countries, it is a priority policy agenda to provide a dynamic environment in which promising SMEs are able to prosper through innovation and competition. An important factor conducive to the development of a thriving SME sector is improving access to finance. Since bank lending is the primary source of external finance for SMEs, credit allocation and risk management practices of banking institutions deeply affect overall performance of the SME sector.

Notwithstanding the imperatives of an effective SME financing, a range of factors may cause failure in this market segment. Indeed, in virtually all countries, it is a major challenge for small and young SMEs to have access to bank credits. Given large information asymmetry, banks often respond by raising loan interest rates in excess of the level implied by the inherent risk or choose to curtail and ration SME lending to avoid adverse selection problems.

Faced with imperfections in the SME financial market, public credit guarantee schemes have been used in many countries to encourage bank lending to SMEs by sharing the risk of loan default. Credit guarantee is intended to expand bank's risk-return frontier so that SME loans that would not have been made in the absence of guarantees could be included in the frontier. While the existence of a credit guarantee should increase the supply of loans creating the 'additionality,' it also often leads to moral hazard on the part of banks and borrowers. Banks have weaker incentives to monitor debt service capacity of borrowing firms knowing that public funds will ultimately reimburse them for possible losses incurred. On the other hand, borrowing firms may engage in

riskier business activities exploiting this weaker monitoring incentive of banks.¹

Korea is one of the countries that have operated an extensive public credit guarantee program. Especially in the post-crisis period, the supply of credit guarantee has increased dramatically as the government used it as a tool to alleviate possible credit crunch in the course of corporate sector restructuring. While the surge in the provision of credit guarantee helped stabilize financial markets, the policy has also been criticized as the cheap credits led by the generous guarantee scheme have delayed restructuring of the SME sector. Recognizing the potential problems of excessive credit guarantee, the Korean government recently proposed a reform plan to gradually retire the supply of guarantee provision and make the scheme more market oriented.

Along with the credit guarantee reform, the new Basel accord to be adopted at the end of 2007 has brought about serious concerns for SMEs as well as policy makers in Korea. As is well known, a key feature of the new Basel accord is its emphasis on the better alignment of economic risk and bank capital requirements. It was argued that, given the relatively high risks of SMEs, the new capital requirements would be too costly for banks, which might have discouraging effects on SME lending. As a matter of fact, this potentially negative impact of the new accord on SME lending has been a common concern for many developing countries and developed countries as well. Accordingly, a series of concessions have been made to respond to this criticism.²

¹ See Vogel and Adams (1997) for costs and benefits of credit guarantees. For empirical studies evaluating the effectiveness of credit guarantees, see Green (2003).

² Under the revised framework of the Basel Committee (2005), banks are allowed to classify SMEs as corporate or retail entities based upon the size of total exposures to respective firms. If SME loans are classified as corporate, a special discount in the asset correlation calculation can be applied for firms with less than Euro 50 million in sales. If total exposure is less than Euro 1 million, SME loans can be classified as retail exposure and a separate risk weight curve can be applied. This special treatment of SME loans is based upon the recognition that the riskiness of the SME exposure largely comes from the diversifiable idiosyncratic risk.

While the special treatment of SMEs has softened criticisms on the new Basel accord, it is still an open question how and to what degree the Basel II regulation would affect SME lending. For instance, Altman and Sabato (2005) investigated the effects of the new Basel accord on bank capital requirements for SMEs using data from the U.S., Italy and Australia. They find that banks will have significant benefits in terms of lower capital requirements when considering SMEs as retail exposures. However, when SMEs are classified as corporate, they find that the capital requirements are slightly larger than the requirements under the current Basel I. They argued that at least 40 percent of SMEs must be classified as retail exposure for banks to be able to benefit from the Basel II in terms of capital requirements.³

There seems to be relatively little research on the possible impacts of Basel II on SME lending in Korea. According to the quantitative impact study conducted by the Financial Supervisory Service in 2004, Korean banks might not suffer a lot from the adoption of Basel II when the special treatment of SME loans as retail exposure is allowed. However, Kim et al (2004) argued that the capital requirement under Basel II would significantly underestimate true economic risk. They simulated economic capital based upon micro firm-level data and found that economic capital required to cover true credit risk would be 6 to 8 percentage point higher than the capital requirement computed under Basel II. Based upon the result, they argued that the Basel II treatment of SME loans might significantly underestimate true correlations of SME exposures.

As noted above, the SME sector in Korea is now faced with two regulatory

³ This bifurcated implementation of the Basel II capital requirements has raised another concern that community and smaller banks that do not adopt the advanced approach may be put at competitive disadvantages as the large banking organizations that are likely to adopt the advanced approach may want to exploit the benefit of lower capital requirements for SMEs under Basel II. However, Berger (2004) argue that this substitution effect on the part of large banks would be relatively limited as community banks tend to have comparative advantages in relationship lending.

shocks – the new capital requirement regulation under Basel II and the reform of the credit guarantee scheme. While the new Basel accord may lower capital requirements for SME loans, especially for banks that adopt the internal ratings-based approaches, a reduction in the credit guarantee supply or downward adjustment of guarantee coverage ratio would raise risk capital charges for banks.⁴ However, there seems to be no study yet, which attempts to evaluate the impact of both credit guarantee reform and the new Basel accord at the same time.

The main objective of the present paper is to evaluate the combined impact of credit guarantee reform and Basel II upon bank capital requirements in Korea. More specifically, we endeavor to address following questions: What are the current practices of SME loan guarantee provision in Korea and what are the key measures of the recent guarantee reform proposal? What are the impacts of the new Basel accord and credit guarantee reform on bank capital requirements? How do risk capital charges vary under alternative guarantee retirement scenarios? Would the guarantee reform have differential impacts across banks that adopt different Basel II approaches? Would those two policy shocks have significant implications on the existing pattern of bank SME lending?

This paper is organized as follows: Section II describes the problems of the existing public credit guarantee scheme in Korea and its recent reform proposal. Section III discusses the treatment of the credit guarantee under the new Basel accord. In section IV, we present data, methodology and simulation results based upon SME loan exposures of Korean commercial banks. Finally, section V summarizes our main findings and concludes.

⁴ Banks may respond by adjusting loan prices charging higher interest rates. The quantity and price effects of the loan guarantee withdrawal are not explicitly analyzed in this paper. Instead, in our simulations below, it is assumed that banks maintain existing exposures at least in the short-run and higher interest rate charges have minimal effects on bank equity capital.

II. Reform of the Credit Guarantee System in Korea

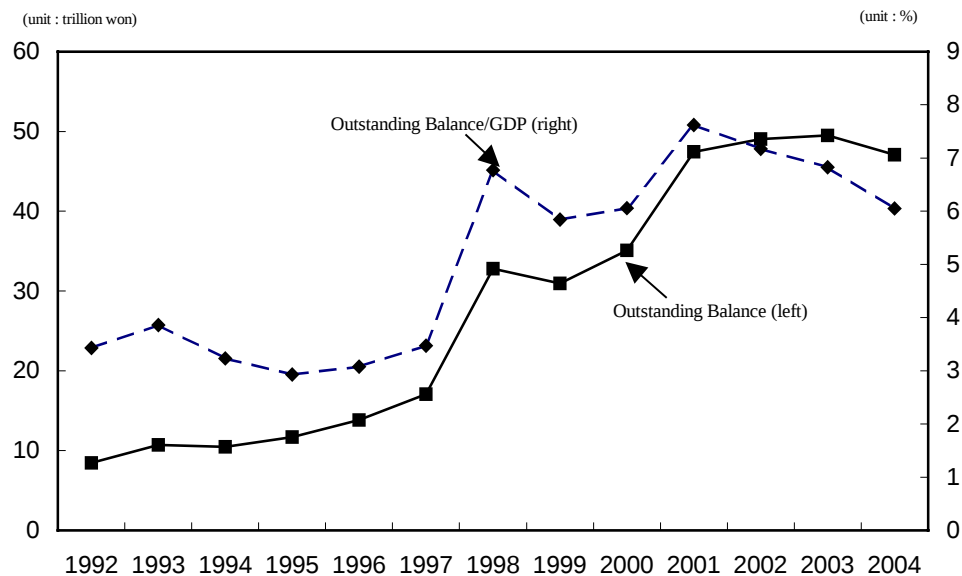
Korea is one of the countries that have operated an extensive public credit guarantee program. It first established the Korea Credit Guarantee Fund (KCGF) in 1976 with an aim to promote balanced development between large and small firms. Another program, the Korea Technology Credit Guarantee Fund (KOTEC) was established in 1989 aiming at facilitating finance for relatively new technology-based firms. As of the end of 2004, the outstanding balance of credit guarantee supplied reached 47.1 trillion won or 6.0 percent relative to nominal GDP. As Figure 1 shows, while the supply of credit guarantee had remained at 2 to 3 percent of GDP until 1997, it surged to over 7 percent of GDP in the post-1997 crisis period. The ratio was 7.6 percent at the hike of corporate sector restructuring in 2001 and then has declined ever since, but the absolute amount of credit guarantee have not been seriously adjusted yet.⁵

While the surge in credit guarantee helped stabilize financial system over the restructuring and recession episodes, many commentators have pointed out that the excessive provision of credit guarantee has distorted financial flows and delayed restructuring of non-viable SMEs. Indeed, lax provisions of credit guarantee crowd out commercial-based private lending and deter proliferation of innovative financial products, in which case, the long-term economic efficiency can be seriously eroded. For instance, Kang (2005) notes that the dramatic increase in credit guarantee in 1998 and 2001 indicated that the credit guarantee was used as a crisis resolution tool by the government to maintain macroeconomic

⁵ Korea's credit guarantee volume in terms of GDP is one of the highest levels in the world along with Japan. Japan's outstanding balance to GDP ratio was highest at 8.5% in 1999 and it has been gradually reduced to 5.9% at the end of 2004. Taiwan, another country that operates a publicly sponsored credit guarantee program, has maintained its credit guarantee supply at a level less than 3% relative to GDP. Except for the three North East Asian countries, these ratios are generally less than 1% in most countries regardless of the type of credit guarantee scheme, either public credit guarantee or mutual credit guarantee.

business conditions and to conceal the failure of venture policies in the late 1990s.

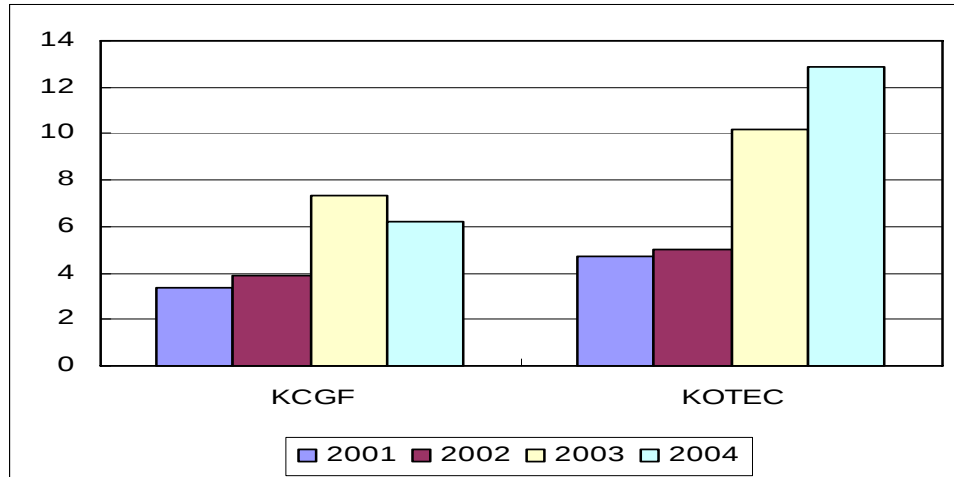
<Figure 1> Outstanding Balance of Credit Guarantee in Korea



Source : Kang (2005)

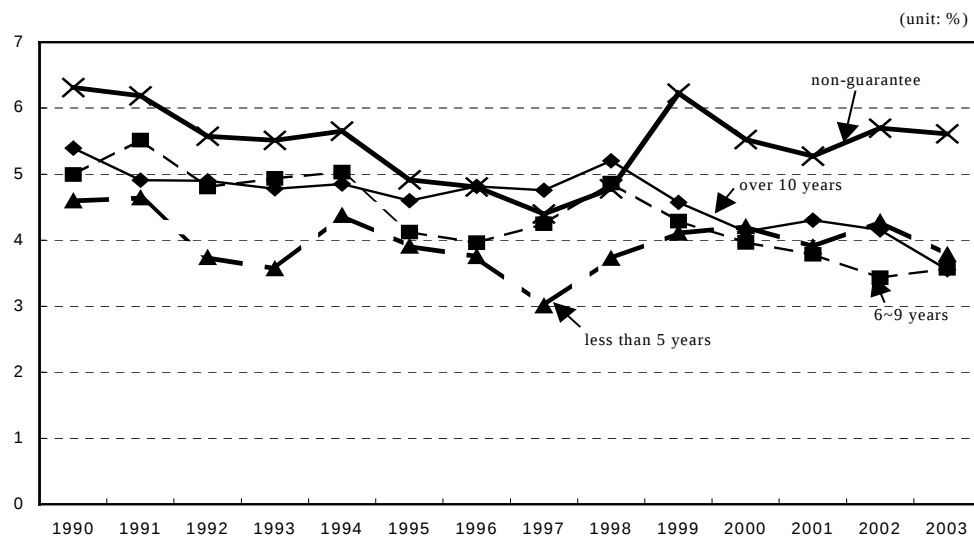
The operation of the credit guarantee scheme was also criticized. Currently, KCGF and KOTEC adopt a partial guarantee system whereby the default risks of the guaranteed companies are shared with the creditors. The average guarantee coverage ratio was 86 percent in 2004, which is relatively high in comparison with 60 to 70 percent in many advanced countries. It was also argued that the current guarantee premium of average 1.07 percent in 2004 was significantly under-priced in view of the high default rates reaching above 6 percent. As can be seen in Figure 2 the default rate has increased rapidly especially for KOTEC.

<Figure 2> Default Rate of Guaranteed Loans



Note: Default rate is the percentage of the amount of guaranteed corporate loans defaulted out of total guarantees outstanding.

<Figure 3> Operating Profit to Sales Ratio of Guaranteed Firms



Source: Kang (2005)

The efficiency and effectiveness of the credit guarantee provision to SMEs were also questioned. For instance, Kang (2005) analyzed the performance of the guaranteed firms according to the number of years of credit guarantee. As shown in Figure 3, the profitability measured as operating profit to sales ratio of the non-guaranteed firms has outperformed those of the guaranteed firms over the entire periods. Among the guaranteed, as the guarantee period increases, the ratio tends to deteriorate especially in the post-crisis period. Based upon this observation he questioned the effectiveness of the credit guarantee program in Korea.

The criticisms on the excessive provisioning and lax operation of credit guarantee scheme in Korea have called forth a necessity of credit guarantee reform. For instance, in its 2004 report on Korea, the IMF suggested that Korea should scale back guarantees by one percentage point of GDP per year during the next five years and that the operating scheme should be changed into a more market-based one. The Korean government has also recognized potential problems of the current public guarantee scheme and announced a reform plan to overhaul the guarantee system.

According to the plan of the Ministry of Finance and Economy (2005), the outstanding volume of credit guarantee will be gradually curtailed under the recognition that current credit guarantee amounts exceed socially desirable level. While the government tries to adjust overall size, it does not necessarily mean uniform reduction in loan guarantees over the guaranteed firms. Significant reductions in guarantee supply will be targeted for relatively large firms to shift the guarantee supply towards more innovation-oriented and new firms. The firms of which the annual sales turnover exceeds 30 billion won and the firms that have received credit guarantee for more than 10 years will not be eligible for public guarantee in the long run. Current ceiling of the credit guarantee per borrower will also be reduced from current 10 billion won to 7 billion won. Firms in serious

financial distress will also be subject to gradual termination of guarantee provision.

The blueprint for guarantee reform includes market-friendly measures as well such as the gradual reduction of the coverage ratio which is currently a uniform ratio of 85 percent and differentiation of it from 50 to 90 percent according to the credit worthiness of firms. This measure is to make the guarantee scheme more incentive compatible and to promote screening and monitoring incentives of banks, which is crucial to the reduction of the default rate and thus the public cost of SME loan guarantees. The new scheme will also gradually increase average guarantee fee rate by raising the upper ceiling from the current 0.5 to 2 percent to 0.5 to 3 percent. The fee structure will also be further differentiated across guaranteed firms according to their credit standing. Additional fees will be charged for firms that have received guarantees for more than 5 years and for firms with large outstanding amount of guarantee.

As noted above the reform proposal of the government has raised serious concerns in the SME sector since it could have unintended negative impact on banks' SME lending at least in the short run. It is argued that commercial banks would respond to the lower coverage ratio and reduced guarantee supply by curtailing SME lending and by charging higher interest rates. Banks may also ask for additional collaterals to cover increased risk in SME lending. In particular, as emphasized above, it may produce a compounding impact under the new Basel framework through the increased capital requirements for banks.

III. Treatment of Credit Guarantees under the New Basel Accord

Banks adopt various measures to mitigate the credit risk of loans. For instance, loan exposures could be collateralized or guaranteed by a third party, in whole or in part. The new Basel accord (2005) allows banks to take account of such credit mitigation in calculating capital requirement on the condition that guarantees are direct, explicit, irrevocable and unconditional, and supervisors are satisfied that banks fulfill certain minimum operational conditions relating to risk management processes.

The substitution approach is applied to the guaranteed loans as under the 1988 accord. According to this approach, only guarantees issued by entities with a lower risk weight than the borrower lead to reduced capital charges since the protected portion of the exposure is assigned the risk weight of the guarantor, whereas the uncovered portion retains the risk weight of the borrower. For partial guarantees, where the amount guaranteed is less than the amount of the exposure and the bank and the guarantor share losses on a pro-rata basis, capital relief will be afforded on a proportional basis. Namely, the protected portion receives the treatment applicable to eligible guarantees with the remainder treated as unsecured.

Currently in Korea under Basel I, the protected portion of the exposure guaranteed by the KCGF and KOTEC is risk weighted at 10 percent. The remaining unprotected portion is treated as unsecured claims on corporate, which is risk weighted at 100 percent.

1. The Standardized Approach

The new Basel accord allows banks to choose from two broad methods in computing their capital requirements for credit risk. One is the standardized

approach and the other is the internal ratings-based (IRB) approach. As noted above, banks adopting the standardized approach are allowed to use the risk weight of the guarantor for the protected portion and the risk weight of the underlying borrower is assigned for the unprotected portion of the exposure. Hence, the protected portion of the exposure by public sector entities (PSEs) may be risk weighted according to the credit assessment on the sovereign in whose jurisdictions the PSEs are established.

As such, for Korean currency denominated loans, the protected portion by the KCGF and KOTEC may be risk weighted at zero percent as the sovereign credit rating of Korea is currently AA (S&P) and its risk weight is zero percent. The unprotected portion is risk weighted according to the credit assessment of the respective borrower. For unprotected corporate claims, the risk weight varies from 20 percent to 150 percent depending on the credit rating of borrowers and 100 percent weight is applied for unrated corporate claims.

Under the new Basel accord, banks still continue to comply with the 8 percent minimum capital requirement rule as under the current Basel I. Under the standardized approach, risk-weights for general corporate exposures are also applied to SME exposures. The minimum capital requirement is computed as follows:

$$K = EAD \times \alpha \times 0.08$$

where, K is the capital requirement for SME exposures, α is the risk weight of the corporate claim and EAD is the exposure at default. However, for small exposures of less than €1 million (one billion Korean won in the case of Korea) that are qualified as a retail exposure, banks would be able to apply a fixed retail credit risk-weight of 75 percent.

2. The Internal Ratings-Based (IRB) Approach

As an alternative to the standardized approach, subject to certain minimum conditions and disclosure requirements, banks that receive supervisory approval may use the IRB approach in which banks rely on their own internal estimates of risk components in determining the capital requirement for a given exposure. The risk components include measures of the probability of default (PD), loss given default (LGD), exposure at default (EAD), and effective maturity (M). In some cases, banks may be required to use values assigned by the supervisory authority as opposed to the internal estimate for one or more of the risk components.

With these risk components, for corporate exposures, the capital requirement rate (K) and the implied risk weighted asset (RWA) under the 8 percent minimum capital is calculated as follows:

$$K = LGD \times \left[\Phi \left(\frac{\Phi^{-1}(PD) + \sqrt{r} \times \Phi^{-1}(C)}{\sqrt{1-r}} \right) - PD \right] \times \frac{1 + (M - 2.5) \times b(PD)}{1 - 1.5 \times b(PD)}$$

$$b(PD) = (0.11852 - 0.05478 \times \ln(PD))^2$$

$$RWA = K \times 12.5 \times EAD$$

where, $\Phi(\cdot)$ is the cumulative distribution function for a standard normal random variable, C is the confidence level, r is the correlation, $b(PD)$ is the maturity adjustment term which is a function of PD .

The new Basel accord suggests a formula to compute the correlation for corporate exposures and proposes an adjustment for exposures to SME borrowers whose reported sales turnover on a consolidated group basis is less than €50

million (60 billion won in the case of Korea). The formula for SME exposures to be used by Korean banks when the sales volume is S (in billion) is the following:

$$r = 0.12 \times \left(\frac{1 - e^{-50 \times PD}}{1 - e^{-50}} \right) + 0.24 \times \left(1 - \frac{1 - e^{-50 \times PD}}{1 - e^{-50}} \right) - 0.04 \times \left(1 - \frac{(S - 6)}{54} \right)$$

For retail exposures, effective maturity (M) is fixed at 2.5 and a lower range in credit correlation is allowed compared to corporate exposures as follows:

$$r = 0.03 \times \left(\frac{1 - e^{-35 \times PD}}{1 - e^{-35}} \right) + 0.16 \times \left(1 - \frac{1 - e^{-35 \times PD}}{1 - e^{-35}} \right)$$

Then, the minimum capital requirements against SME loans are obtained using the same formula used for corporate exposures above.

a. The Foundation Approach (F-IRB)

Under the foundation IRB approach, banks provide their own estimates of PD associated with each of their borrower grades, but must use supervisory estimates for the other relevant risk components (LGD , EAD and M). The PD is the greater of the one-year PD associated with the internal borrower grade to which that exposure is assigned, or 0.03 percent. The PD of borrowers assigned to a default grade is 100 percent. As for the LGD , a 45 percent LGD is assigned for senior claims on corporate not protected by recognized collateral and a 75 percent LGD is assigned for unprotected subordinated claims on corporate. LGD mitigation may be allowed for claims protected with collateral. For banks using foundation approach, effective maturity (M) is 2.5 years except for repurchase agreement

transactions where the effective maturity is 6 months.

For banks adopting the foundation IRB approach, the treatment of guarantees closely follows the substitution principle of the standardized approach. The range of eligible guarantor is the same as under the standardized approach except that companies that are internally rated and associated with a *PD* equivalent to A- or better may also be recognized under the foundation approach. For the protected portion of the exposures, the capital requirement rate is computed by replacing *PD* with that of the guarantors. Hence, for the protected portion of the guaranteed exposures by the KCGF or KOTEC, the minimum *PD* value of 0.03 percent is to be used. For the unprotected portion of the guaranteed exposures, *PD* of the underlying obligor is used.

b. The Advanced Approach (A-IRB)

Under the advanced approach, banks provide their own estimates of *PD*, *LGD*, *EAD*, and *M* subject to satisfying a minimum standard set by the supervisory authority. Based upon the internal estimates above formula are used to compute the capital requirements.

As for the guaranteed exposures, banks using the A-IRB approach may reflect the risk mitigating effect through either *PD* or *LGD*. Hence, for banks that choose *PD*, 0.03 percent is used for the protected portion by the public guarantor. Banks may instead choose to make an adjustment to their *LGD* estimates for the protected portion of guaranteed exposures. Under this option, there are no limits to the range of eligible guarantors although certain qualifications must be satisfied concerning the type of guarantee. For instance, in Korea, *LGD* of 5 percent would be used for the protected portion of the guaranteed loans in the case of the public guarantors. The treatments of the guarantees under the Basel I and Basel II in Korea are summarized in Table 1.

<Table 1> Summary Framework of Capital Requirements for Credit Risks

	Unprotected Loans	Collateralized Loans	Guaranteed Loans (Protected Portion)
[Basel I]	- risk weight 100%	- residential real estate: 50% - commercial real estate: 100%	- KCGF and KOTEC guarantees: risk weight 10%
[Basel II] Standardized Approach	- rated: 20~150% - unrated: 100% - retail exposure(≤1 billion won): 75%	- eligible financial: 0% - residential real estate: 35% - commercial real estate: 100%	- KCGF and KOTEC guarantees: 0%
Foundation IRB Approach	- PD: estimated - LGD: senior: 45% subordinate: 75% -M: 2.5 -SME exposure (sales ≤60 billion won) and retail exposures: correlation adjustment	- PD: estimated - LGD: up to 70% of collateral value: 35% remaining 30%: 45%	- PD: 0.03% - LGD: senior: 45% Subordinate: 75%
Advanced IRB Approach	- PD: estimated - LGD: estimated - M: estimated -SME exposure (sales ≤60 billion won) and retail exposure: correlation adjustment	- PD: estimated - LGD: up to 70% of collateral value: 35% remaining 30%: 45%	- PD: 0.03% - LGD: senior: 45% subordinate: 75% or - PD: estimated - LGD: 5%

IV. Empirical Analysis and Simulations

1. Data and Information

This study has mainly relied upon the dataset provided by the Korea Federation of Banks, which reports the total amount of credits extended by member banks for respective SMEs as of the end of 2004. After observations with outliers and missing values are deleted, the total number of firms that we use for analysis is 5,362, which includes almost all externally audited SMEs that have a non-zero outstanding loan balance from commercial banks in Korea. Note that firms whose total asset size is 7 billion won (approximately US 7.3 million dollars) or above are subject to the external audit requirement. Hence, our dataset excludes relatively small and young SMEs whose asset size is less than 7 billion won.

Decomposition of the total bank credit outstanding for a given firm is also reported: pure unprotected loans without risk mitigations, effective value of collateral for collateralized loans, and credit guaranteed loans. Other balance sheet and profit and loss information for the SMEs were obtained from the Korea Information Service (KIS) line. The KIS line also reports its own credit score evaluation for respective firms, which we use to assign internal credit ratings for firms.

There are a number of caveats that should be noted regarding the data. First, our dataset does not include smaller and younger SMEs for which external audit is not required. The use of this restricted sample is inevitable due to data availability. However, since credit guarantee supply is relatively more concentrated on those excluded smaller SMEs, our results may underestimate or overestimate the true impact of credit guarantee reform. For instance, the increase in the required capital of banks as a result of the reduced coverage ratio may be underestimated as credit guaranteed loans account for a smaller portion in total bank loans for our

sample firms. However, it may overestimate the increase in capital charge since most of loan exposures to the excluded smaller SMEs would qualify for retail exposures and hence treated favorably under the new Basel accord.

Second, while our bank credit data reports the effective value of collateral for respective borrowing firms, it does not report the exact loan amount covered by the collateral. Hence, we assume that the face value of the collateralized loan is the same as the effective value of loan collateral. Furthermore, our dataset does not provide detailed information on the type of collateral and hence, we assume that the collateral is commercial real estate or others and not residential real estates.

2. Profile and Determinants of Credit Guaranteed Loans

a. Basic Profile of Credit Guaranteed Loans

According to our dataset, 1,093 firms out of total 5,362 externally audited firms (approximately 20 percent) received credit guaranteed loans as of the end of 2004. The basic profiles of the credit guaranteed firms and firms without credit guarantees are summarized in Table 2. As can be seen, the credit guaranteed firms on average show a higher growth rate (both in asset and net sales growth rates) relative to non-credit guaranteed firms. However, the credit guaranteed firms in general show lower profitability and interest coverage ratio. It is difficult to evaluate the allocational efficiency or effectiveness of the public guarantee policy based upon this static profile alone. In some respect, it is reasonable to observe this pattern if the public guarantees are relatively more concentrated on the SMEs with a lower profitability but with a high growth potential. However, especially when we consider that the actual duration of loan guarantee including refinancing is relatively long in Korea, this result implies that the credit guarantees have not

been so much instrumental for SMEs in improving their financial performance.

<Table 2> Basic Profile of Credit Guaranteed Firms

	Firms with Credit Guarantee	Firms without Credit guarantee	t-value ^{1), 2)}
Growth Rate in Total Assets (average)	9.20%	6.09%	5.03***
Growth Rate in Net Sales (average)	15.59%	12.76%	2.56**
Debt Equity Ratio ³⁾ (average)	356.30%	360.60%	-0.28
Total Borrowings to Total Assets Ratio (average)	40.73%	34.54%	10.02***
Interest Coverage Ratio (average)	3.49	6.68	-8.30***
Operating Income to Net Sales Ratio (average)	4.00%	5.44%	-5.72***
Return on Assets (average)	3.48%	3.91%	-2.24**
Number of Firms	1,093	4,269	

Notes:

¹⁾ t-values are for the hypothesis that the means of two groups are equal under the assumption of equal variance. Numbers in parentheses denote t-values.

²⁾ ***, **, * denote respectively 1%, 5%, and 10% level of significance.

Tables 3-1 and 3-2 show the distribution of credit guaranteed loans across firms with different asset size and net sales volume. For instance, among the credit guaranteed firms, nearly 50 percent (48.76 percent) of firms had their asset sizes

between 10 and 20 billion won. The overall average balance of credit guaranteed loan was 1.52 billion won, and the average ratio of credit guaranteed loan to total bank borrowing was 19.17 percent implying that approximately one fifth of total bank loan was a guaranteed loan for a typical firm in our sample. Note that more than 60 percent of the credit guaranteed loans were allocated to the firms with asset sizes between 10 and 30 billion won. While the largest firms received on average the largest amount of loan guarantee in absolute value, relatively small firms with asset sizes below 20 billion won received the largest share (over 20 percent) in terms of the guaranteed loan to total bank borrowing ratio.

<Table 3-1> Distribution of Credit Guaranteed Loans by Asset Size of Firms

Asset Size of Firms (billion won)	Number of Firms (%)	Average Balance of Credit Guaranteed Loan (million won)	Share in Total Credit Guaranteed Loans	Ratio of Credit Guaranteed Loan to Total Bank Borrowing (average)
Over 60	41 (3.75%)	2,998.16	7.39%	8.88%
50~60	30 (2.74%)	1,977.49	3.56%	11.14%
40~50	41 (3.75%)	2,340.63	5.77%	15.64%
30~40	82 (7.50%)	2,112.83	10.41%	14.86%
20~30	198 (18.12%)	1,900.18	22.61%	19.72%
10~20	533 (48.76%)	1,301.49	41.69%	20.80%
Below 10	168 (15.73%)	849.61	8.58%	20.24%
Totals / Average	1,093 (100%)	1,524.68	100%	19.17%

When we investigate the distribution of credit guaranteed loans in terms of net annual sales turnover, it is noteworthy that the firms with very large sales

turnover (more than 60 billion won) received a relatively large share (23.49 percent) in total credit guaranteed loans. This seems to be in general true even in terms of the ratio of the guaranteed loan to total bank loan. Hence, the present results seem to support for the criticism that the public credit guarantees for relatively large firms with high sales turnover need to be curtailed and shifted towards more smaller and younger SMEs.

<Table 3-2> Distribution of Credit Guaranteed Loans by Annual Sales Turnover

Annual Sales Turnover (billion won)	Number of Firms (%)	Average Balance of Credit Guaranteed Loan (million won)	Share in Total Credit Guaranteed Loans	Ratio of Credit Guaranteed Loan to Total Bank Borrowing (average)
Over 60	156 (14.27%)	2,506.08	23.49%	16.84 %
50~60	50 (4.57%)	2,200.35	6.61%	23.84 %
40~50	66 (6.04%)	2,333.33	9.25%	21.22 %
30~40	135 (12.35%)	1,580.63	12.82%	18.93 %
20~30	226 (20.68%)	1,398.90	19.00%	19.84 %
10~20	348 (31.84%)	1,134.19	23.72%	19.37 %
Below 10	112 (10.25%)	758.35	5.10%	17.41 %
Totals / Average	1,093 (100%)	1,524.68	100%	19.17%

Table 4 shows the distribution of the credit guaranteed loans across different industrial sectors. Note that nearly 70 percent of the total guaranteed loans outstanding were concentrated on the manufacturing industry, and the wholesale and retail trade industry and the construction industry received the second and

third largest shares. In terms of the credit guaranteed loan to total bank borrowing ratio, the recreational, cultural and sporting activity industry, other community, repair and personal service activity industry, and the agriculture and forestry industry received relatively large amount of credit guarantees.

<Table 4> Distribution of Credit Guaranteed Loans by Industry

Industry	Number of Firms (%)	Average Balance of Credit Guaranteed Loan (million won)	Share in Total Credit Guaranteed Loans	Ratio of Credit Guaranteed Loan to Total Bank Borrowing (average)
Agriculture & Forestry	1 (0.09%)	1,761.18	0.11 %	34.05 %
Fishing	1 (0.09%)	282.35	0.02 %	5.46 %
Mining & Quarrying	3 (0.27%)	514.51	0.09 %	17.47 %
Manufacturing	813 (74.38%)	1,413.94	69.08 %	16.60 %
Electricity, Gas & Water Supply	1 (0.09%)	500.00	0.03 %	15.53 %
Construction	92 (8.42%)	1,959.36	10.83 %	31.05 %
Wholesale & Retail Trade	138 (12.63%)	1,900.15	15.76 %	24.21 %
Hotels & Restaurants	2 (0.18%)	364.71	0.04 %	4.68 %
Transport	24 (2.20%)	1,400.15	2.02 %	25.67 %
Real estate and Renting & Leasing	2 (0.18%)	1,054.12	0.13 %	9.68 %
Business Activities	8 (0.73%)	1,776.18	0.85 %	28.19 %
Recreational, Cultural and Sporting Activities	5 (0.46%)	1,129.18	0.34 %	34.89 %
Other Community, Repair & Personal Service Activities	3 (0.27%)	3,910.98	0.71 %	34.78 %
Totals / Average	1,093 (100%)	1,524.68	100 %	19.17%

Note: Industry classification is based on the 'Korea Standard Industry Code,' National Statistical Office

Finally, Table 5 shows the distribution of the credit guaranteed loans in terms of the credit rating of firms. According to the KIS credit score evaluation, 36 percent of credit guaranteed firms belong to grade 5 with credit scores between 50 and 60. This group received the largest share of credit guaranteed loans. In terms of the ratio of the guaranteed loan out of total bank borrowing firms in grade 3 with credit scores between 70 and 80 received the highest share (25.5 percent).

<Table 5> Distribution of Credit Guaranteed Loans by KIS Credit Score

KIS Credit Rating Grade (Credit Score)	Number of Firms (%)	Average Balance of Credit Guaranteed Loan (million won)	Share in Total Credit Guaranteed Loans	Ratio of Credit Guaranteed Loan to Total Bank Borrowing (average)
Grade 2 (80~90)	17 (1.64%)	2,666.44	2.84 %	21.15 %
Grade 3 (70~80)	102 (9.84%)	2,332.78	14.29 %	25.50 %
Grade 4 (60~70)	296 (28.54%)	1,608.39	29.85 %	20.92 %
Grade 5 (50~60)	374 (36.07%)	1,495.96	35.08 %	18.63 %
Grade 6 (40~50)	192 (18.51%)	1,216.86	14.65 %	16.47 %
Grade 7 (30~40)	49 (4.73%)	784.59	2.41 %	12.90 %
Grade 8 (20~30)	7 (0.68%)	589.41	0.26 %	8.53 %
Totals / Average	1,037 ²⁾ (100%)	1,538.14	100%	19.26%

Note: 1) No firms were in grade 1 (over 90 in credit score) and grade 9 (10~20 in credit score)

2) 56 firms that do not have credit scores were deleted from the sample.

b. Determinants of Credit Guaranteed Loans

In an attempt to explore the determinants of credit guarantee allocations across firms, we conduct regression analyses utilizing our cross-section firm level data described above. We estimate two distinctive model specifications:

$$\ln(CG)_i = \beta_0 + \beta_1 \ln(Asset_i) + \beta_2 (Borr / Asset)_i + \beta_3 (Income / Sales)_i + \beta_4 CScore_i + \beta_5 Years_i + \sum_k \beta_k IDummy_{ki} + \varepsilon_i \quad (1)$$

$$(CG / BLoan)_i = \beta_0 + \beta_1 \ln(Asset_i) + \beta_2 (Borr / Asset)_i + \beta_3 (Income / Sales)_i + \beta_4 CScore_i + \beta_5 Years_i + \sum_k \beta_k IDummy_{ki} + \varepsilon_i \quad (2)$$

In the first model, the dependent variable is the natural logarithm of the outstanding amount of credit guaranteed loans (CG), and in the second model, the dependent variable is the ratio of credit guaranteed loans relative to total bank borrowing ($CG/BLoan$). As independent variables, we include various firm specific variables such as log total asset size ($Asset$), total borrowing to asset ratio ($Borr/Asset$), operating income to net sales ratio ($Income/Sales$), the KIS credit score ($CScore$), number of years since firm establishment as well as industry dummy variables ($IDummy$).

Table 6 reports the OLS regression estimation results. To avoid possible simultaneity problems between explanatory variables and regression disturbances, we used one year lagged values for $\ln(Asset)$, $(Borr/Asset)$, and $(Income/Sales)$. As for the log credit guaranteed loan regression, we find that the coefficients of log asset size and credit score are significantly positive, which suggests that relatively large firms and firms with better credit standing tend to receive more credit guaranteed loans. However, firm's financial structure represented by the total

borrowing to asset ratio as well as profitability measure such as operating income to net sales ratio do not seem to be significantly associated with the amount of credit guaranteed loans.

Note that the positive coefficient of credit score indicates that the public credit guarantee funds have operated guarantee provisioning relatively conservatively for this externally audited group of SMEs from the perspective of risk management. In some respect, this would make sense in that they need to maximize profit per unit of risk taken for this relatively large SME group as they have to assume more risks for much smaller and younger firms for which external audit is not required. Note also that the coefficient of the firm year variable is negative, which indicates that, with presumably reduced information asymmetry, credit guarantee funds have gradually curtailed guarantee provision for relatively older and thus well known firms. However, this effect is significant only at the 10% level, and further efforts in this direction may be required by the public guarantee funds.

When we use the ratio of credit guaranteed loans to total bank borrowing as a dependent variable, the coefficients of log asset size and borrowing to total asset ratio are significantly negative. This indicates that the positive size effect observed in the loan amount regression is mostly driven by the fact that larger firms tend to have a larger amount of total bank borrowing. Hence, when we adjust by the size of total bank borrowing, the share of guaranteed loans turns out to be lower for larger and more leveraged firms. Note that the profitability measure is still insignificant and the number of firm years becomes insignificant. However, the credit score variable is positive again and significant at the 10% level, indicating that firms with relatively good credit standing tend to have a higher guaranteed loan share.

<Table 6> Determinants of Credit Guaranteed Loans: Regression Analysis

Independent Variables	Dependent Variable: Log Credit Guaranteed Loan	Dependent Variable: Credit Guaranteed Loan to Total Bank Borrowing Ratio
Log Total Assets (lagged)	0.3872 ^{***} (7.06)	-6.5541 ^{***} (-7.03)
Total Borrowings to Total Asset Ratio (lagged)	0.0007 (0.35)	-0.2663 ^{***} (-7.84)
Operating Income to Net Sales (lagged)	0.0041 (0.90)	0.0609 (0.78)
KIS Credit Score	0.0142 ^{***} (4.66)	0.0965 [*] (1.87)
Log Number of Years since Establishment	-0.0875 [*] (-1.71)	-0.8258 (-0.95)
Adjusted R ²	0.08	0.15

Note: 1) Constant and industry dummy variables were included in the regressions but the coefficients are not reported to save space.

2) Numbers in parentheses denote t-values.

3) ^{***}, ^{**}, ^{*} denote respectively 1%, 5%, and 10% levels of significance.

3. Simulation Analysis

Now we turn to the simulation analysis to address our main questions of the present study: Namely, what are the impacts of the new Basel accord and the credit guarantee reform on bank capital requirements? How do risk capital charges vary under alternative credit guarantee reform scenarios? And would the guarantee reform have differential impacts across banks that adopt different Basel II approaches?

a. Assumptions

Our simulation analysis needs to rely upon several assumptions because we have no access to detailed loan information such as loan maturities and the nature of collaterals. Moreover, banks' internal credit rating evaluations as well as *PD* and *LGD* estimates for respective firms are also unknown. Major assumptions used in the simulation are summarized in the following:

First, we assumed that all uncollateralized claims were senior, and for collateralized loans, all collaterals were commercial real estates rather than residential real estates.

Second, we applied the SME adjustment to corporate exposures to SMEs whose annual sales turnover was 60 billion won or less. We also classified corporate exposures as a retail exposure if the unprotected pure corporate exposure without risk mitigations was less than 1 billion won.

Third, in the standardized approach, we used external credit ratings of commercial paper or corporate bond for those firms that have issued such corporate securities. In assigning the risk weight, we chose the lower rating in case both ratings were available. Those firms that have not issued rated securities were classified as unrated.

Fourth, we need internal credit ratings of respective borrowing firms in the IRB approaches. In order to determine the credit rating of respective SMEs, we used the credit score values assigned by the KIS. We also obtained *PD* and *LGD* estimates as well as the proportions of firms across credit risk ratings from a major commercial bank in Korea, which is summarized in Table 7. After ordering the 5,362 firms according to the KIS credit score, we applied the proportions of firms in Table 7 to determine the credit rating of a given SME, and according to this credit risk rating, we assigned *PD* and *LGD* estimates to the SME.

Fifth, under the advanced IRB, we may choose to substitute either *PD* or

LGD for guaranteed loans. We substituted *PDs* for guaranteed loans by assigning 0.03 percent which is the minimum *PD* that could be assigned.

Sixth, in the advanced IRB approach, the effective maturity (*M*) was assumed to be 2.5 years as a base case as in the foundation IRB. However, to reflect that the average maturity of SME loans is 1.5 year in Korea (Kim and Park 2004) we also assumed *M* to be 1.5 years in conducting simulations for A-IRB.

<Table 7> *PD* and *LGD* by Credit Risk Ratings

Credit Risk Rating	<i>PD</i>	<i>LGD</i>	Number of Firms	Percentage in Total Firms
1	0.03%	45.0%	4	0.08%
2	0.03%	50.3%	20	0.36%
3	0.91%	34.2%	226	4.13%
4	0.71%	31.1%	997	18.19%
5	2.73%	29.2%	2,278	41.58%
6	5.93%	23.7%	1,723	31.45%
7	7.14%	30.4%	142	2.59%
8	100%	44.0%	22	0.41%
9	100%	29.1%	16	0.28%
10	100%	28.3%	51	0.94%
Total			5,479	100%

Note: Credit Ratings 8, 9, 10 are default grades.

b. Scenarios of Credit Guarantee Reform

Note that the main objective of the present simulation analysis is to explore the impact of credit guarantee reform under alternative approaches of the new Basel accord. As we discussed in section II, the mandate of the credit guarantee reform is to gradually curtail the overall outstanding volume of credit guarantees. However, while the government tries to adjust overall size, it does not necessarily imply a uniform reduction across the board. Rather, reductions will be targeted for relatively large and good credit firms as they would have access to bank lending even in the absence of public guarantees. In addition, non-viable firms will be excluded from guarantee provision in order to facilitate restructuring of the SME sector. Reflecting the priorities of credit guarantee reform, we constructed four distinct reform scenarios summarized in Table 8.

<Table 8> Scenarios of Credit Guarantee Reform

Scenario A	Scenario B	Scenario C	Scenario D
Uniform coverage ratio: 75%	Uniform Coverage ratio: 60%	Differentiate coverage ratio by KIS credit Score	Differentiate coverage ratio by annual sales turnover
		80 or more: no guarantee	50 bil. or more: no guarantee
		70~80: 55%	30~50 bil.: 55%
		60~70: 65%	20~30 bil.: 65%
		40~60: 75%	less 20 bil.: 75%
		Less than 40: no guarantee	

In scenarios A and B, the current 85 percent uniform coverage ratio of loan guarantee is reduced to 75 percent and 60 percent respectively. Note that the reduced ratio is applied to all guaranteed loans regardless of firm characteristics. In scenario C, the coverage ratio is differentiated across borrowing firms according to firm's credit risk. We used the KIS credit score and differentiated coverage ratio from 55 percent to 75 percent applying higher ratios to riskier firms. When a firm's credit score is 80 or more, we assume that no guarantee is provided as this firm would have access to bank credits even without guarantees. In addition, as noted above, no guarantee is provided for firms with credit scores less than 40.

Scenario D differentiates the guarantee coverage ratio according to firm size. Specifically, we apply 55 percent to 75 percent to firms with annual sales turnover less than 50 billion won. For relatively large firms with annual sales turnover of 50 billion won or more, we assume that no guarantees are provided as they would have access to bank credits. In actual simulations below we assumed additional set of scenarios by imposing one more condition on those four scenarios. Namely, we assumed no guarantee provision for relatively old and established firms for which the number of years since establishment is 15 or longer. Note again that the rationale for this assumption is that information asymmetry would be lower for older and established firms with relatively long company histories.

c. Simulation Results

In this section we apply the Basel I and Basel II methodologies described in section III to obtain bank capital requirements for SME exposures which include pure credit based loans, collateralized loans and credit guaranteed loans for 5,362

externally audited firms. For a consistent comparison of the impact on capital requirement of alternative reform scenarios across different Basel approaches, we chose a common measure - the implied weighted average risk weight. To obtain the weighted average risk weight, we first computed the risk weighted asset (*RWA*) for respective corporate exposure by applying the appropriate capital requirement rate (*K*) and assuming 8 percent minimum capital requirement, that is, $RWA = K \times 12.5 \times EAD$. Then, the weighted average of the implied risk weight (RWA/EAD) was obtained using the total loan exposure of firms as a weight.

As noted before, our dataset does not include smaller and younger SMEs for which external audits are not required. Since credit guarantees are relatively more concentrated on those excluded smaller SMEs and thus, since the proportion of guaranteed firms is smaller in our externally audited firm sample, our results may underestimate the true impact of credit guarantee reform. For instance, the increase in the required capital of banks as a result of the reduced coverage ratio may be underestimated as the number of credit guaranteed firms is relatively small (1,093 out of total 5,362 firms) in our sample. Due to this problem, we conduct simulations for two distinct samples – for whole sample including all 5,362 firms and for sub-sample of 1,093 credit guaranteed firms. Note that the actual impact of the credit guarantee reform in Korea including both audited and non-audited SMEs may lie somewhere between these two sample results since actual percentage of guaranteed firms would be greater than the percentage in our whole sample but lower than 100% in our sub-sample with guaranteed firms only.

Simulation results for the whole sample are summarized in Tables 9-1 and 9-2. Table 9-1 is without the year condition and Table 9-2 is with the year condition. In Table 9-1, the implied weighted average risk weight under current Basel I without credit guarantee reform is 0.969. Starting from this as a base case, we can compare the magnitude of the impact across different scenarios and Basel II approaches. First, note that, without guarantee reform, the impact of Basel II is

largest under the foundation IRB and the average risk weight increases to 1.33 when SME and retail adjustments are not applied. When we apply SME and retail adjustments, the weighted average risk weight falls to 1.198 under F-IRB. Note that banks would be barely impacted from the adoption of Basel II under the standardized and advanced IRB approaches when SME and retail adjustments are applied. The reason why banks suffer most under F-IRB is because banks cannot exploit the benefit of reduced *LGDs* under F-IRB while lower *LGDs* can be applied under A-IRB.

Second, as expected, the credit guarantee reform invariably increases average risk weight and thus capital requirements under all scenarios. The adverse impact is in general in the increasing order from the scenario A to D. It is also interesting to note that the net adverse impact of the credit guarantee reform is alleviated under the new Basel accord compared to the impact under Basel I. For instance, the average risk weight increases from 0.969 to 0.992 in scenario D, an increase of 0.023 under Basel I. However, the net increases in the risk weight solely due to the guarantee reform are in the range of 0.01 to 0.017 under Basel II. The adverse impact of the guarantee reform is even smaller when we apply SME and retail adjustments. Now the net increase in the risk weight is on the order of 0.008 to 0.015 - approximately 35 to 75 percent of the impact under Basel I.

Third, in terms of the combined impact, when we compare the implied risk weights with that of the current Basel I without reform, even if guarantee reforms are undertaken, banks may be able to benefit under Basel II especially under the advanced IRB approaches. Namely, the risk weight drops from current 0.969 to 0.873~0.881 in the case of A-IRB with maturity 1.5 years and when SME and retail adjustments are applied.

There are two factors underlying the observation that the adverse impact of the credit guarantee reform is alleviated under Basel II. The first factor is the reduced risk weight for the protected portion of the publicly guaranteed loans

from the current 10 percent under Basel I to zero percent in Basel II. The second factor is the SME and retail adjustments for unprotected loans allowed under Basel II, which provide cushions to guard against the adverse impact of the guarantee reform. The simulation results when we impose further reform measure that no credit guarantees are provided to firms older than 15 years are qualitatively similar to the above results except that now the weighted average risk weights are in general higher than the case without the measure.

Tables 9-3 and 9-4 show simulation results for the sub-sample of credit guaranteed firms. Since we simulate based upon a sample of guaranteed firms only, this would overestimate the true impact to be obtained when we include both externally audited and non-audited firms. In addition, since the non-audited firms excluded are in general relatively small firms, a larger proportion of bank exposures to them would qualify for the retail adjustment. In this sense, the results shown in Tables 9-3 and 9-4 could be regarded as the most conservative worst case. Due to its importance as a base case in drawing policy implications, we also summarize the simulation results visually in Figures 4-1 to 4-3 and 5-1 to 5-3.

Note that now the adverse impacts of the credit guarantee reform are in general bigger than the whole sample results. However, except for the amplified impacts of the guarantee reform, most of findings in the whole sample are still observed here. Namely, first, the adoption of Basel II does not always lead to the increase in the capital requirements, while banks suffer most under the F-IRB approach. Second, while the credit guarantee reform invariably increases the capital requirements, its adverse impact is alleviated in Basel II due to the effectively zero risk weight for guaranteed portion and SME and retail adjustments of unprotected loans. Third, even in terms of the combined impact, Basel II and credit guarantee reform may not lead to a significant increase in capital requirements except for the F-IRB case.

These findings are visually summarized in Figure 6. Figure 6 compares the

net increases in the weighted average risk weight for our sub-sample simulations and when SME and retail adjustments are applied. To represent the worst conservative case we chose reform scenario D for comparison. The first blue bars denote the pure Basel II impact relative to current Basel I without reforming the credit guarantee system. Note that, only under the F-IRB approach, banks actually suffer from Basel II in terms of capital requirements. Under F-IRB, the net increase in the risk weight is 0.18 (from 0.888 to 1.068), which implies that the BIS capital ratio would fall by 1.348 percentage point for banks that currently maintain 8 percent BIS capital adequacy ratio ($8\% - 100 \times 0.888 \times 0.08 / 1.068$). However, for other Basel II approaches, banks may actually benefit from the lower risk weights.

As for the pure impact of the credit guarantee reform, which is denoted by the second red bars in Figure 6, the net increase in the average risk weight is highest under Basel I. The increase in the risk weight is 0.084 (from 0.888 to 0.972) which means a 0.691 percentage point fall in the BIS capital ratio ($8\% - 100 \times 0.888 \times 0.08 / 0.972$) for banks currently maintaining 8% BIS capital ratio. Note that the adverse impact of the credit guarantee reform is significantly reduced under Basel II ranging from 0.03 to 0.055.

Finally, the third yellow bars denote combined impacts of Basel II and credit guarantee reform. Note that the adverse impact of credit guarantee reform is alleviated by the benefit from Basel II in standardized and A-IRB approaches. Only under F-IRB, both impacts are adverse, and the combined impact is a significant increase in the risk weight of 0.234 (from 0.888 to 1.122), which implies a 1.668 percentage fall in the BIS capital ratio ($8\% - 100 \times 0.888 \times 0.08 / 1.122$). For other approaches, the net combined impact in terms of the increase in the weighted average risk weight is modest, and in the case of A-IRB with 1.5 years, the net combined effect is actually favorable for banks.

<Table 9-1> Simulation Results: Comparison of Weighted Average Risk Weights
(all sample firms)

Scenario	Treatment of Exposures	Basel I	Basel II			
			Standardized	F-IRB	A-IRB (M=2.5)	A-IRB (M=1.5)
No Reform	Corporate Exposure	0.969	0.959	1.330	1.070	0.971
	SME Adjustment	N/A	N/A	1.201	0.964	0.875
	SME & Retail Adjustment	N/A	0.956 (Retail only)	1.198	0.962	0.873
Scenario A	Corporate Exposure	0.973	0.963	1.335	1.073	0.974
	SME Adjustment	N/A	N/A	1.206	0.967	0.877
	SME & Retail Adjustment	N/A	0.960 (Retail only)	1.202	0.965	0.875
Scenario B	Corporate Exposure	0.978	0.969	1.342	1.077	0.978
	SME Adjustment	N/A	N/A	1.212	0.978	0.888
	SME & Retail Adjustment	N/A	0.966 (Retail only)	1.208	0.968	0.878
Scenario C	Corporate Exposure	0.978	0.968	1.342	1.077	0.978
	SME Adjustment	N/A	N/A	1.212	0.971	0.881
	SME & Retail Adjustment	N/A	0.965 (Retail only)	1.208	0.968	0.878
Scenario D	Corporate Exposure	0.992	0.975	1.347	1.080	0.981
	SME Adjustment	N/A	N/A	1.218	0.974	0.884
	SME & Retail Adjustment	N/A	0.971 (Retail only)	1.213	0.971	0.881

<Table 9-2> Simulation Results: Comparison of Weighted Average Risk Weights
(all sample firms, no credit guarantees to firms older than 15 years)

Scenario	Treatment of Exposures	Basel I	Basel II			
			Standardized	F-IRB	A-IRB (M=2.5)	A-IRB (M=1.5)
No guarantee to older than 15 years only	Corporate Exposure	0.986	0.977	1.352	1.082	0.983
	SME Adjustment	N/A	N/A	1.221	0.976	0.885
	SME & Retail Adjustment	N/A	0.973 (Retail only)	1.219	0.972	0.882
Scenario A	Corporate Exposure	0.987	0.979	1.354	1.084	0.984
	SME Adjustment	N/A	N/A	1.223	0.977	0.886
	SME & Retail Adjustment	N/A	0.975 (Retail only)	1.217	0.973	0.883
Scenario B	Corporate Exposure	0.990	0.982	1.358	1.086	0.986
	SME Adjustment	N/A	N/A	1.226	0.982	0.892
	SME & Retail Adjustment	N/A	0.977 (Retail only)	1.220	0.975	0.885
Scenario C	Corporate Exposure	0.990	0.981	1.358	1.086	0.987
	SME Adjustment	N/A	N/A	1.227	0.979	0.889
	SME & Retail Adjustment	N/A	0.977 (Retail only)	1.221	0.975	0.885
Scenario D	Corporate Exposure	0.996	0.984	1.360	1.087	0.987
	SME Adjustment	N/A	N/A	1.228	0.980	0.889
	SME & Retail Adjustment	N/A	0.980 (Retail only)	1.222	0.976	0.886

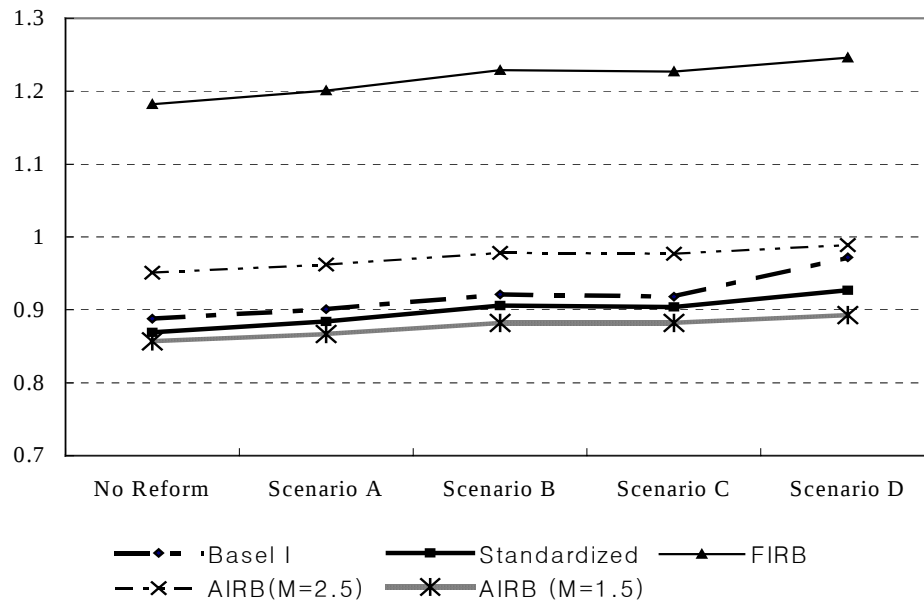
<Table 9-3> Simulation Results: Comparison of Weighted Average Risk Weights
(sub-sample of credit guaranteed firms)

Scenario	Treatment of Exposures	Basel I	Basel II			
			Standardized	F-IRB	A-IRB (M=2.5)	A-IRB (M=1.5)
No Reform	Corporate Exposure	0.888	0.869	1.182	0.951	0.857
	SME Adjustment	N/A	N/A	1.072	0.863	0.777
	SME & Retail Adjustment	N/A	0.866 (Retail only)	1.068	0.861	0.775
Scenario A	Corporate Exposure	0.901	0.884	1.201	0.962	0.867
	SME Adjustment	N/A	N/A	1.088	0.873	0.786
	SME & Retail Adjustment	N/A	0.880 (Retail only)	1.083	0.869	0.783
Scenario B	Corporate Exposure	0.921	0.906	1.229	0.978	0.882
	SME Adjustment	N/A	N/A	1.113	0.915	0.825
	SME & Retail Adjustment	N/A	0.900 (Retail only)	1.105	0.882	0.795
Scenario C	Corporate Exposure	0.918	0.904	1.227	0.977	0.882
	SME Adjustment	N/A	N/A	1.112	0.887	0.800
	SME & Retail Adjustment	N/A	0.898 (Retail only)	1.104	0.882	0.796
Scenario D	Corporate Exposure	0.972	0.927	1.246	0.989	0.893
	SME Adjustment	N/A	N/A	1.132	0.899	0.811
	SME & Retail Adjustment	N/A	0.921 (Retail only)	1.122	0.893	0.805

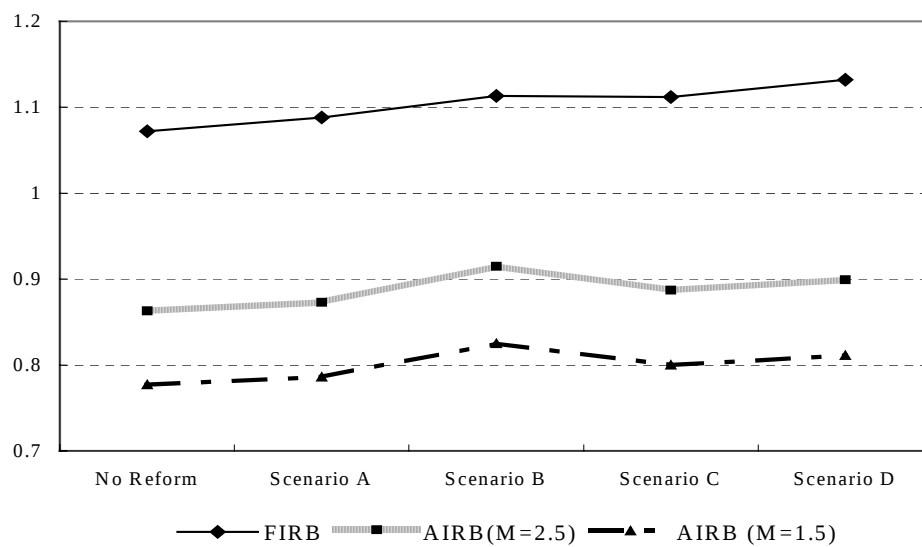
<Table 9-4> Simulation Results: Comparison of Weighted Average Risk Weights
(sub-sample of guaranteed firms, no guarantees to firms older than 15 years)

Scenario	Treatment of Exposures	Basel I	Basel II			
			Standardized	F-IRB	A-IRB (M=2.5)	A-IRB (M=1.5)
No guarantee to older than 15 years only	Corporate Exposure	0.947	0.936	1.263	0.998	0.901
	SME Adjustment	N/A	N/A	1.144	0.905	0.816
	SME & Retail Adjustment	N/A	0.927 (Retail only)	1.144	0.897	0.810
Scenario A	Corporate Exposure	0.954	0.942	1.272	1.003	0.906
	SME Adjustment	N/A	N/A	1.152	0.909	0.821
	SME & Retail Adjustment	N/A	0.933 (Retail only)	1.139	0.901	0.814
Scenario B	Corporate Exposure	0.963	0.953	1.286	1.011	0.914
	SME Adjustment	N/A	N/A	1.164	0.929	0.840
	SME & Retail Adjustment	N/A	0.943 (Retail only)	1.150	0.907	0.820
Scenario C	Corporate Exposure	0.962	0.952	1.287	1.012	0.915
	SME Adjustment	N/A	N/A	1.165	0.917	0.829
	SME & Retail Adjustment	N/A	0.942 (Retail only)	1.151	0.909	0.821
Scenario D	Corporate Exposure	0.985	0.961	1.291	1.014	0.917
	SME Adjustment	N/A	N/A	1.170	0.920	0.831
	SME & Retail Adjustment	N/A	0.951 (Retail only)	1.156	0.911	0.823

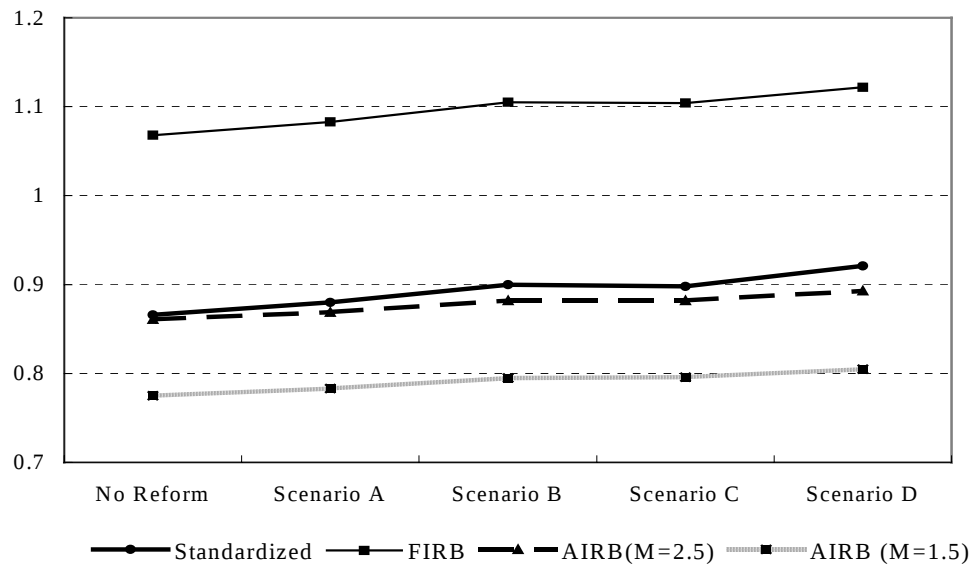
<Figure 4-1> Simulation Results: Weighted Average Risk Weights
(sub-sample of guaranteed firms - corporate exposures)



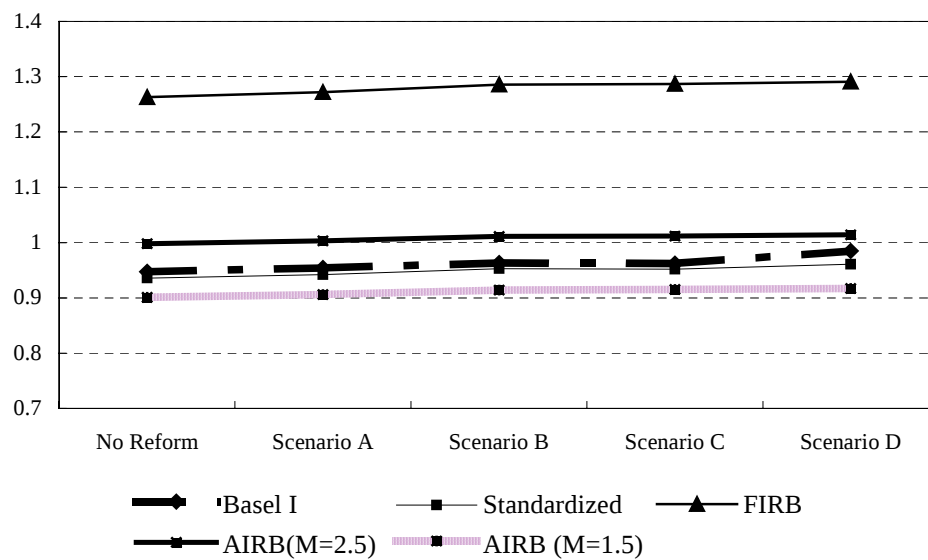
<Figure 4-2> Simulation Results: Weighted Average Risk Weights
(sub-sample of guaranteed firms – SME adjustments)



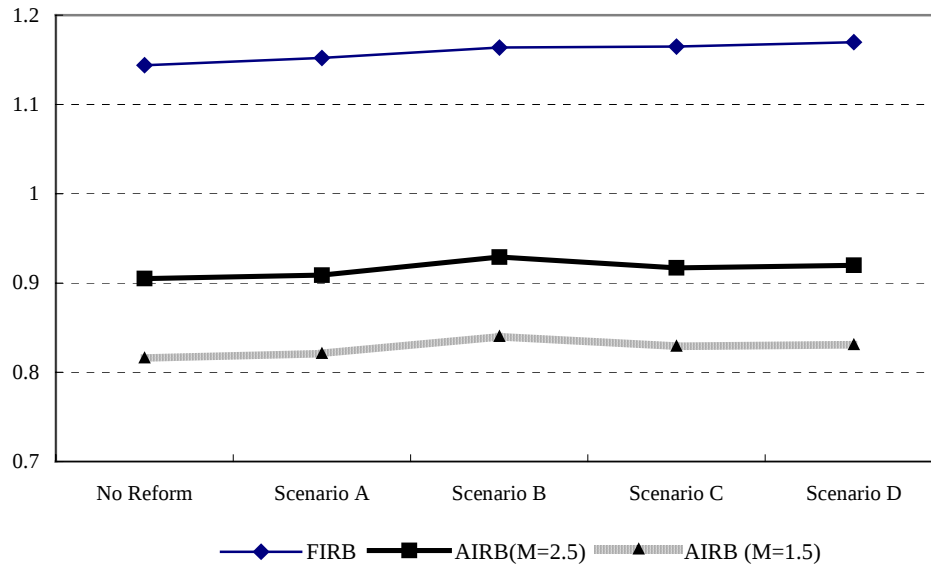
<Figure 4-3> Simulation Results: Weighted Average Risk Weights
(sub-sample of guaranteed firms – SME & Retail adjustments)



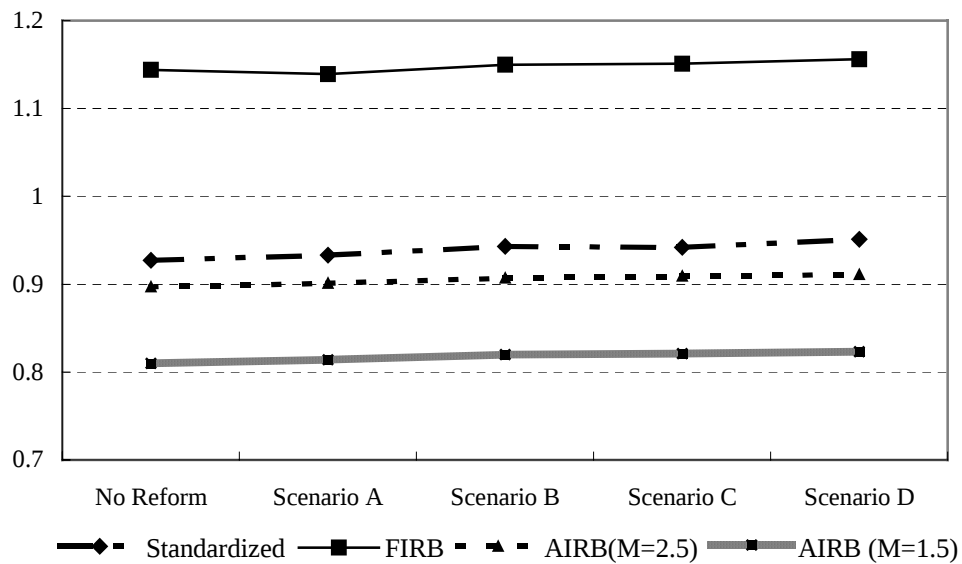
<Figure 5-1> Simulation Results: Weighted Average Risk Weights
(sub-sample, no guarantee to older than 15 years - corporate exposures)



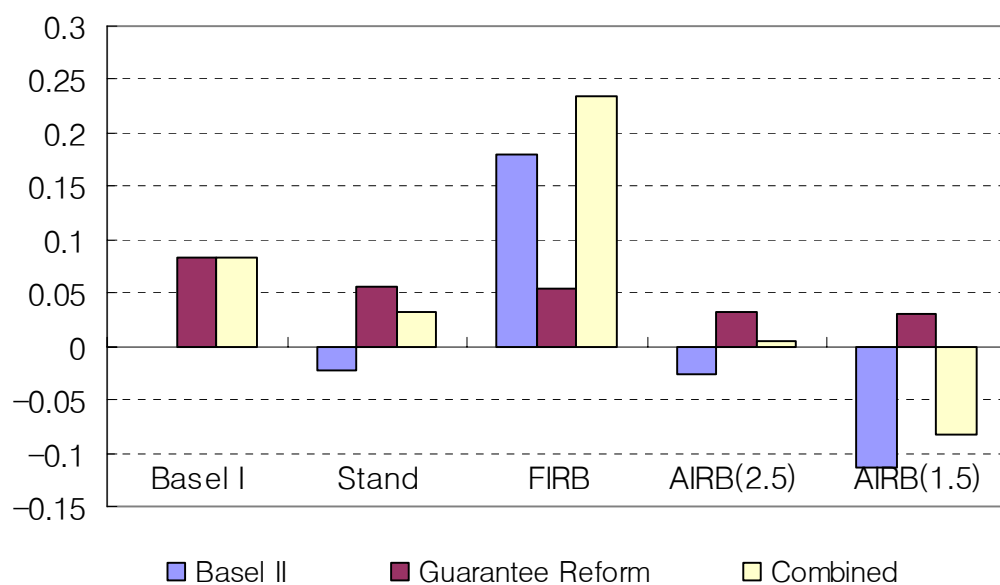
<Figure 5-2> Simulation Results: Weighted Average Risk Weights
(sub-sample, no guarantee to older than 15 years – SME adjustments)



<Figure 5-3> Simulation Results: Weighted Average Risk Weights
(sub-sample, no guarantee to older than 15 years – SME and retail adjustments)



<Figure 6> Net Increases in Weighted Average Risk Weights
(sub-sample, SME & retail adjustments, Scenario D without the year condition)



V. Summary and Concluding Remarks

Korea is one of the countries that have operated an extensive public credit guarantee program. Recognizing the potential problems of excessive credit guarantee, the Korean government recently proposed a reform plan to gradually retire the supply of guarantee provision. As a result, along with the new Basel accord to be adopted from 2008, Korea is now faced with two regulatory shocks. The main objective of the present paper is to evaluate the combined impact of the credit guarantee reform and Basel II upon bank capital requirements in Korea. Conducting simulation analysis utilizing a firm level dataset of bank loan exposures for 5,362 externally audited SMEs, we found the following results:

First, as for the impact of Basel II without reforming the guarantee system, the new Basel accord does not always lead to the increase in bank capital requirements. While banks are likely to suffer most under the F-IRB approach, they may actually benefit from lower capital requirements under the standardized and A-IRB approaches.

Second, while the credit guarantee reform invariably increases bank capital requirements, its adverse impact can be alleviated under Basel II due to two factors. The first factor is the reduced risk weight for the protected portion of the publicly guaranteed loans from the current 10 percent under Basel I to zero percent in Basel II. The second factor is the SME and retail adjustments for unprotected portion under Basel II, which provide cushions to guard against the adverse impact of the reduced guarantee coverage ratio.

Third, even in terms of the combined impact, Basel II and credit guarantee reform may not lead to a significant increase in capital requirements except for the F-IRB case. In a most conservative worst case, the BIS capital ratio may fall by approximately 1.7 percentage point as a result of the combined impact under F-IRB. However, for other approaches, the net combined impact is modest, and in

the case of A-IRB with 1.5 years, the combined impact may turn out to be actually favorable for banks.

The findings of the present study broadly support for the reform of credit guarantee system. Note that serious concerns have been raised that the credit guarantee reform would even aggravate the presumably negative impact of the new Basel accord. However, as a matter of fact, Basle II actually provides a more favorable regulatory environment to undertake the credit guarantee reform.

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