26 February 2013

Interim results of the EBA review of the consistency of risk-weighted assets.

Top-down assessment of the banking book

Interim results of the EBA review of the consistency of risk-weighted assets.
Top-down assessment of the banking book

Table of contents

List of Figures

Abbreviations

C-QIS	Comprehensive quantitative impact study
CCPs	Central counterparties
CCR	Counterparty credit risk
CET1	Common equity tier 1
SA	Standardised approach
IRB	Internal ratings based approach
FIRB	Foundation internal ratings based approach
AIRB	Advanced internal ratings based approach
PD	Probability of default
LGD	Loss given default
M	Maturity
GC	Global charge
EAD	IRB Exposure at default and SA exposure value
EL	Expected loss
SME	Small and medium-sized enterprise
RO	Roll-out effect
RWA	Risk-weighted assets
CMG	Capital monitoring group
TCOR	Task force on the consistency of outcome in risk-weighted assets
CCF	Credit conversion factor
SIGBB	Standard implementation group banking book

Introduction to the EBA's analysis of RWA

The purpose of this interim report on the EBA's investigation into what drives differences in RWA outcomes is to inform interested parties about the EBA's analysis of RWA, and assist them in understanding the scope of the work undertaken.

After finalising the 2011 EU-wide stress test and the recapitalisation exercise, the EBA turned its attention to understanding RWA. The aim is to identify whether there are material differences in RWA outcomes and, if so, to discover the sources of these differences and whether they are justified by fundamentals or are related to differences between banks and supervisory practices.

One key objective of this report is to illustrate the complexity behind differences in RWA and to emphasise that there is not necessarily a right and wrong answer in RWA outcomes. In-depth analysis can shed some light on what drives differences in RWA outcomes. This is useful for understanding the risk weights in different banks. Since this is an interim report, no policy conclusions can be drawn from the analysis.

The EBA's stress test and recapitalisation exercise have helped strengthen and enhance the consistency of the numerator of the capital ratios, whilst also improving broader understanding of capital levels through improved transparency and consistency of definitions. Following on from this, questions have been raised as to why there are significant differences in the denominator of the capital ratios (the capital requirements) and material differences in the regulatory parameters (PDs and LGDs) of the banks. The EBA is investigating these issues and plans to provide better information about them in due course in 2013 (see below work-plan).

As noted in the past, differences in risk parameters and capital requirements between banks are not a sign of inconsistency per se. For example, the composition of portfolios may differ across banks as the result of differences in markets (e.g. geography), risk appetite or borrower selection criteria. However, a substantial divergence between banks may signal that the methodologies used for estimating risk parameters by some banks will require further analysis.

Initially, the EBA has focused its analysis on credit risk, mainly IRB, postponing the work on the trading book. The report covers analysis of the risk parameter estimates used in the RWA and EL calculations and investigates to what extent any differences may reflect individual experience and risk management practices, different features of the internal models, and/or varying interpretation/practical application of the Capital Requirements Directive (CRD). Some attention has been given to the computation of RWA under the standardised approach, with particular reference to risk classification, usage of external ratings (ECAIs) and credit risk mitigation techniques.

After reaching an enhanced understanding of what drives differences in RWA, a number of options will be explored to address specific concerns. These include using existing CEBS/EBA Guidelines, where appropriate, to enhance convergence in the computation of RWA, and improve Pillar 3 disclosures, validation and ongoing monitoring of internal models.

The work plan on banking book exposures to be achieved by the end of 2013 includes:

1. Conducting a preliminary review on the consistency of RWA through a top-down exercise making use of the current existing supervisory reporting data. The results of this exercise are presented in this report.
2. Investigating the low default portfolio exposures (sovereigns, institutions and large corporate) including a hypothetical portfolio exercise. The exercise started in Q4 2012 and will be finalised in H1 2013.
3. Ad-hoc review of SMEs and residential mortgage exposures.

Executive summary of the top-down analysis

This report presents the first phase of our analysis. It is a 'top-down' exercise carried out by the EBA using an existing European dataset of supervisory reporting data at December 2011 covering 89 banks from 16 countries. The key indicator selected for the analysis and assessing the materiality of differences is the overall RWA and EL outcome or 'global charge' (information on risk weights are also provided in the report and specifically in Annex III), which takes into account both unexpected losses (from standardised and IRB approach) and expected losses (EL).

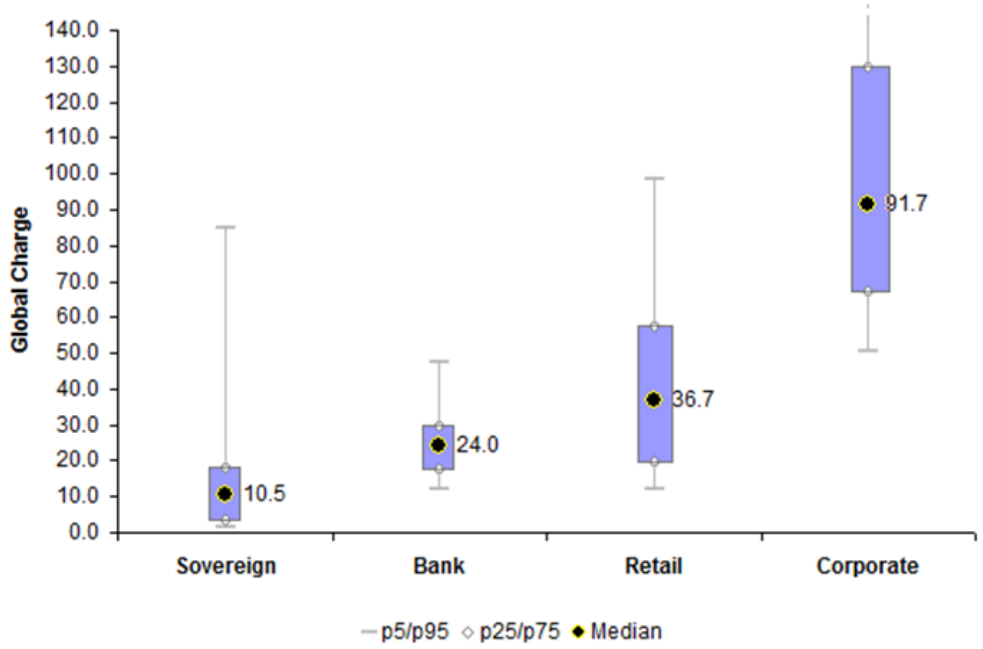
$$\text{Global charge (GC)} = \frac{\text{RWA} + 12.5 * \text{EL}}{\text{EAD}}$$

Credit risk is by far the most significant component of total risk-based capital requirements, representing around 77% of total RWA. Operational risk and market risk contribute on average 8.5% and 10.5% respectively. In general, the impact of 'floor adjustment'[1] which places a floor on RWA levels relative to Basel I, is not significant, although for some banks the floor adjustment is material.

More detailed analysis carried out for credit risk on the different portfolios (sovereign, bank, corporate, retail) confirmed the existence of a significant difference in the GC between the banks[2].

[1] In the recapitalisation exercise (2011) the EBA identified different practices in the computation of the transitional floor. The EBA promotes a consistent application of the floor in the current Regulation and in the forthcoming CRD4/CRR.
[2] The results of this more detailed analysis are not presented in this report.

Figure 1: Graph of GC (%) for each IRB asset class[3]



In order to analyse the relevant differences among the banks we have developed a specific methodology that identifies a representative benchmark and uses that to measure what part of the global differences between banks can be explained by what we have termed 'A-type' and 'B-type' differences.

- **A-type differences** include those referring to the type of method in use (SA or IRB) and to the portfolio composition: roll-out effect, standard risk weight effect, IRB portfolio mix effect and the IRB share of defaulted assets. The differences can be attributed to these specific drivers **relating to structure of the balance-sheet and the reliance to different regulatory approaches**. They might be reasonable, as they do not depend on risk parameters estimated under the IRB approach but they also reflect different business and supervisory practices that might require further investigations and possibly measures to achieve greater convergence.

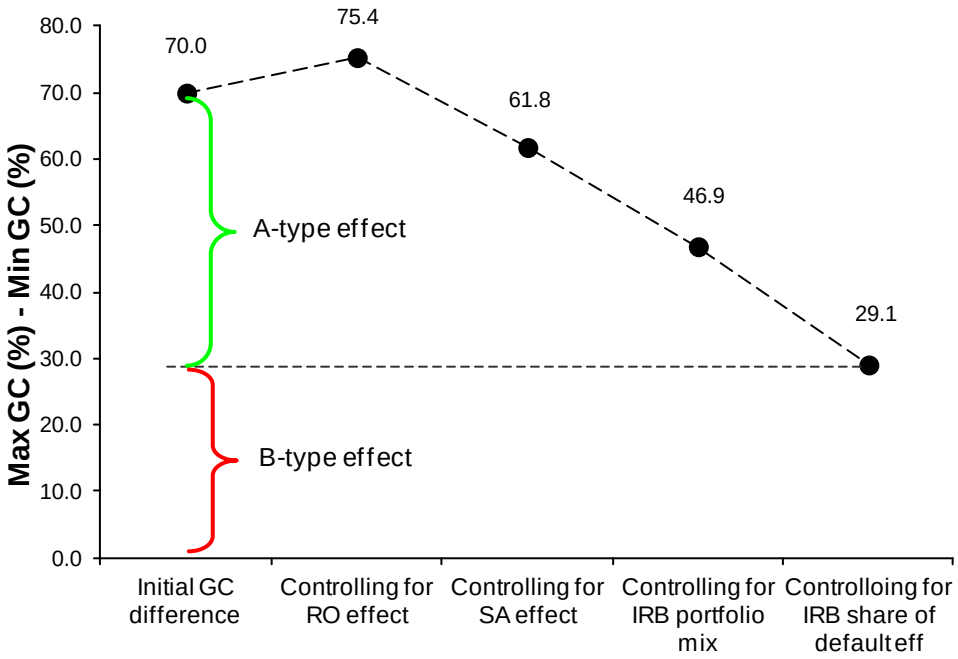
- Differences which are not taken accounted for the work are termed **B-type differences** and these will be the subject of further supervisory analysis. They include differences **stemming from the IRB risk parameters** applied which are caused by idiosyncratic variations in the riskiness of exposures and credit risk mitigation, and the use of foundation versus advanced IRB.

The results obtained may be influenced by the sample of banks used for the identification of the benchmark. Simulations run using different samples, however, have given broadly similar outcomes.

All of the analysis conducted suggests that A-type factors account for about 50% of the differences between banks as shown in the figure below.

[3] The chart shows the GC (%) for each asset class excluding SA exposures.

Figure 2: Change in GC (%) difference for credit risk after taking into account A-type effects



Starting from an initial observed difference in the GC of 70 percentage points for the whole sample (5th and 95th percentile) it reached a value of 29.1 percentage points after taking into account the A-type drivers. That means an overall decrease in the GC dispersion by 58%. **The reduction and the residual dispersion from the GC benchmark are heterogeneous between banks**. The same exercise applied to the 20 largest banks has produced a reduction in the GC dispersion by 48%.

This means that the remaining difference (almost 50%) in the GC are not clearly captured by the drivers identified as A-type and require further investigation. There are indeed a number of factors that can explain the residual divergence (B-type differences). To complete our understanding, a more granular 'bottom-up' exercise is needed, based on specific data requests from individual banks, to try and **understand whether the residual variance is justifiable and is driven by different risk profiles of banks' portfolios or by different interpretation or practical application of the regulation**.

One outcome of the analysis though is that the **B-type differences appear mainly in two portfolios: corporate and retail**. Although some dispersion can be observed on the bank, sovereign and other portfolios, they can explain only a minor part of the GC due to their relatively low RWA levels[4].

On the basis of the current status of the analysis it is not possible to clearly subdivide the sources of differences (A-type and B-type) between intended or unintended drivers. Also **some of the A-type differences appear to be driven by potentially different practices** (e.g. exposures in partial use

[4] Although bank and sovereign explain only a minor part of the GC, the low default portfolios, to be finalised in the next months, will contribute to shed some light regarding the existence of potential inconsistency in the computation of RWA on such exposures.

and the treatment of defaulted assets) **that may require further investigation and possibly supervisory measures to foster convergence**.

In this context, it is clear that the first phase of the top-down exercise has been vital for clarifying about half of the differences but **the residual divergence is still high and require an in depth investigation to ensure that RWA are reliable, consistent across banks and reflect their true risk profile**.

Whilst no policy conclusions can be drawn from this analysis so far it is noted that the role of the 'basic' factors captured under A-type differences is fairly easy to understand if properly disclosed. **Improvements in Pillar 3 information would therefore allow for better comparisons by third parties, potentially increasing confidence in the IRB approach**. Whilst the EBA is working to enhance disclosure generally and RWA in particular, it is worth noting parallel international initiatives (including the Financial Stability Board enhanced disclosure task force report).

1. The aim of the top-down analysis

The basic aim of the top-down assessment of differences in RWA is to end up with a picture at aggregate level of the source of these differences. Bottom-up analysis draws on specific data from individual banks and is usually more granular and able to capture specific situations of individual banks.

Any top-down approach disregards detailed information in favour of a broader overview. Our top-down analysis can show that a given bank's average RWA diverge from a benchmark value due to type of method in use (SA or IRB) and differences in portfolio composition, but cannot go beyond this to identify whether the average RWA in each portfolio or asset class, e.g. residential mortgages or corporate, is appropriate for that bank. For this reason, the top-down analysis is an important stage ahead of a complementary bottom-up analysis which aims to discover the possible reasons for those differences.

The top-down analysis can show the types of risks, portfolios, etc. that contribute to differences in RWA, and it can provide an initial classification of these differences. That is an important stage prior to conducting any further analysis with other tools to look into the possible justification for those differences.

Although for this kind of analysis, the comparison of RWA density (defined as RWA/EAD) between banks appears to be a natural starting point[5], the EBA has decided to focus the analysis on the GC defined as [(RWA+12.5*EL)/EAD)) so as to include expected losses in the analysis (see Section 2.1).

The report focuses on banking book requirements for credit risk, reflecting the importance of this risk in the global capital requirements. There is no doubt that most RWA stem from credit risk and,

[5] It is worth noting that the exposure at default (EAD) is different from the total assets as it excludes the trading book activities but it has the advantage of including off-balance-sheet exposures

therefore, other type of risks (market risk, operational risk, deductions, securitisations, etc.) should play a minor role in explaining differences in RWA and GC (see Sections 3.2 and 3.3).

The report mainly focuses on IRB as the method for computing credit risk capital requirements. However, there is some analysis of the use of the standardised approach and particular attention is paid to the impact of a partial use of this approach on RWA differences.

Due to the intrinsic limitation in the methodology, the top-down analysis cannot fully clarify how far the differences in RWA stem from 'unintended' or 'intended' drivers.

RWA differences are classified in this report as follows:

- Differences that stem from the type of method in use (SA or IRB) and to the portfolio composition: roll-out effect, standard risk weight effect, IRB portfolio mix effect and the IRB share of defaulted assets. The differences can be attributed to these specific drivers **relating to structure of the balance-sheet and the reliance to different regulatory approaches**. They might be reasonable, as they do not depend on risk parameters estimated under the IRB approach but they also reflect different business and supervisory practices that might require further investigations and possibly measures to achieve greater convergence.

    ⇨ These differences are termed **A-type differences** in this report.

- Differences that stem from the different capital consumption of the various asset classes. It is not possible to explain these differences at an aggregate level and from the top-down perspective, and they are therefore unaccounted for in this analysis. These differences may well result from varying risk profiles between banks within the same portfolio type, which reflect individual experience and risk management practices such as loan acceptance criteria and the use of credit risk mitigation. Differences between foundation and advanced IRB, in models used and data available can also have a huge impact. Furthermore, differences can stem from inconsistencies in the interpretation or application of the CRD. Other tools such as bottom-up analysis are needed to assess the reasons behind these type B-differences. **These differences are dependent on the risk parameters applied under the IRB approach**.

    ⇨ These differences are termed **B-type differences** in this report.

The analysis tries to measure what part of the global differences between banks can be explained by A-type and B-type factors. It is obvious that the potential sensitivity of the results depends on the benchmark used. In this report the benchmarks always the exposure weighted average of the underlying sample. The analysis tries to isolate B-type differences as much as possible. A-type differences come basically from the structure of the balance sheet of the banks and thus do not depend on risk parameters estimated under the IRB approach.

In very general terms, we can describe the GC differences as follows:

GC differences = A-type differences + B-type differences

Starting from an average bank portfolio (benchmark), the analysis shows per bank to what extent RWA, EL and GC differences from the benchmark can be explained by the following factors:

- roll-out effect (RO effect); relative share of exposures treated under SA (portfolios under roll-out or permanently in partial use) in the portfolio.
- standard risk weight effect (standard effect); differences in the overall SA risk weights for the exposures in partial use;
- portfolio mix (portfolio mix effect for the portfolio treated under the IRB approach); taking into account differences in the allocation of IRB EAD between the sub-portfolios: sovereign, bank, corporate, retail, and other;
- share of defaulted assets; taking into account different shares of IRB defaulted exposures in corporate and retail portfolios.

2. The methodology

2.1 Choosing the proper indicator

To carry out appropriate comparisons among banks, we need to choose a ratio measuring the risk taken by a bank relative to the exposure associated with this risk. This ratio should be consistent and complete, i.e., it should include both all relevant exposures for the analysis and only all those risks that are related to such exposures.

Three alternative ratios can be considered, all of them using the exposure at default (EAD) in the denominator, since it is a measure of exposure that includes both on-balance-sheet assets and off-balance-sheet contingent exposures and commitments, through the application of credit conversion factors (CCF), which transform the latter into equivalent on-balance-sheet amounts. Thus, the differences among the three ratios stem from the numerator:

$$\text{Ratio } 1 = \frac{\text{RWA}}{\text{EAD}}$$

$$\text{Ratio } 2 = \frac{\text{RWA} + (12.5 * \text{RCD})}{\text{EAD}} \text{ where RCD} = \text{expected loss (EL)} - \text{ provisions}$$

$$\text{Ratio } 3 = \frac{\text{RWA} + (12.5 * \text{EL})}{\text{EAD}} \text{ where EL} = \text{expected loss (IRB approach)}$$

Ratio 1 is the well-known RWA ratio, where the numerator reflects the regulatory capital requirements for credit risk. Its main drawback is that EL are not included, although they constitute an additional regulatory requirement for those banks' exposures under the IRB approach. This ratio has the advantage of being simple and is widely used by market analyst reports.

Ratio 2 does take EL into account, although in an indirect way, through the concept of RCD (regulatory calculation difference) that measures the difference between both EL and provisions under IRB approach. This ratio would have the advantage of measuring the actual capital costs of the

Basel II framework. However, the main drawback comes from the fact that provisions considered hereof are not related to the regulatory parameters, the provision process is not comparable in several countries, and taking into account that RCD also takes part of the own funds definition, this ratio combine in the numerator requirements (RWA) and own funds.

Finally, Ratio 3, the GC ratio, takes into account the regulatory charges, related both to unexpected losses (from the standardised and IRB approach) and EL calculated from the regulatory parameters estimated under the IRB approach. The EL can be very relevant for explaining the differences between banks' regulatory requirements, mainly due to the stock of defaulted assets. The possible drawback of this ratio is the comparison between SA and IRB, so we incorporate the EL under IRB, a concept that doesn´t exist (at least explicitly) under SA. However, it is not within the remit of this report to compare the two approaches[6].

Given the pros and cons of each of these ratios, we propose using the **Global Charge (GC)** for the analysis.

Reason for use of GC:

The following example shows why we mainly use the GC in our analysis. Consider two banks with 100 credit exposure each and the following variables:

- $EL_{Bank\ A} = 1$; $EL_{Bank\ B} = 3$ and RWA = 40 each bank
- Provisions $_{Bank\ A} = 1$; Provisions $_{Bank\ B} = 3,5$
- Ratio 1 $_{Bank\ A} = 40\%$; Ratio 2 $_{Bank\ A} = 40\%$; Ratio 3 $_{Bank\ A} = 52,5\%$
- Ratio 1 $_{Bank\ B} = 40\%$; Ratio 2 $_{Bank\ B} = 33,75\%$; Ratio 3 $_{Bank\ B} = 77,5\%$

Using Ratio 1, both banks have the same ratio, while they have different value of EL, a figure that is a requirement under IRB approach.

Using Ratio 2, Bank B has lower requirements than Bank A, but this is not actually the case as they have the same RWA but higher value of EL in case of Bank B. The Ratio 2 for Bank B is lower than for Bank A because it has higher provisions than EL. This situation should be (and will be) reflected in the own funds figure but should not be reflected in a ratio where the main purpose is simply to compare requirements stemming from the application of regulatory parameters.

Ratio 3, the GC, shows the actual differences between Bank A and Bank B by simply focusing on the

[6] To carry out a consistent comparison we should incorporate the EL for the SA exposures. The best proxy for this value should be the provisions. In addition, since the EAD of the exposures treated under the SA approach is always calculated net of provisions, to be fully consistent, a correction should be made to take into account their gross value, i.e., adding up the provisions. However, information about provisions is not available in the dataset used by the TCOR group.

requirements of both banks.

2.2 How differences can be analysed

To analyse the relevant differences in GC among a sample of European banks, we are going to use both a descriptive approach, and analytical tools that will allow us to measure these differences and break them down into the part that stems from structure and composition effects (which, as mentioned above, could be allocated to A-type differences) and the part mainly related to the IRB risk parameters (to be allocated to B-type differences).

The rationale is quite simple: if a bank had just exposures in two portfolios then the total GC of this bank may be broken down as GC = $q_1GC_1 + q_2GC_2$, where GC_i is the GC for portfolio i and q_i is the share of portfolio i in terms of exposure of the total ($q_i = EAD_i/EAD_{total}$).

The idea is to compare a bank's GC to the GC of a benchmark bank (GC benchmark = q_1 benchmark GC_1 benchmark + q_2 benchmark GC_2 benchmark) and then study and measure how much of the differences between bank´s GC and the GC of the benchmark comes from different regulatory approach and portfolio composition (differences values in q) and how much stems from different values of GC of each portfolio.

Here is a simple example. Consider two banks with exposure allocated in only two portfolios, say corporate and retail, with similar average risk weights for both portfolios, but with different relative importance of the two asset classes, for example:

$$\mathrm{GC}^{\mathrm{corp}}_{\mathrm{bank}\ 1} = 30\%;\ \mathrm{GC}^{\mathrm{retail}}_{\mathrm{bank}\ 1} = 42\%;\ \mathrm{Share}^{\mathrm{corp}}_{\mathrm{bank}\ 1} = 10\%;\ \mathrm{Share}^{\mathrm{retail}}_{\mathrm{bank}\ 1} = 90\% \rightarrow \mathrm{GC}_{\mathrm{bank}\ 1} = 40.8\%$$

$$\mathrm{GC}^{\mathrm{corp}}_{\mathrm{bank}\ 2} = 30\%;\ \mathrm{GC}^{\mathrm{retail}}_{\mathrm{bank}\ 2} = 40\%;\ \mathrm{Share}^{\mathrm{corp}}_{\mathrm{bank}\ 2} = 90\%;\ \mathrm{Share}^{\mathrm{retail}}_{\mathrm{bank}\ 2} = 10\% \rightarrow \mathrm{GC}_{\mathrm{bank}\ 2} = 31\%$$

The GC difference between these two banks is 9.8 percentage points (40.8% for $Bank_1$ and 31% for $Bank_2$). It's clear that a large part of this difference is explained by the different portfolio composition. If we overlook this driver, we could erroneously conclude that the slight difference in average GC under the retail portfolio explains all the difference in terms of overall GC. By having the additional information of the sub-portfolio weight, the proposed methodology would attribute, for instance, 9 percentage points to the portfolio mix effect (i.e., the impact of the different weights of the exposure classes in the portfolio), and 0.8 percentage points is the difference that comes from the different average risk weights associated to the exposure classes in the portfolio. It is worth noting that the approach still does not allow any conclusion to be drawn regarding the GC difference or equivalence between $Bank_1$ and $Bank_2$ for the retail and the corporate portfolio.

In this example we have compared two banks. In this report, we compare each bank with the benchmark which is to be the (weighted) average bank for the entire sample.

3. The database

The database used to conduct the analysis is the EBA's Impact Study Group (ISG) dataset. This dataset has been designed and is currently being applied by the EBA for monitoring the cyclicality of the CRD capital requirements.

The ISG dataset contains information from 89 IRB banks on RWA for credit, market and operational risk. For IRB portfolios the information available is: EAD, RWA, EL, PD, LGD, maturity and share of defaulted assets.

Figure 3: Sample composition by country and banks' asset size (EAD)

Ead, bln.	AT	BE	DE	DK	ES	FI	FR	GB	HU	IE	IT	LU	NL	NO	PT	SE	Total number of banks
< 10 bln.	1		5				1		1					1		2	11
10-50 bln.	1	2	6	2			1	2			1	1	1	4		3	24
50-100 bln.			3		1	1		1		1			1		1		9
100-200 bln.	1		4		2					2					1	1	11
200-500 bln.	1	2	4	1	2			2			1			1		2	16
500-1000 bln.			1		1		3	2			2		2			1	12
> 1.000 bln.			1		1		2	2									6
All	4	4	24	3	7	1	7	9	1	3	4	1	4	6	2	9	89

Account must be taken of some limitations in the information in this dataset which are due to limitations in existing supervisory reporting schemes, such as the following:

- Not all countries report information at sub-portfolio level (SME, residential mortgages etc.) so our analysis is restricted to the portfolio level (e.g. corporate and retail).
- Due to the lack of breakdown of the exposure into counterparty country, the analysis cannot distinguish between domestic and foreign exposures. This affects the most internationally active banks.
- There is no information on CCF and the analysis is based on post-CCF figures.
- The dataset does not allow IRB exposures treated according to the FIRB and or AIRB approach to be clearly identified.
- Some countries do not map the exposure under SA in their portfolios, which is being reported, as a whole, as being in 'partial use' portfolio; furthermore it is not possible to distinguish between defaulted and performing SA exposures.

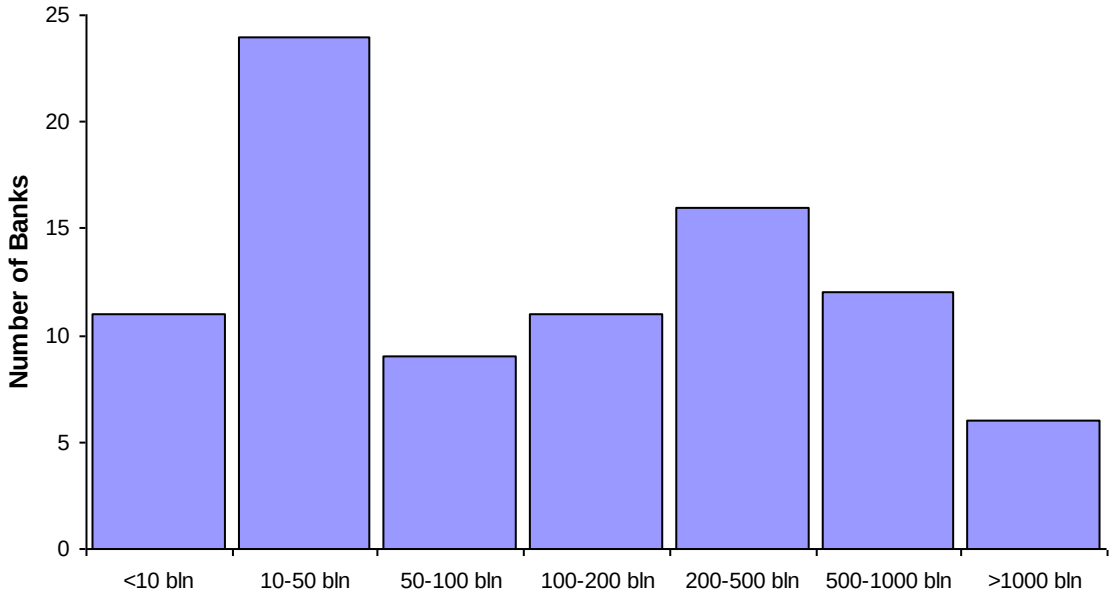
- The proportion of exposures which are reported using the standardised approach is unclear because the reporting of partial use exposures does not distinguish between permanent and temporary partial use exposures. This particularly affects the sovereign and bank portfolios.

The existing limitations in the dataset affect the breadth of analysis and may create some possible inaccuracy. Nevertheless, the dataset is considered appropriate for drawing some initial general conclusions.

3.1 Descriptive statistics

The figures below show some descriptive statistics about banks included in the sample. At the reference date of December 2011 there were 89 banks from 16 European countries with an average credit exposure (EAD) of about EUR 270 billion. Three quarters of the banks have an average EAD lower than EUR 306 billion.

Figure 4: Level of EAD by bank, December 2011



N	89	Ead, bln			
Mean	268.8	Minimum	0.9	Upper Quartile	306.2
Median	103.2	10th Percentile	5.9	90th Percentile	945.0
		Low er Quartile	27.5	Max	1698.9

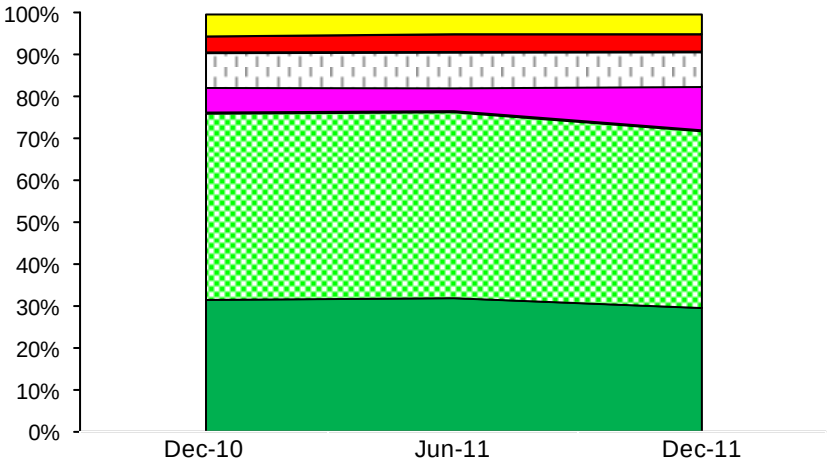
3.2 RWA composition

At the aggregate level, credit risk (including securitisation[7] and equity) represents the main contribution to total RWA. Its share for the whole sample was 77% in December 2011 but it was about 81% in the previous end December reporting period to June 2011. The decrease in the last period to December 2011 was mainly due to the increase in the share of market risk in RWA (from 6% in June

[7] Securitisations exposures deducted from capital have been included in the total RWA amount

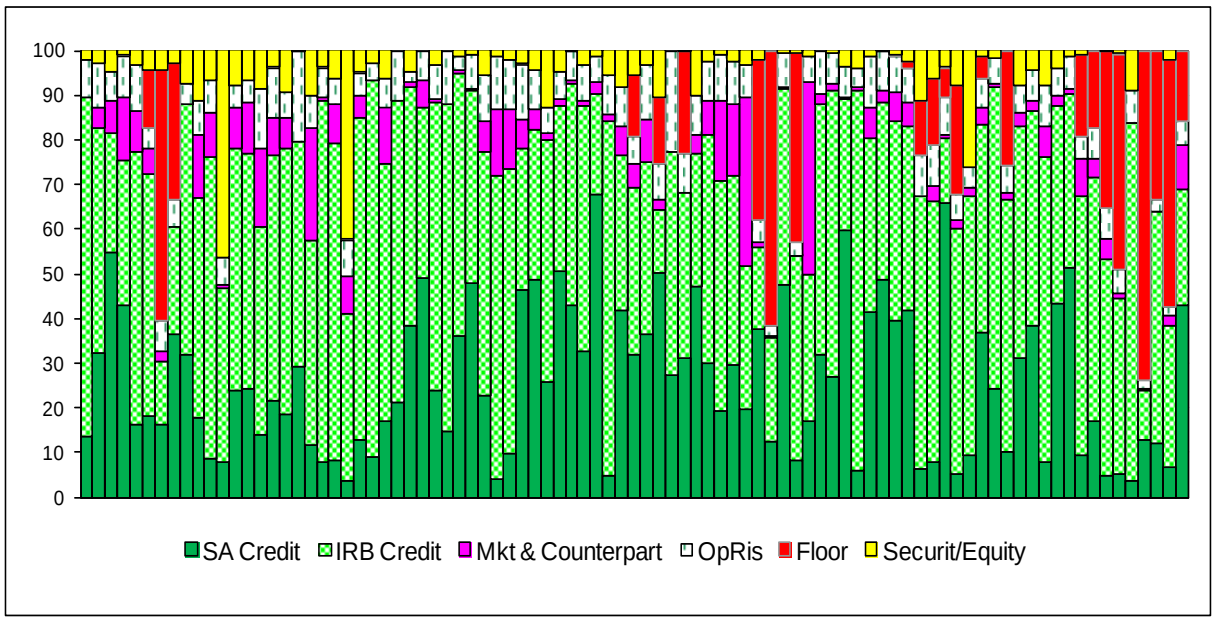
2011 to 10.5% in December[8]) as a result of Basel 2.5. operational risk, securitisations and equity, and transitional floor are more or less stable over time. The floor accounts on average for about 4% and is binding for one quarter of the population, the maximum being about 70%[9].
About one third of the total amount of RWA is generated from credit exposure treated under the SA.

Figure 5: Total RWA composition



	Dec-10	Jun-11	Dec-11
Securit & Equity	5.1	4.6	4.6
Floor	4.0	4.4	4.3
OpRisk	8.5	8.7	8.5
Mkt & Counterpart	6.0	5.6	10.5
RWA IRB Credit	44.6	44.6	42.4
RWA SA credit	31.8	32.2	29.8

Figure 6: Total RWA composition by bank, December 2011



[8] For some banks the Basel 2.5 increase for market risk RWA is up to 3 times the June 2011 figures
[9] In general the floor is significant for small specialised retail banks.

3.3 Global Charge

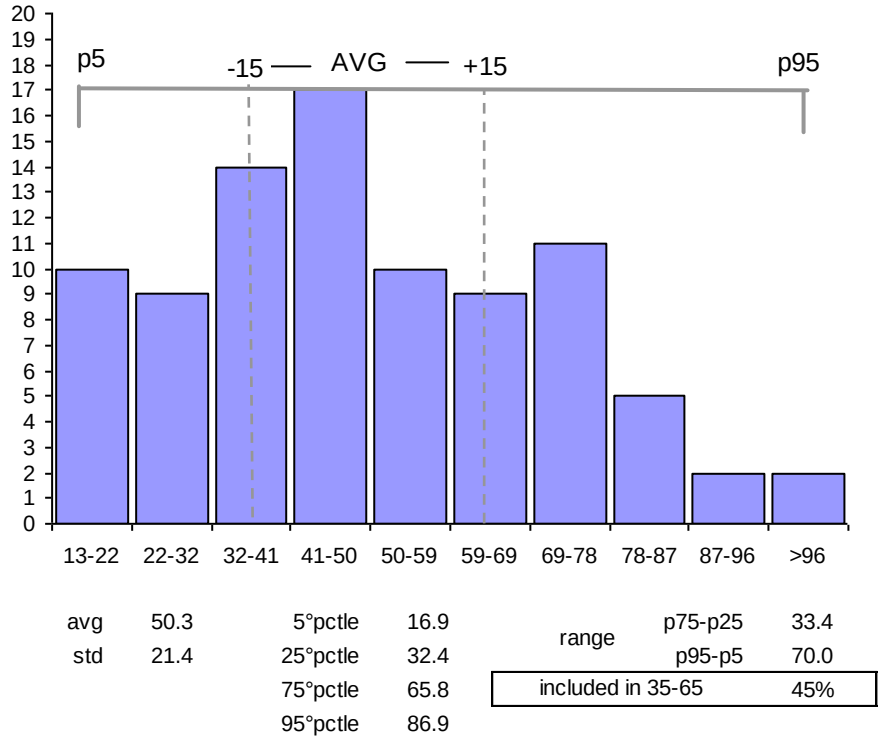
For the whole sample, the average GC for credit risk was 50.3% in December 2011[10] (GC IRB 52.9%, RW SA 44.8%, RW IRB 30.1%). The expected loss (EL) component accounts for about one third of the Global charge amount.

Figure 7: Global charge components, Dec. 2011

	IRB Credit risk	SA Credit risk	IRB + SA Credit risk
RWA (Euro bln.)	4,707	3,310	8,017
EL *12.5 (Euro bln.)	3,552		3,552
EAD (Euro bln.)	15,620	7,386	23,006
RW (%)	30.1%	44.8%	34.8%
GC (%)	52.9%		50.3%

Figure 8[11] shows the GC distribution for the banks in the sample. A total of 90% of the banks have GC between 17%-87% (5th and the 95th percentiles)[12]. A total of 45% of the banks can be included in the interval 35%-65%, (i.e. the average ± 15%).

Figure 8: Distribution of the GC (%)



[10] Since there was no comparable information for the securitisation and equity portfolios, these two portfolios were excluded from the analysis.

[11] The vertical axis represents the number of the banks for the different GC (%) buckets; the horizontal axis the GC (%) buckets.

[12] In Section 4, the analysis of the GC distribution is focused on the banks which have values between the 5th and the 95th percentiles.

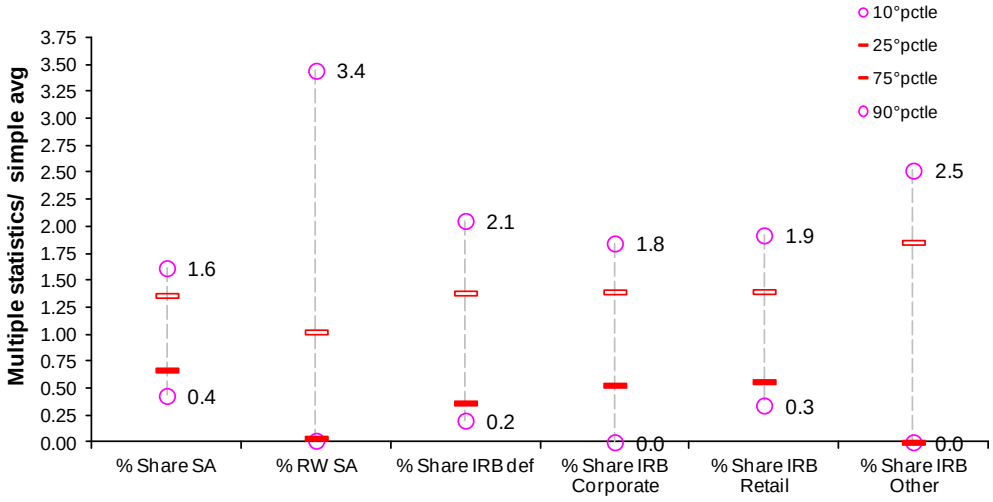
The following figure shows the distribution of share of partial use, average risk weight under the partial use (PU), and share of defaulted assets under the IRB approach for all banks. All these factors can potentially explain A-type differences in the GC levels. The varying portfolio composition in terms of different asset classes is another possible A-type driver of the differences in GC.
For example, for a quarter of the sample, the IRB corporate portfolio accounts for more than one half of the IRB exposures; for a quarter of the sample, the IRB retail portfolio accounts for more than three quarters of the IRB exposures.

Figure 9: Distribution of the share and average risk weight of SA exposures; portfolio mix and share default for IRB exposures

Statistics	SA exposures share and RW		IRB exposures mix and share default			
	% Share SA	% RW SA	% Share def	% Share Corp	% Share Retail	Share Other
avg	32.1	44.8	3.4	37.7	37.4	24.8
std	16.5	63.5	3.2	25.3	53.2	20.4
min	2.4	0.0	0.0	0.0	0.0	0.0
10°pctle	14.3	0.5	0.7	0.0	17.8	0.0
25°pctle	22.2	1.4	1.3	19.3	29.3	0.0
Median	30.6	8.5	2.8	36.9	46.7	11.7
75°pctle	45.2	38.0	5.1	51.0	72.8	32.8
90°pctle	53.6	128.0	7.5	67.4	100.0	44.6
max	82.4	293.4	16.2	100.0	100.0	100.0

Figure 9 and Figure 10 show the distribution of the indicators which represent the possible A-type drivers of the GC differences, RO (% Share SA), SA risk weights (% RWA SA), IRB share defaulted assets (% Share def), and IRB portfolio mix represented as a proxy by the IRB % shares of the corporate, retail and other portfolios (sovereign, bank and other).

Figure 10: Distribution of the share and average risk weight of SA, shares of default and corporate portfolio under the IRB approach[13].



4. The drivers of divergence: A-type and B-type contributions

In the previous section, we found that there is a considerable divergence in GC at bank level. In this section, we will measure the contribution of the factors 'share of exposure under the SA', 'SA risk weights', 'share of IRB defaulted assets' and the 'IRB portfolio mix' in explaining the divergence in GC.

The analysis is conducted twice at bank level:

- using the whole sample of banks; and
- using the 20 largest banks.

4.1 Bank level: whole sample

Roll-out effect and average RW under the standardised approach

First, we measure the effects of roll-out (RO) and SA risk weights. Although the two drivers are strongly interconnected, we start by assessing the roll-out effect separately and then we measure the effects of both factors. Since GC differences among banks in the overall average risk weights under the standardised approach depend only on the different relative share of the various exposure classes, those differences are classified as A-type.

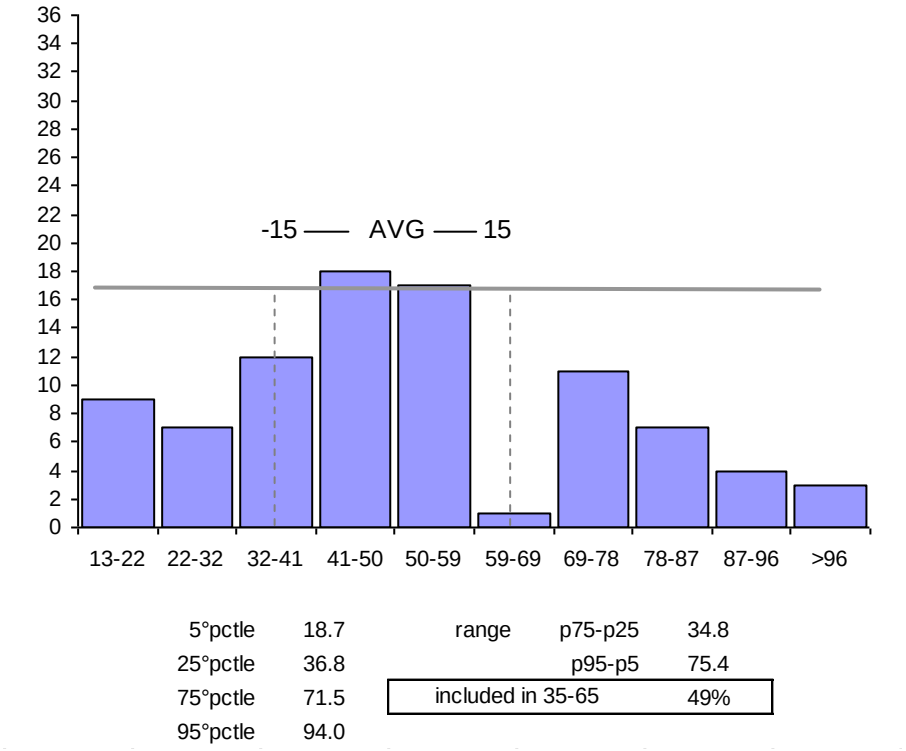
The roll-out effect is the contribution to the difference in GC determined by the different extensions of the IRB approach. It represents that part of the difference that would change if all the banks had the same share of exposure under the SA of the benchmark, but continued to apply the bank's SA risk weights and IRB GC.

[13] The numbers at the co-ordinates indicate the multiple in relation to the parameter average (i.e. 1.70 means 170% of the average)

Figure 11 shows the distribution of the banks in terms of GC if the share of partial use were the same for all banks. As benchmark for the partial use share we took the EAD average share in the sample.

Comparing Figure 8 and Figure 11 it is clear that although the roll-out effect increases the distance between the 5th and the 95th percentiles (from 70% to 75%), the number of banks included in the interval 35%-65% increases by 4 percentage points

Figure 11: Distribution of the GC (%) after taking into account the different extension of the IRB approach (RO)



The SA risk weights effect is that part of GC differences that would disappear if the banks had the same average RW under the SA of the benchmark. There is insufficient information to investigate the SA further, so the hypothesis is that differences in average RW under the SA can be fully explained by the different composition of the portfolios in terms of asset classes and the risk profile.

Figure 12 shows how the distribution of the GC would change if both

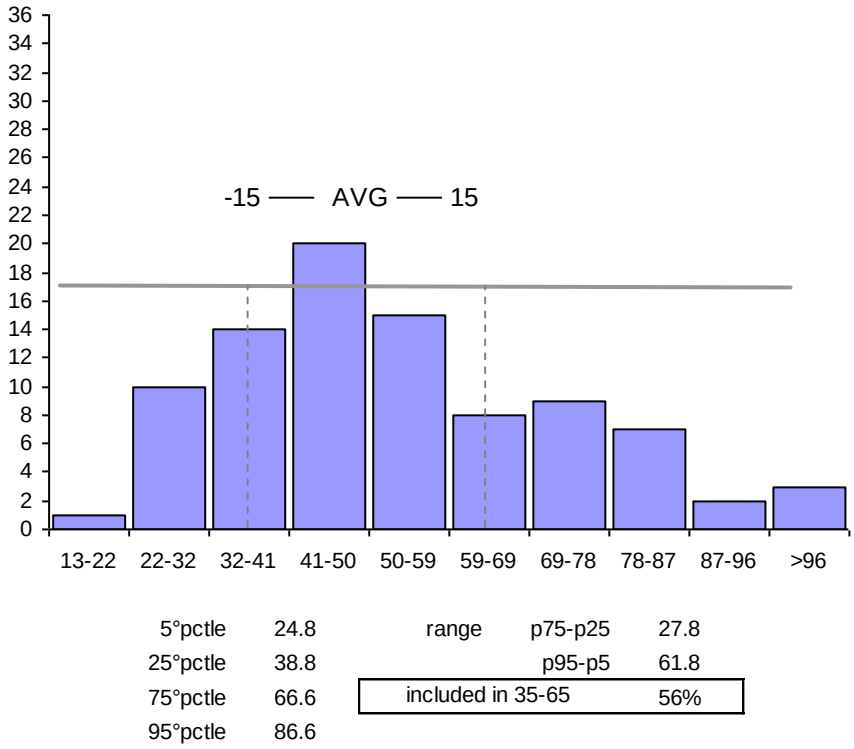
(1) the average risk weight under the standardised approach (i.e. if the portfolio composition was the same); and

(2) the extension to the IRB approach.

were the same for all the banks.

The GC difference between the 5th and the 95th percentiles decreases to 62% and the GC of more than half of the banks would be in the range 35%-65%.

Figure 12: Distribution of the GC after taking into account the different average RW under the standardised approach



IRB approach: portfolio mix and share of defaulted assets

The remaining difference between banks in average GC under the IRB approach (IRB effect) is the residual difference that would remain if all the countries had the same share of SA and the same average RW under the SA. This difference depends on variations in the risk parameters, but part of the difference can be explained by the portfolio mix (banks' proportions of EAD in each asset class) and the share of defaulted assets.

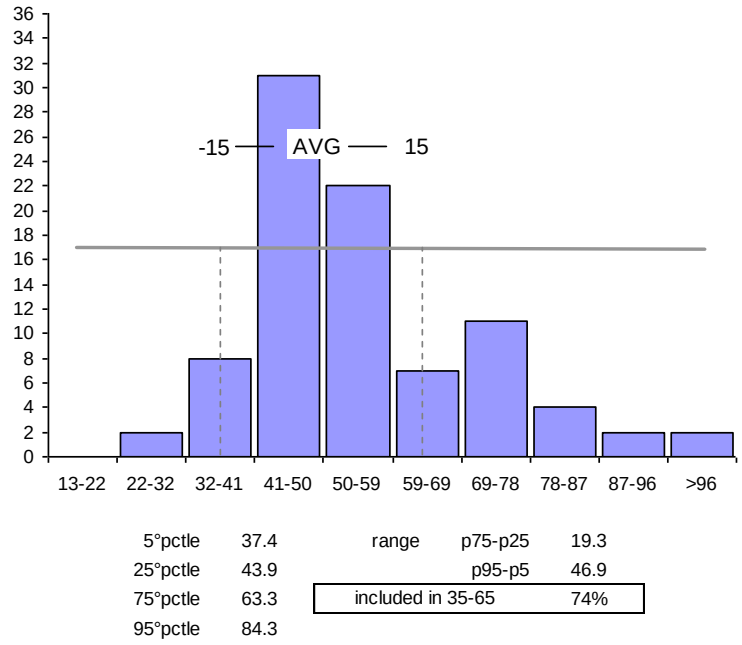
The next step in our analysis is to separate out the following from the IRB effect:

(1) the contribution of the different IRB portfolio composition (portfolio mix effect); and

(2) the contribution of the different shares of defaulted assets.

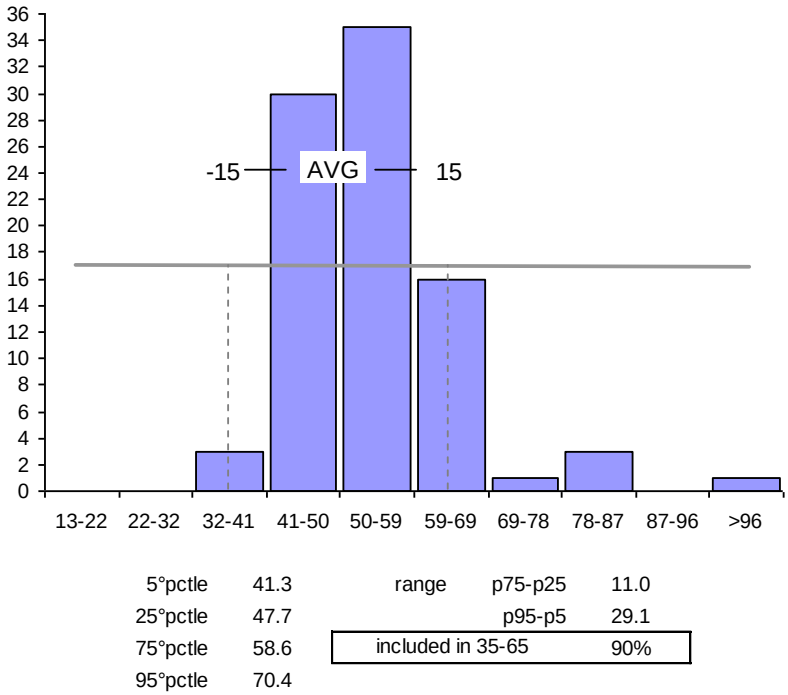
As a second step, we analyse the portfolio mix effect, which is the part of the difference in GC explained by the different portfolio composition under the IRB. If all the banks had the same asset class composition under the IRB approach, three quarter of the banks would be included in the range 35%-65%. The distance between the 5th and the 95th percentiles decreases to 47%.

Figure 13: Distribution of the GC after taking into account the different IRB portfolio composition



As a third and final step, and in addition to the portfolio mix effect, we analyse the impact of the share of defaulted assets. This effect is the part of the overall GC difference that would disappear if all the banks had the same share of defaulted exposure under the IRB corporate and retail exposure classes of the benchmark.

Figure 14: Distribution of the GC after taking into account the different portfolio composition and the different share of defaulted assets under the IRB approach

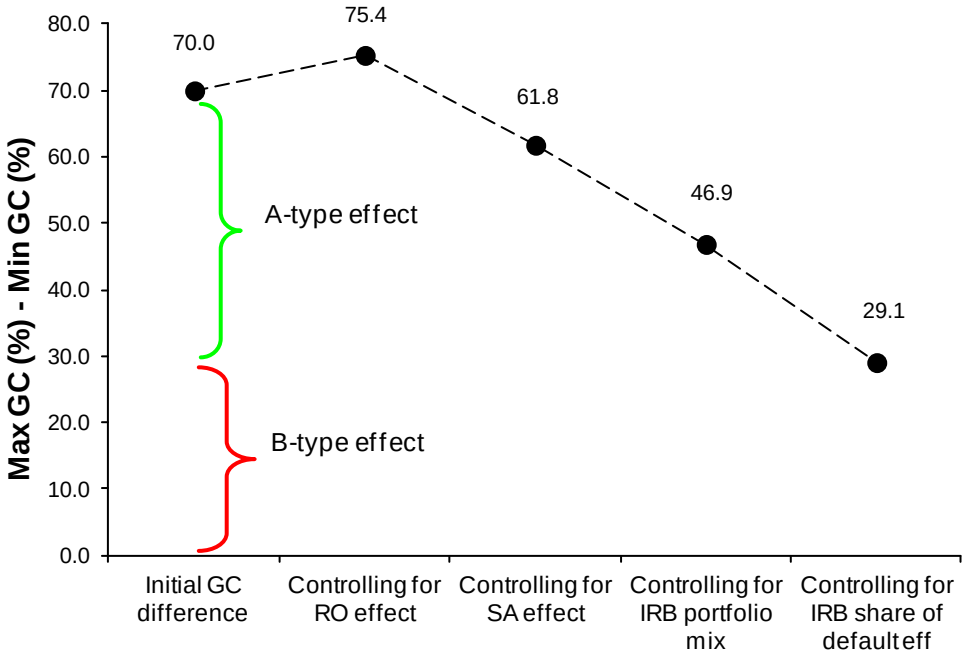


Cumulative impact

In the last sections we analysed the impact of four effects: roll-out, SA risk weights, IRB portfolio mix, and IRB share of defaulted assets. We always applied the share and the GC of the benchmark bank for the relevant segment to measure the resulting GC for each bank and the maximum difference between the 5th and 95th percentile.

Figure 15 shows the change in the GC difference when taking into account the non-risk-sensitive drivers of GC differences.

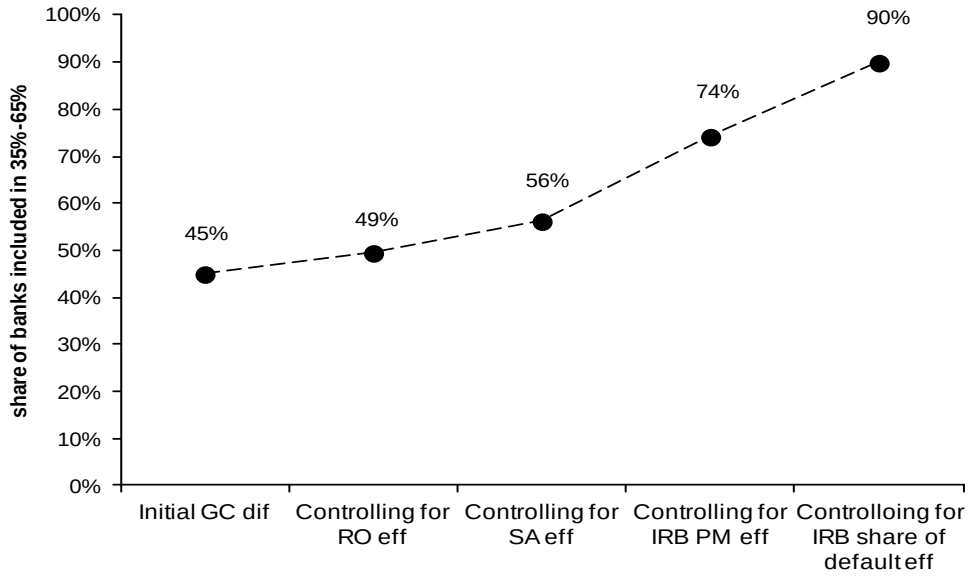
Figure 15: Change in GC (%) difference after taking into account A-type differences



The remaining GC differences of 29.1% are generated from the different GCs in each asset class, i.e. from the underlying risk parameters. If we applied the benchmark GC for each asset class to all the banks the difference would be reduced to zero.

As an illustration of this, Figure 16: shows the change in the number of banks that have GC between 35% and 65%. Starting with 44.9%, the share increases steadily. After taking into account the A-type differences, nearly 90% of all banks are in the given range.

Figure 16: Number of banks with 35% ≤ GC ≤ 65%

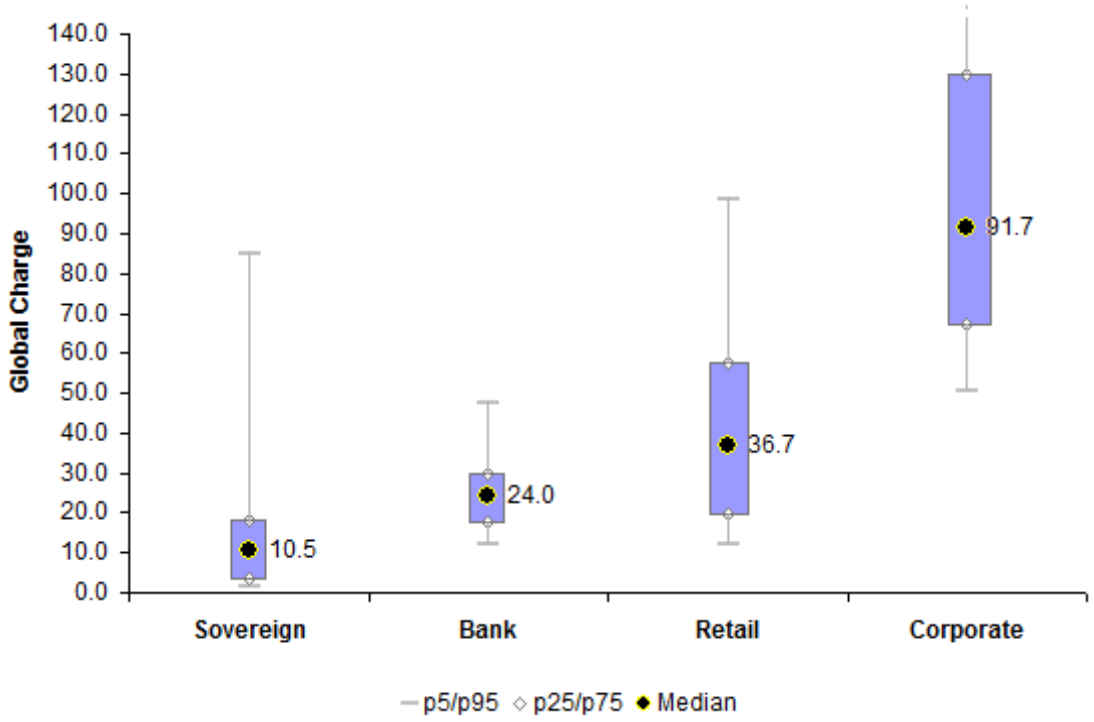


After controlling for the A-type effect the residual difference is still relevant and require in depth analysis. At a first glance, the B-type effect is that part of the GC difference explained by the differences in the GC within each asset class (see Figure 17 and Figure 18).

Figure 17: GC (%) for each IRB asset class

	Sovereign	Bank	Retail	Corporate
n obs.	39	54	79	75
min	0.3	5.9	8.9	38.0
max	100.0	55.7	163.6	542.4
5° pctle	1.6	12.0	12.2	50.4
25° pctle	3.7	17.6	19.7	67.3
Median	10.5	24.0	36.7	91.7
75° pctle	18.0	30.0	57.6	129.7
95° pctle	84.7	47.3	98.7	188.0
5°-95° pctle	83.1	35.3	86.5	137.6

Figure 18: Graph of GC (%) for each IRB asset class



Further investigations of the B-type differences would require analysis of the differences in IRB risk parameters at portfolio level including back-test with observed historical data[14]. For an appropriate comparison the work has to go even deeper and investigate any difference at sub-portfolio level[15] and possibly by country[16] of location of the exposures.

The dispersion of risk parameters for the same (sub) asset class in not a sign of inconcistency per se. For example the composition of portfolios may differ across banks as the result of differences in the markets, risk appetite or borrowers' selection criteria. However a substantial dispersion from benchmarks and historical observed risk parameters may signal that the methodologies used for their estimation by some banks require more detailed analysis in order to assess if reasonable and justifiable.

It is expected that B-type differences are also caused by different interpretation and practical application of the regulation. For this purpose the work has to integrate quantitative analysis with the acquisition of qualitative information.

[14] For an appropriate comparison between the IRB parameters and the observed historical data it is necessary make use of appropriate time series. Point in time differences between IRB parameters (PD, LGD) and realised default and losses are not indicative per se of inaccuracy in the parameters or inappropriate calibration of the internal models.

[15] In particular this is appropriate for Corporate (Large corporate, SME) and Retail (Residential mortgages, SME and Revolving) asset class that includes exposures with risk profile and RWA requirements very different at sub-portfolio level.

[16] Preliminary investigation run making use of the EBA stress dataset has confirmed the existence of a material correlation between the geographic location of the exposures and the observed historical banks' losses for Corporate and Retail portfolios.

Figure 19: PD[17] (Dec. 2011)[18]

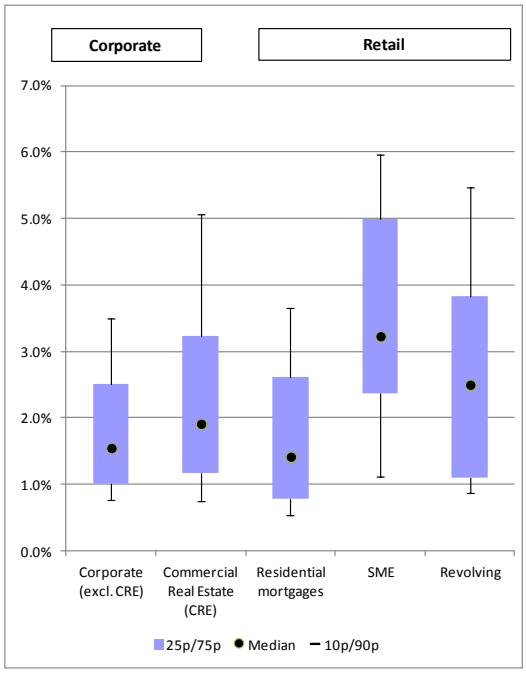
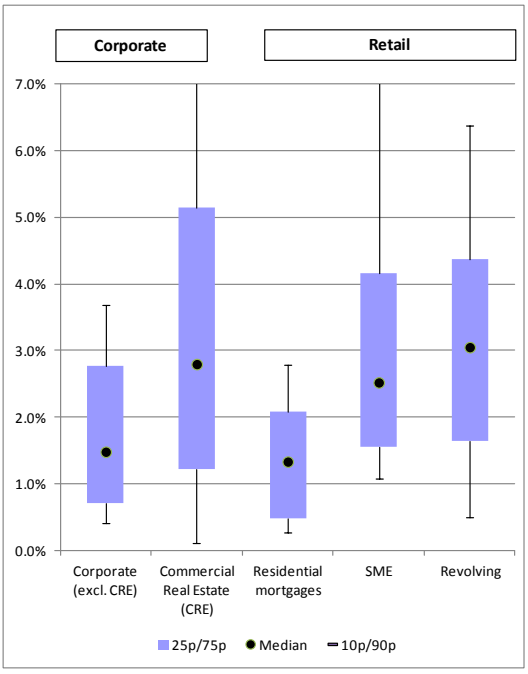


Figure 20: Default rate (Dec. 2011)



In the Annex III is provided an illustration of the IRB parameters (PD, LGD and Maturity) applied by the banks for the computation of RWA/EL and IRB RW (%) for non-defaulted and defaulted exposures at December 2011.

4.2 The 20 largest banks

To test the robustness of the results/benchmark the same analysis is now conducted on the sub-sample of the 20 largest banks. These banks represent about 70% of the total exposure of the entire population in the dataset. The GC benchmark for the banks in the sample is about 50.8% (GC IRB 51.2%, RW SA 49.8%, RW IRB 28.8%).

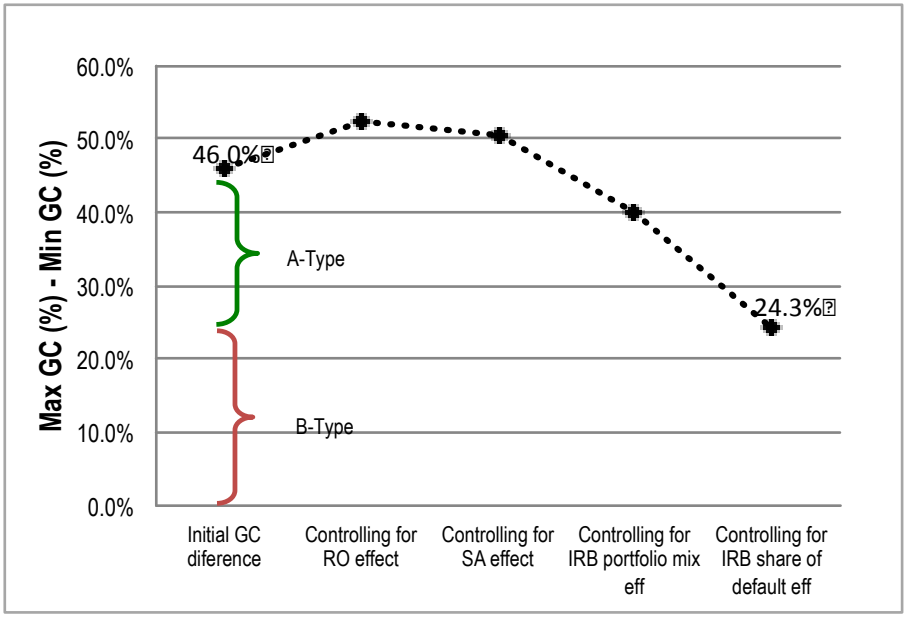
The main results are shown in this section while Annex 2 provides more granular data and details of the different results achieved by applying the methodology step by step for the largest 20 banks.

The results appear broadly in line with those presented above. The maximum difference of GC between two banks is 46%. The difference is reduced by taking into account all the drivers mentioned above giving a figure of about 47% (see Figure 21). Thus the remaining B-type difference is 24.3%.

[17] PD values for non-defaulted exposures

[18] The data showed in the Figure 19 and Figure 20 are provided for pure illustrative purpose as indicative of the further investigation needed to assess type-B effects. The parameters showed in the Figure 19 are the EAD weighted IRB PD applied by the banks for the computation of RWA for Corporate (exposures secured by commercial real estates and other) and Retail (Residential mortgages, SME and Revolving facilities). The observed default rates in the Figure 20 are computed as yearly default flows amount over the EAD amount at the beginning of the year.

Figure 21: The 20 largest banks – Change in the GC differences after taking into account A-type effects, December 2011

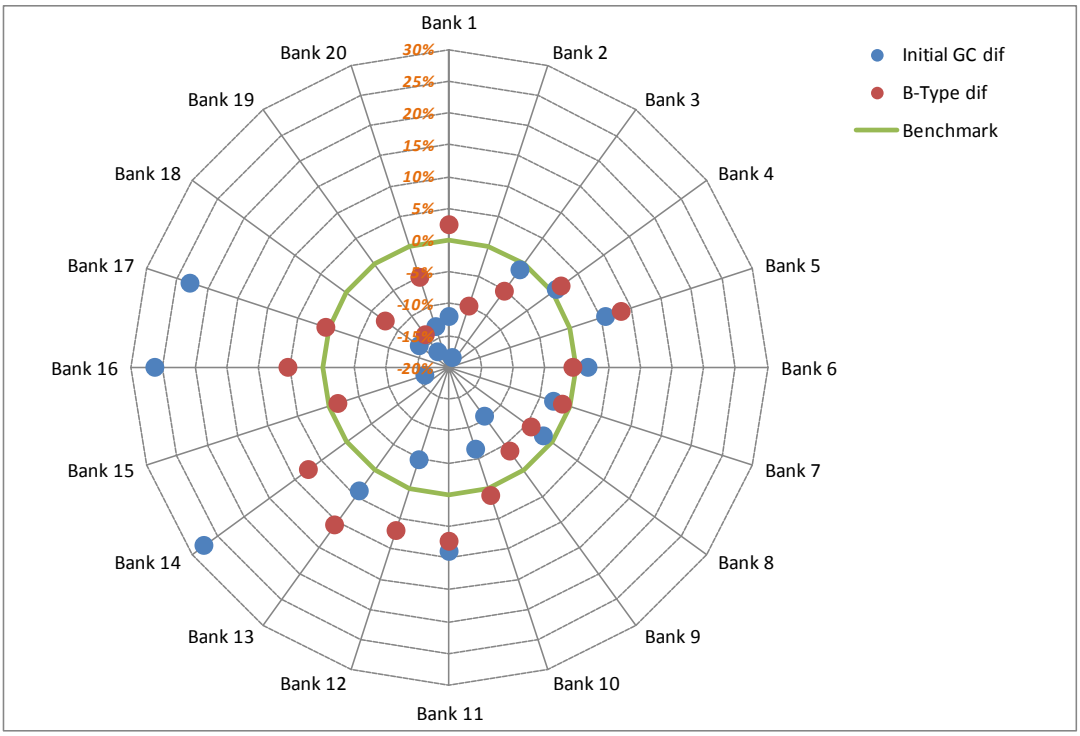


Nevertheless, after taking into account the different drivers, the reduction in the GC variance and the residual dispersion still differ between banks. Figure 22 shows the total GC difference (initial GC dif) between a bank and the benchmark and the GC difference after taking into account the A-type differences (shown as B-type).

For Bank 17, for example, the GC difference (blue dot) is 22.8% (the GC is higher than the benchmark), taking into account RO, SA, IRB portfolio mix and IRB share default, the distance from the benchmark is more or less zero (0.4%; red dot). Another example is Bank 1; the GC difference is negative (-12%) at the start (blue dot), so the GC is lower than the benchmark. This distance is not only reduced, the GC difference becomes positive (2.4%; red dot) after taking account of A-type differences.

The results do not indicate whether one bank is more conservative or aggressive than another. They simply show how the GC of one bank changes after the application of benchmark values account for the effects of the factors identified and tested (RO, SA, IRB portfolio mix and IRB share default). The banks with residual GC (B-type) above or below the benchmark and after taking into account the residual B-type drivers can still end up as either more conservative/aggressive compared to the benchmark.

Figure 22: The 20 largest banks - Breakdown of GC differences



5. Conclusion

The computation of the regulatory charges (RWA and EL) requires a high number of inputs combined with complex algorithms. Looking at the significant differences between banks in the average RW or in the GC at aggregate level, it appears very difficult to distinguish between the various factors determining these differences. Indeed, if the analysis are only conducted on very high-level data, any conclusion may be very misleading.

In this report we show that in a large sample of European banks **one half of this divergence can be explained by very simple effects, which we have termed A-type: the extension of IRB; the SA risk weights; IRB portfolio mix; and the share of IRB defaulted assets.** Some of the A-type differences appear to be driven by potentially different practices (e.g. exposures in partial use and the treatment of defaulted assets) that **may require further investigation and possibly supervisory measures to foster convergence. Appropriate and consistent Pillar 3 disclosure of such information by the banks would allow third parties to breakdown GC differences in a similar way.**

The report itself is a contribution to increasing transparency in the disclosure of the regulatory charges (RWA and ELs) computed by banks.

Given the current status of the analysis it is not possible to subdivide the sources of differences between intended or unintended drivers. The top-down approach deals with factors that, on an aggregate level, can explain about half of RW and GC differences among banks. A bottom-up

approach is needed to complement the present analysis. This is especially the case for corporate and retail exposures.

In this context, it is clear that the first phase of the top-down exercise has been vital for clarifying about half of the differences but **the residual divergence is still high and require an in depth investigation to ensure that RWA are reliable, consistent across banks and reflect their true risk profile**

Annex I: Methodology

This annex summarises the analytical framework used in the top-down exercise for measuring the differences in the GCs among a sample of European banks, separating out the contributions of the different drivers. .

The analytical approach is based on the use of a Taylor expansion of order one of a function $f: \mathbb{R}^n \to \mathbb{R}$ at a point $a \in \mathbb{R}^n$, which has the following expression:

$$f(x) = f(a) + \sum_{i=1}^{n} f_i(a)(x_i - a_i) + R$$

where $f_i(\cdot)$ are the first derivatives, x is a point near a and R is the residual term, which includes all derivatives of higher orders (including mixed derivatives).

In particular, assuming that the credit portfolio of bank j can be separated into two sub-portfolios, the GC of that bank can be expressed as follows:

$$GC^j = q_1{}^j GC_1{}^j + q_2{}^j GC_2{}^j$$

where $q_i^j = EAD_i^j / EAD_j$, for $i = 1,2$ and GC_i^j is the specific GC of sub-portfolio i. Therefore, we can consider the GC of bank j as a function $GC^j = f\left(GC_1^j, GC_2^j, q_1^j, q_2^j\right)$, whose Taylor expansion of order one at a point $(\mathrm{GC_1}^{\mathrm{B}}, \mathrm{GC_2}^{\mathrm{B}}, \mathrm{q_1}^{\mathrm{B}}, \mathrm{q_2}^{\mathrm{B}})$ -that represents a benchmark bank- has the following expression:

$$GC^j = GC^B + q_1^B\left(GC_1^j - GC_1^B\right) + q_2^B\left(GC_2^j - GC_2^B\right) + GC_1^B\left(q_1^j - q_1^B\right) + GC_2^B\left(q_2^j - q_2^B\right) + R$$

Since $q_2^j = 1 - q_1^j$ and $q_2^B = 1 - q_1^B$ we have $q_2^j - q_2^B = -\left(q_1^j - q_1^B\right)$ and we can write:

$$\Delta GC = GC^j - GC^B = q_1^B \Delta GC_1 + \left(1 - q_1^B\right)\Delta GC_2 + \left(GC_1^B - GC_2^B\right)\Delta q_1 + R$$

Moreover, since the GC is linear in all its components (assuming that q_i and GC_i $\mathrm{GC_i}$are independent), the residual term R only contains the second order mixed derivatives:

$$R = \sum_{i \neq j} f_{ij}(a)(x_i - a_j)(x_i - a_j)$$

$$R = \left(GC_1^j - GC_1^B\right)\left(q_1^j - q_1^B\right) + \left(GC_2^j - GC_2^B\right)\left(q_2^j - q_2^B\right) = \left(\Delta GC_1 - \Delta GC_2\right)\Delta q_1$$

Therefore, we can break down the differences in GC among banks or between a bank and a benchmark in the following way:

$$\Delta GC = q_1^B \Delta GC_1 + \left(1 - q_1^B\right)\Delta GC_2 + \left(GC_1^B - GC_2^B\right)\Delta q_1 + \left(\Delta GC_1 - \Delta GC_2\right)\Delta q_1$$

Here the first three terms are the first-order derivatives of the expansion and the last term is a second-order term.

We can distinguish three elements in this breakdown:

$(\mathrm{GC_1}^{\mathrm{j}}\,\Delta\,\mathrm{q_1} + \mathrm{GC_2}^{\mathrm{j}}\,\Delta\,\mathrm{q_2})$ $\left(GC_1^B - GC_2^B\right)\Delta q_1$ is the *structure* effect, i.e., it captures the sources of the GC differences that stem from the specific composition of the credit portfolio of a bank against that of the other banks. In particular, this structure effect captures, at least, the differences in:

- Roll-out: share of credit exposures whose regulatory requirements are calculated under the standardised approach.
- Portfolio mix: sovereign, banks, corporate, retail, others; default/non-default composition

These are, thus, understandable sources of GC differences and therefore included in A-type differences.

$q_1^B \Delta GC_1 + \left(1 - q_1^B\right)\Delta GC_2$ is the *consumption*[19] effect, which need to be further analysed, with other tools (bottom-up exercises, data collection, qualitative questionnaires, etc.), for assessing whether they reflect also desired differences (e.g. if they can be explained by differences in the risk profile for homogeneous portfolios) or less justifiable/unintended differences. This effect will be assigned as B-type differences.

An extended analysis of this *consumption* effect would entail quantifying the part of the differences in the GC of a given portfolio that can be assigned to differences in regulatory parameters (PD, LGD, CCF, Maturity, etc.).

$(\Delta\mathrm{GC_1}\Delta\mathrm{q_1} + \Delta\mathrm{GC_2}\Delta\mathrm{q_2})$ is the *mixed* effect, residual differences that could be assigned both to structure effect or *consumption* effect.

Summing up the structure effect and the mixed effect we achieve the following expression:

$$\Delta GC = q_1^B \Delta GC_1 + \left(1 - q_1^B\right)\Delta GC_2 + \left(GC_1^j - GC_2^j\right)\Delta q_1$$

We proceed in several phases or rounds to develop the analysis described above, with the aim of identifying sequentially each of the sources of GC differences: roll-out effect, standard effect, portfolio mix effect, share of defaulted assets.

[19] The consumption effect or B-type is the difference in the GC stemming from the application of different IRB parameters in each sub-portfolios.

Annex II: Sample of 20 largest European banks

The purpose of this annex is to provide more detail regarding the practical application of the methodology applied in the top-down exercise by the EBA for a sample of 20 large European banks making use of the IRB approach. Such institutions represent about 70% of the total exposures of the entire population in the dataset.

The initial difference in the GC is measured comparing the minimum and maximum value of the GC of the banks in the sample (46%).

The benchmark used for the exercise is the weighted average bank in the sample (20 large banks). This 'average' bank has the following characteristics:

- GC of 50.8% (GC IRB 51.2%, RW SA 49.8%, RW IRB 28.8%)
- Share of exposures in partial use (SA) of 30.6%
- IRB portfolio mix composition with corporate and retail exposures accounting equally for about one third, bank (11%), sovereign (13%)
- GC corporate for about 55%, retail (30%), bank (5%), sovereign (2%) and others (7%)
- IRB defaulted exposures share for 3% (corporate 5%, retail 3%, bank 0.6 % and sovereign 0.6%)
- GC for IRB defaulted assets of about 566% and for IRB performing loans 34%.

In the first step, the methodology tries to exclude the differences in the GC stemming from the different extension of the application of IRB approach to the exposures of the banks or from different SA risk weights (RW), reflecting different portfolio mix for the exposures in permanent or transitional partial use.

Using the methodology, the PU share for each bank is substituted by the benchmark figure but we continue to apply the bank average SA risk weight. A similar approach is followed to calculate the SA risk weight effect.

Figure 23 and Figure 24 provide an illustration for the banks in the sample of differences in application of the IRB approach (RO), the SA and IRB risk weights (RW) and GCs.

Figure 23: Exposures by regulatory approach

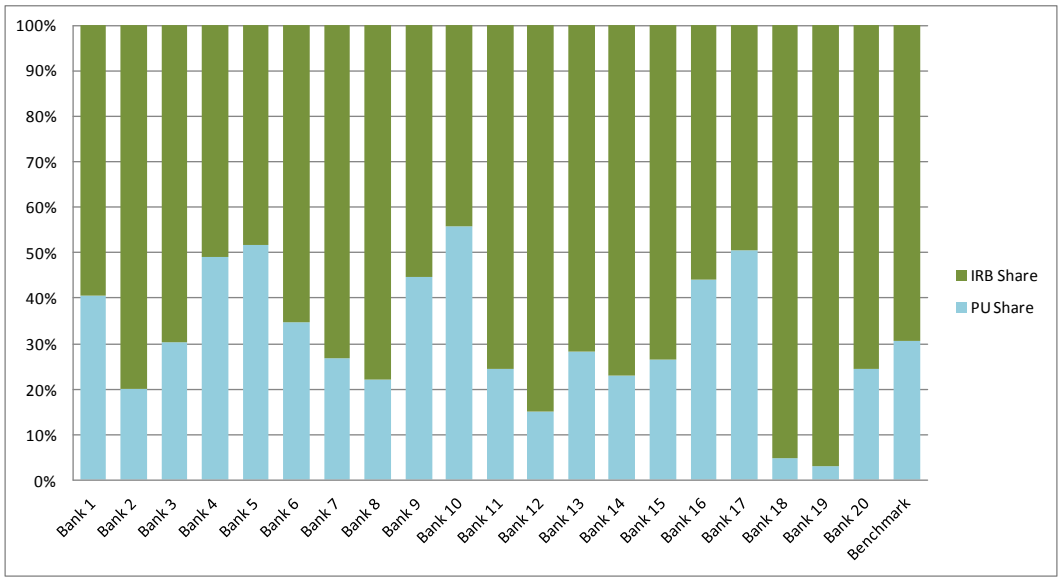


Figure 24: Requirements (%) by regulatory approach

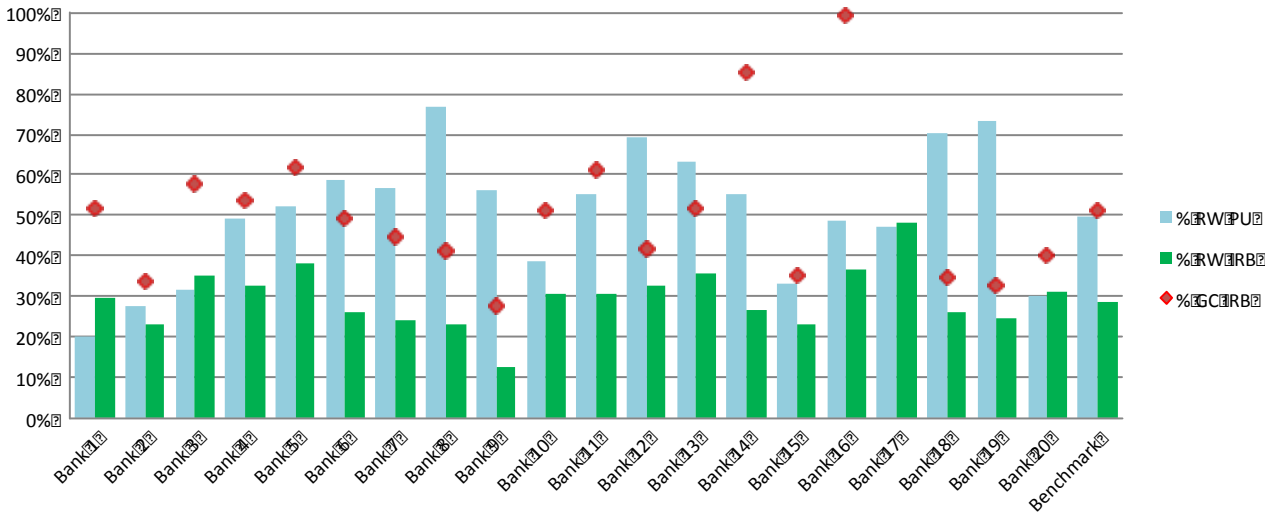


Figure 25 below shows the results. After taking into account the roll-out and the SA risk weights, the residual difference in the GC from the benchmark stems from the IRB estimated risk parameters and IRB portfolio mix and composition (share of defaulted assets).

Figure 25: Change in the GC among the banks after application of the different steps of analysis

Bank	Initial difference GC	Step 1		Residual difference GC (IRB)	Step 2	Residual difference GC after control IRB portfolio mix effect	Step 3	Residual difference GC IRB performing
		SA effect	Roll out effect		IRB portfolio mix effect		IRB share defaulted assets	
Bank 1	**-12.0%**	-9.1%	-3.2%	0.3%	-4.2%	4.5%	2.1%	2.4%
Bank 2	**-18.4%**	-6.7%	0.6%	-12.3%	0.6%	-12.9%	-3.0%	-9.9%
Bank 3	**-1.1%**	-5.5%	0.1%	4.4%	5.2%	-0.8%	4.4%	-5.2%
Bank 4	**0.8%**	-0.2%	-0.8%	1.8%	-0.5%	2.4%	0.6%	1.8%
Bank 5	**5.9%**	0.7%	-2.0%	7.2%	-2.2%	9.4%	0.9%	8.4%
Bank 6	**1.8%**	2.7%	0.4%	-1.2%	-1.1%	-0.2%	0.4%	-0.5%
Bank 7	**-2.7%**	2.1%	-0.5%	-4.4%	0.6%	-4.9%	-3.7%	-1.3%
Bank 8	**-1.7%**	8.3%	-3.0%	-6.9%	-2.5%	-4.4%	-0.4%	-4.1%
Bank 9	**-10.5%**	1.9%	4.0%	-16.4%	-12.2%	-4.2%	-0.5%	-3.7%
Bank 10	**-6.5%**	-3.3%	-3.1%	-0.1%	0.4%	-0.5%	-1.7%	1.2%
Bank 11	**8.9%**	1.7%	0.3%	6.9%	-10.5%	17.4%	10.1%	7.3%
Bank 12	**-4.7%**	6.0%	-4.3%	-6.4%	-4.2%	-2.2%	-9.2%	7.0%
Bank 13	**4.0%**	4.0%	-0.3%	0.2%	-4.7%	4.9%	-5.7%	10.6%
Bank 14	**27.6%**	1.7%	2.3%	23.7%	4.2%	19.5%	12.1%	7.3%
Bank 15	**-16.0%**	-5.0%	0.1%	-11.0%	-4.5%	-6.5%	-4.9%	-1.6%
Bank 16	**26.2%**	-0.3%	-6.8%	33.4%	8.2%	25.1%	19.8%	5.3%
Bank 17	**22.8%**	-0.8%	-10.7%	34.3%	28.6%	5.7%	5.4%	0.4%
Bank 18	**-14.2%**	6.2%	-9.1%	-11.3%	0.3%	-11.7%	-4.1%	-7.6%
Bank 19	**-17.0%**	7.1%	-11.1%	-12.9%	1.9%	-14.9%	-1.2%	-13.7%
Bank 20	**-13.3%**	-6.1%	0.6%	-7.8%	2.4%	-10.2%	-5.1%	-5.1%

In a second step the methodology tries to exclude the differences stemming from the IRB risk parameters through estimating the residual portion of the GC that can be explained by extending the methodology to take account of any effects of portfolio mix and share of defaulted assets for IRB exposures.

In this second step, the IRB exposure share of the different portfolios for each bank is substituted by the benchmark levels. Using this methodology, when substituting the shares of the IRB exposures we continue to apply the bank GC IRB for each portfolio.

Figure 26 and Figure 27 provide an illustration for the banks in the sample of the divergence in the IRB share and IRB GC for each portfolio.

Figure 26: IRB Exposures by portfolio

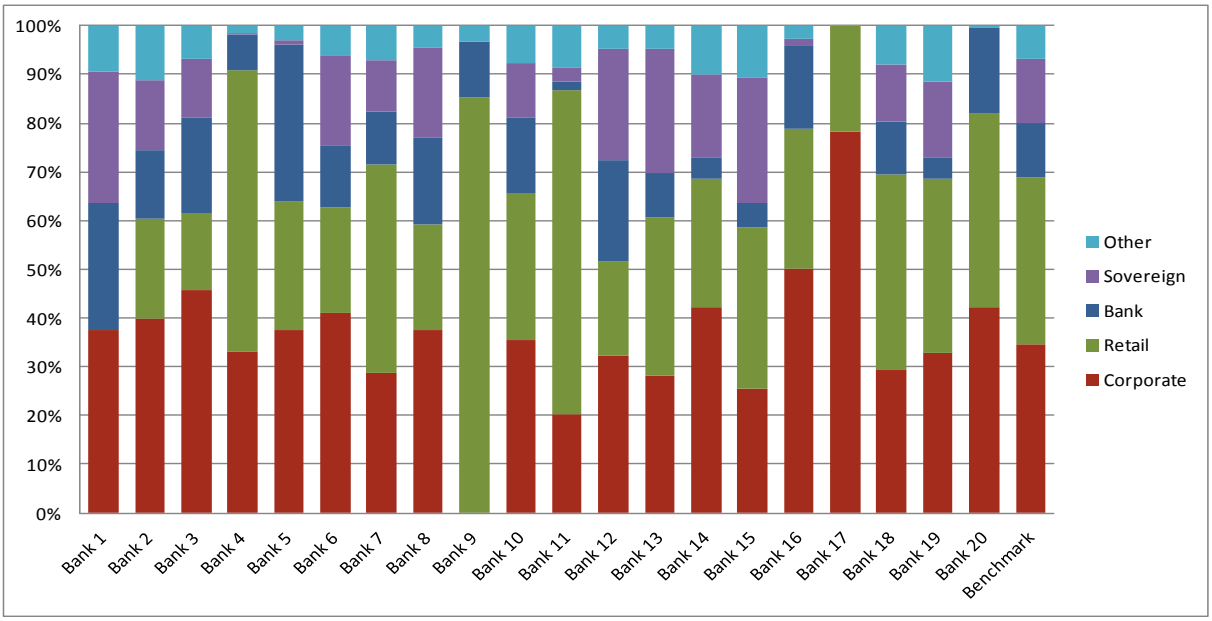
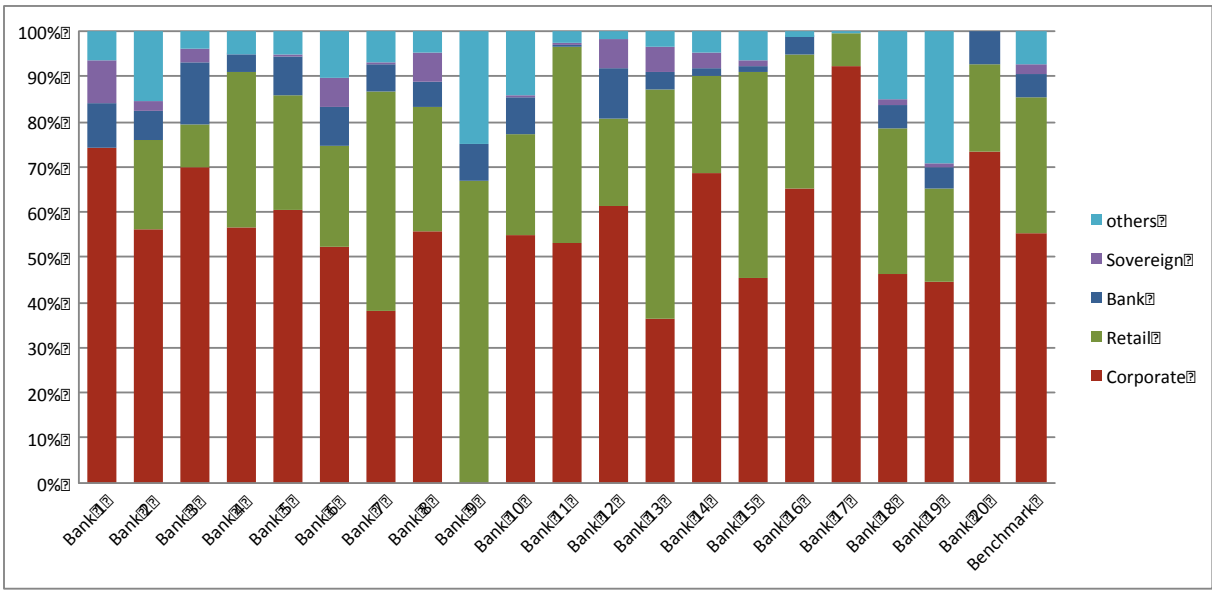


Figure 27: IRB GC broken down by portfolio



In the third step the IRB share defaulted exposures of the different portfolios for each bank is substituted by the benchmark ones. Using the methodology, when substituting the shares of the IRB defaulted exposures we continue to apply the bank IRB GC for each portfolio.

Figure 28 and Figure 29 provide an illustration for the banks in the sample of the existing divergence in the IRB share defaulted exposures, total IRB GC and IRB GC for performing loans.

In Figure 28 the shape of the line for the GC IRB is very similar to the share of IRB defaulted exposures. This confirms the relevance of such a driver in explaining any IRB differences in the GC and the need to exclude such a component before looking further into the analysis of the IRB risk parameters for performing loans.

Figure 28: IRB share defaulted exposures by portfolio

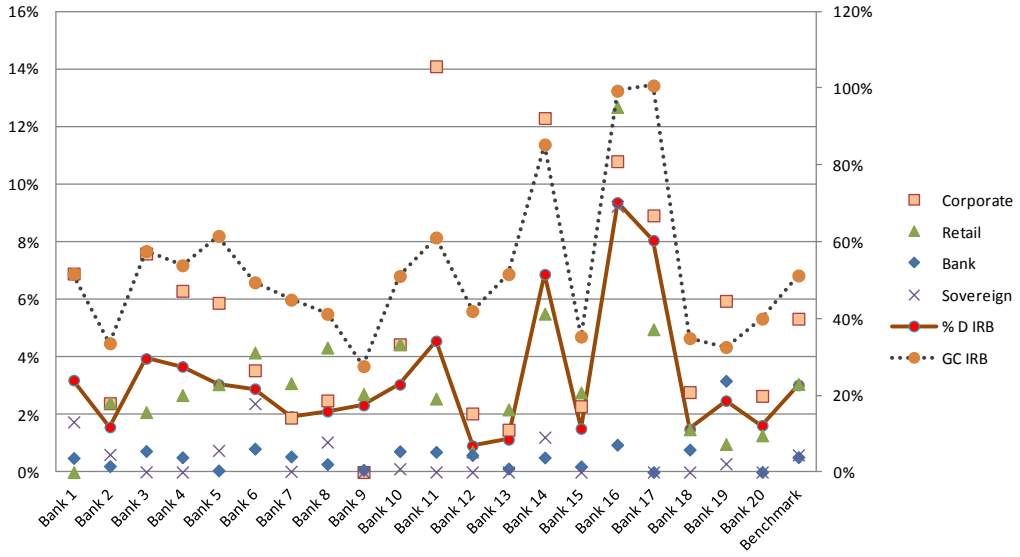


Figure 29 confirms the size of the difference between the GC of performing and defaulted exposures (distance between the red and green lines). The distribution of the GC for performing loans require further investigation to understand the extent to which the differences in IRB parameters may result from the intrinsically different risk profile.

Figure 29: Requirements for IRB exposures

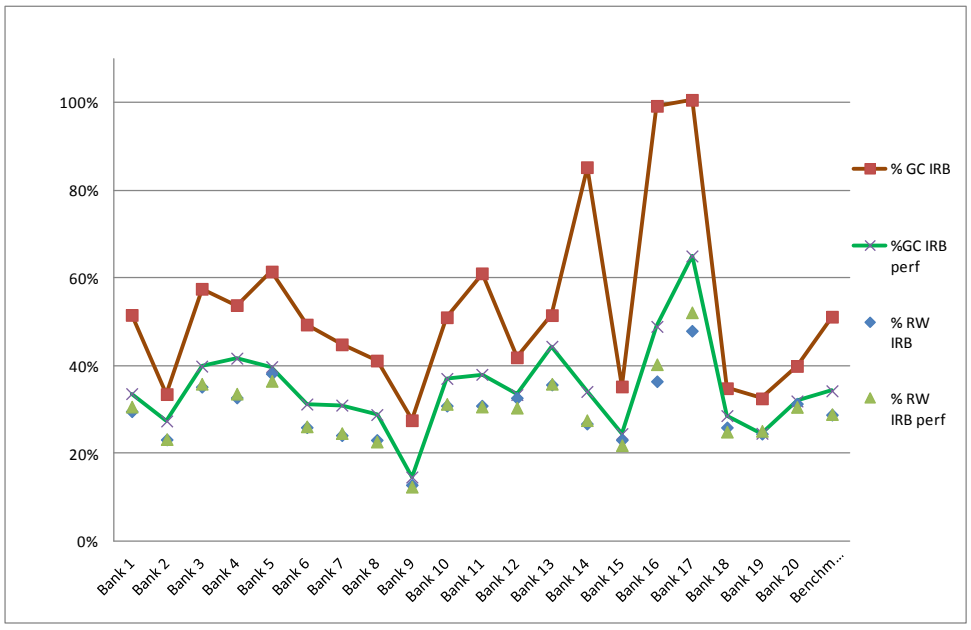


Figure 25 above shows the final results after the second and third steps of the analysis.

Annex III : IRB parameters used for the computation of RWA and EL, December 2011

The figures below show the dispersion of the IRB parameters applied by the bank in the sample for the computation of RWA and EL at December 2011. All the figures are EAD exposure weighted and represent average parameters.

Figure 30: PD[20] for each IRB asset class

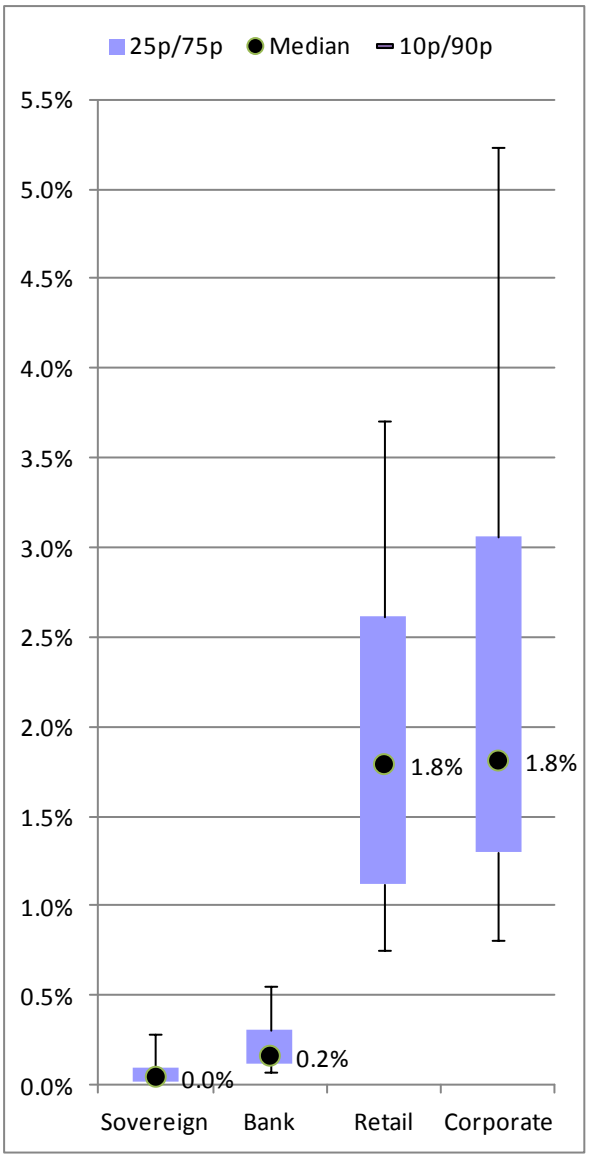
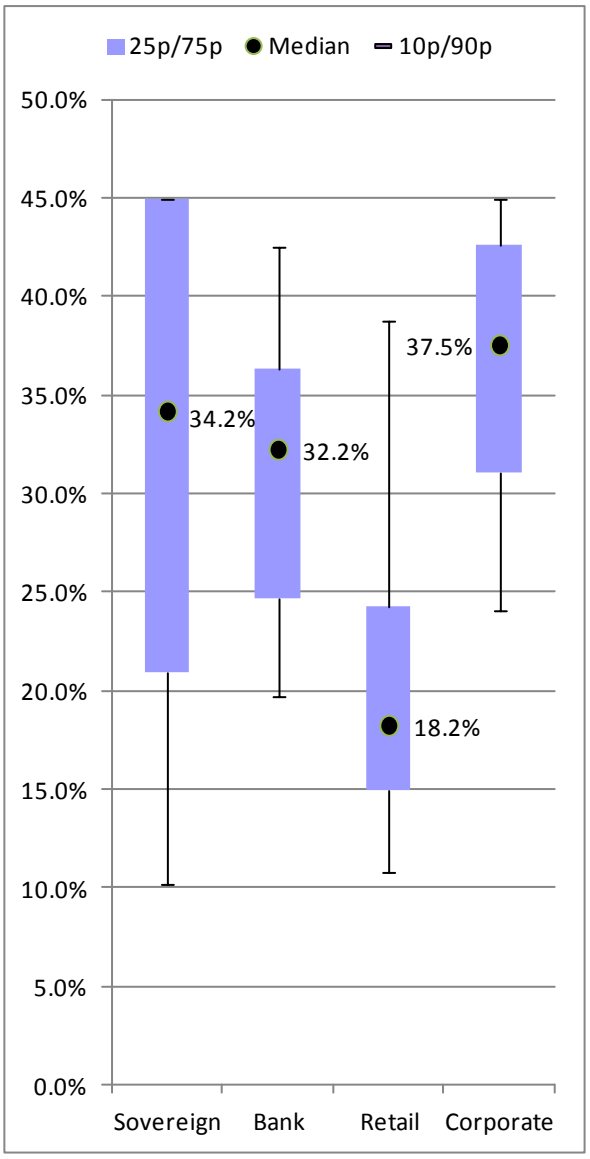


Figure 31: LGD performing for each IRB asset class



[20] PD values for non defaulted exposures

Figure 32: LGD default for each asset class

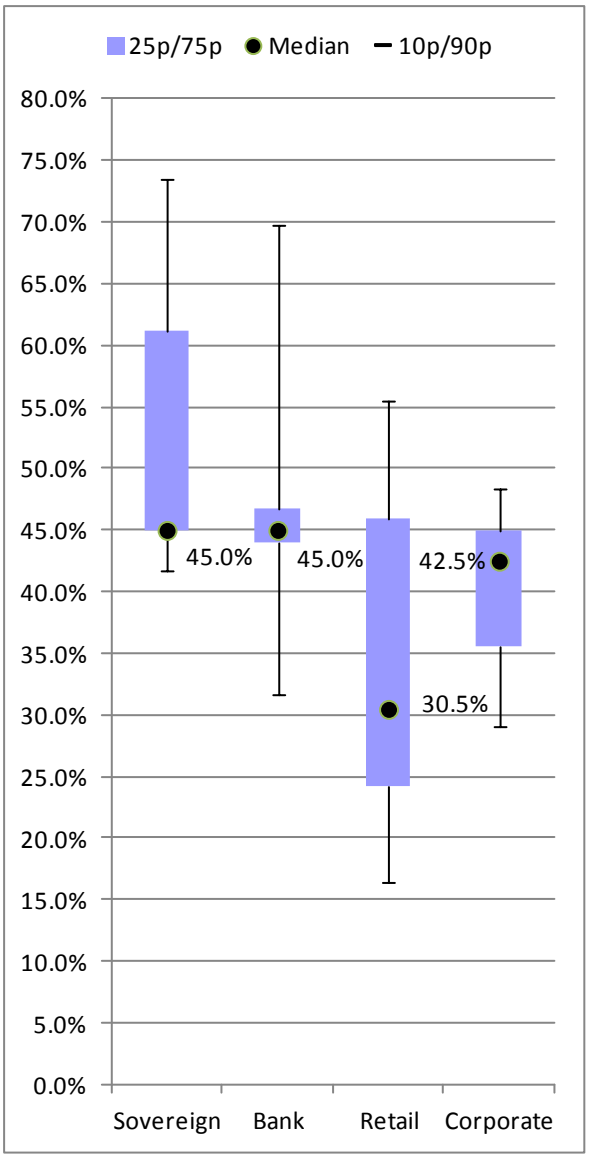


Figure 33: Maturity (number of years) for each asset class

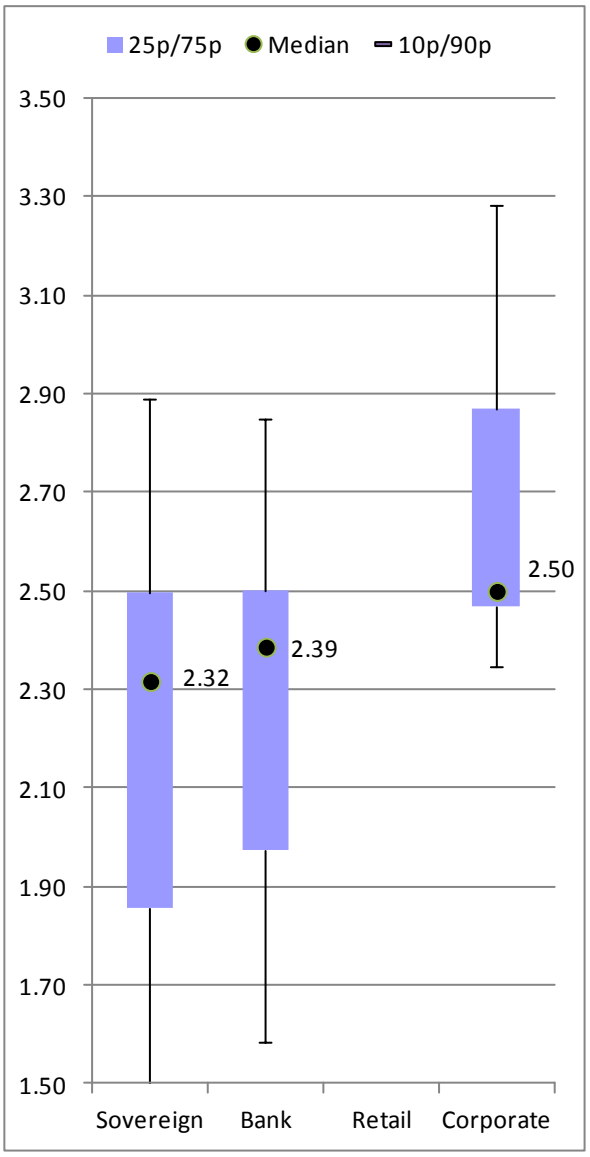


Figure 34: RW (%) for non defaulted exposures for each IRB asset class

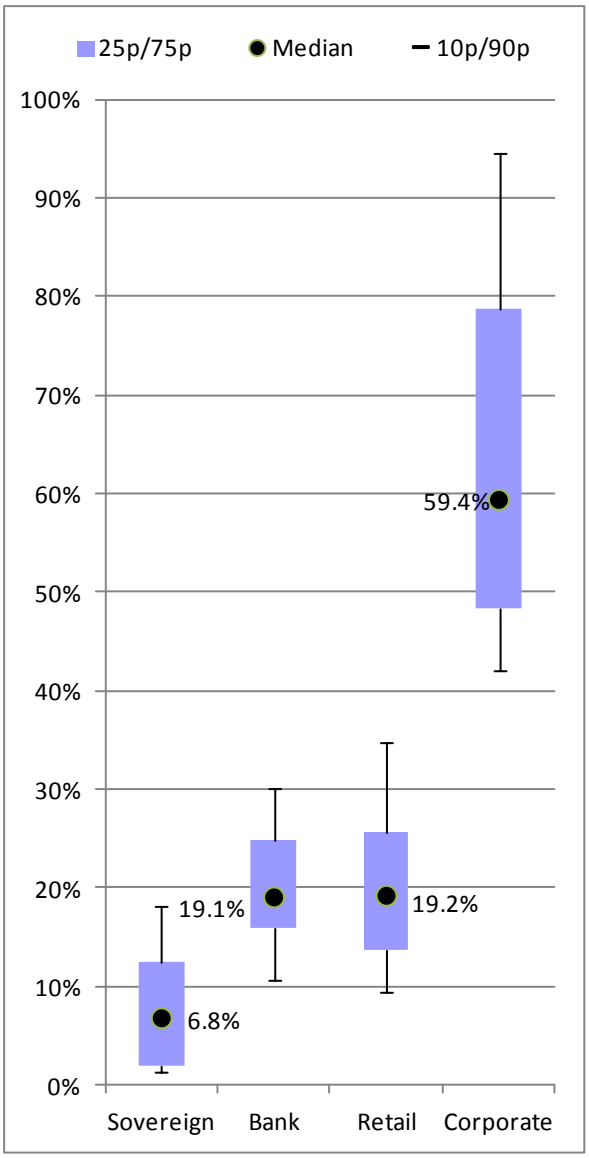
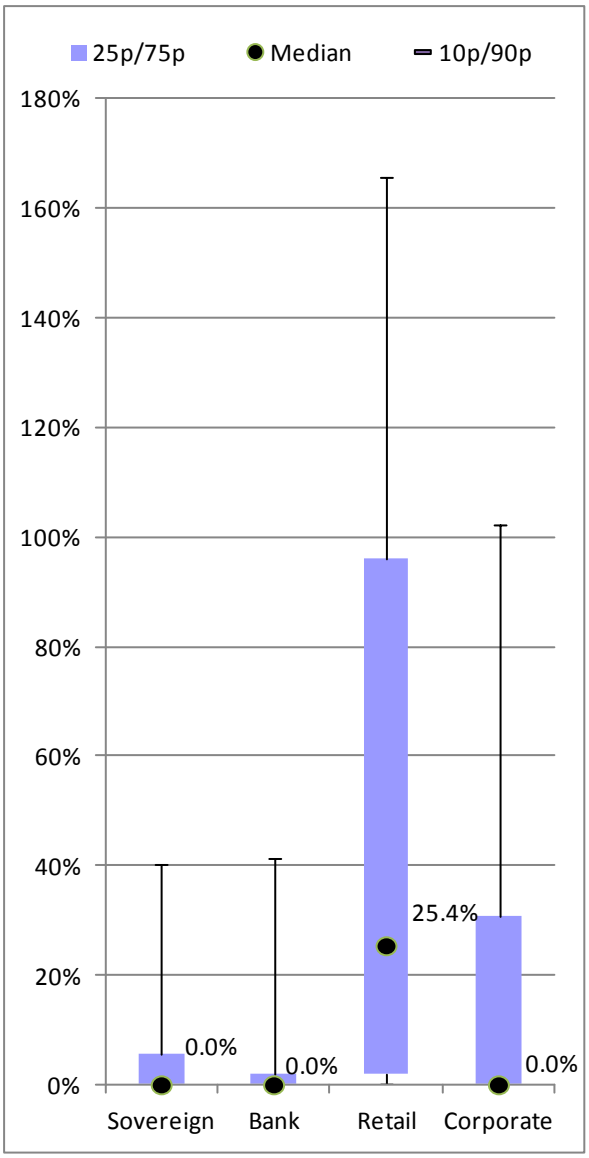


Figure 35: RW (%) for defaulted[21] exposures for each IRB asset class



[21] According to the CRD RW (%) for defaulted exposures are null for FIRB sovereign, bank and corporate; for AIRB and Retail defaulted exposures the RW (%) are computed by the banks.