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Heterogeneity of Bank Risk Weights in the EU: Evidence by Asset Class and Country of Counterparty Exposure

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Heterogeneity of Bank Risk Weights in the EU: Evidence by Asset Class and Country of Counterparty Exposure[1]

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Abstract

Concerns about excessive variability in bank risk weights have prompted their review by regulators. This paper provides prima facie evidence on the extent of risk weight heterogeneity across broad asset classes and by country of counterparty for major banks in the European Union using internal models. It also finds that corporate risk weights are sensitive to the riskiness of an average representative firm, but not to a market indicator of a firm's probablity of default. Under plausible yet severe hypothetical scenarios for harmonized risk weights, counterfactual capital ratios would decline significantly for some banks, but they would not experience a shortfall relative to Basel III's minimum requirements. This, however, does not preclude falling short of meeting additional national supervisory capital requirements.

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Contents **Page**

Abstract……..1
I. Introduction……3
II. Regulatory Review of Bank Risk Weights……...6
III. Variation in Risk Weights Across Bank Portfolios……...10
IV. Variation in Risk Weights by Country of Counterparty and Asset Class……..12
V. IRB Corporate Risk Weights and Firm Fundamentals……...13
VI. Harmonization of Risk Weights: Hypothetical Counterfactual Analyses…….16
VII. Conclusions……..18

FIGURES

1. Capital Ratios for Banks in the EU……..23
2. Risk Weighted Assets Density…….24
3. RWA, IRB/SA Portfolio Decomposition, and Risk Weights……..25
4. IRB/SA Average Risk Weights by Credit Exposure……...26
5. IRB Average Risk Weights in the Europe……...27
6. Changes to Capital Adequacy Ratios……...27

TABLES

1. Median Risk Weights across IRB/SA Portfolios of European Banks…….29
2. Descriptive Statistics for Bank Risk Weights by Country of Counterparty Exposure……30
3. IRB Corporate Risk Weights and Firm Fundamentals……33
4. IRB Corporate Risk Weights and Expected Default Frequencies……...35

APPENDICES

I. The 2015 EU-Wide Transparency Exercise…….36
II. Average Risk Weights, IRB Portfolio…….42

References…….....20

I. INTRODUCTION

Holding capital against risk-weighted assets (RWA) rather than total assets is consistent with the greater risk sensitivity intended by the Basel framework. Such risk sensitivity moderates banks' incentives to hold assets with high expected returns by requiring them to hold adequate capital to cover the underlying risk. Many banks use internal models to calculate risk, which rely on parameters that are largely based on historical data and previous loss experience. However, doubts regarding the resulting capital ratios have arisen and their usefulness has been questioned (Le Leslé and Avramova, 2012; Vallascas and Hagendorff, 2013; Behn, Haselmann, and Vig, 2016). Recent papers have documented a strategic under-reporting of bank risk (Mariathasan and Merrouche, 2014; Begley, Purnanandam, and Zeng, forthcoming) and some supervisors went as far as alluding to regulatory arbitrage by banks.

> *The combined complexity and opacity of risk weights generated by each banking organization for purposes of its regulatory capital requirement create manifold risks of gaming, mistake, and monitoring difficulty.*
>
> Governor Daniel Tarullo, May 8, 2014 speech at the Federal Reserve Bank of Chicago Bank Structure Conference, Chicago, Illinois.

In the aftermath of the global financial crisis (GFC), the Basel Committee on Banking Supervision (BCBS) has been devoting great attention to strengthening the regulatory capital framework. Having improved the quantity and quality of capital that banks must hold to absorb losses, the BCBS is seeking to address "the issue of excessive variability in risk-weighted assets" to restore "market confidence in risk-based capital ratios" and "promote sound levels of capital and comparability across banks" (Bank for International Settlements (BIS), BCBS, 2016a).[2]

An issue at stake is that the proposed reforms to calculate bank risk (see section II) are expected to increase by a greater amount the capital that European banks must hold compared with, for example, their American peers (The Economist, December 3, 2016).[3]

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[2] To strengthen bank resilience in Europe, the total capital requirement is expected to include, on top of the Pillar 1 minimum capital requirement, additional Pillar 2 capital that is set on a bank-by-bank basis, as well as three add-on buffers to be met from Common Equity Tier 1 (CET1) capital—a capital conservation buffer, a systemic risk buffer, and a counter cyclical risk buffer.

[3] Global banking discussions that last took place in Chile in November 2016 have yet to converge. A first version of the BCBS proposal had suggested a 60-90 percent lower bound on banks' RWA (so called output floor), and no agreement was reached on a compromise for gradually raising it to 75 percent over four years, starting 2021. The rules aim to ensure consistency in bank assessment of risks from loans for the determination of capital reserves, and the output floor is proposed to act as a backstop to ensure a minimum level of capital (The Economist, January 7, 2017).

This reflects, among others, different asset compositions on banks' balance sheets[4] and wider use of internal models in the EU relative to the U.S, which significantly reduce the ratio of RWA to total assets, the so-called RWA density. With many European banking sectors still suffering from the legacies of the GFC and the euro area crisis, there may be a reluctance to impose higher capital requirements that could increase bank costs.

A growing body of literature has examined issues related to risk weight heterogeneity. One feature common to all previous studies is the use of the RWA density as basis for their analysis, simply because disaggregated data at the bank portfolio level were previously lacking. Another common feature of existing research is the coverage of large listed banks across the world. For instance, Beltratti and Paladino (2016) use the RWA density to find that banks use internal models to optimize their financial structure, under the hypothesis that a larger cost of equity capital induces banks to reduce the share of equity financing of their assets. Other studies have looked at issues arising from the use of internal models other than regulatory arbitrage. Using a large sample of 246 international listed banks where less than 60 banks are from Europe, Vallascas and Hagendorff (2013) also use the RWA density to show that risk-weighted assets are ill-calibrated to portfolio risk so that banks under-report portfolio risk, which undermines their ability to withstand shocks. Mariathasan and Merrouche (2014) report that the RWA density across 115 banks from 21 OECD countries declines considerably once regulatory approval for using the internal ratings-based (IRB) methods is granted. Such a drop in risk weights is particularly pronounced for weakly capitalized banks, where supervision is weak, and in countries where supervisors are overseeing many IRB banks. More recent evidence by Begley, Purnanandam, and Zeng (forthcoming) using 41 banks in the U.S., Canada, and Europe, indicates that bank risk measures become less informative precisely when banks are approaching financial distress.

Other studies analyze banks' risk assessment in a single country context. For the U.S., Barakova and Palvia (2014) find that internally generated risk weights are determined mostly by portfolio risk. But Plosser and Sanos (2014), who estimate bank biases at the credit level, report that low-capital banks have low risk estimates. As for evidence from Europe, Behn, Haselmann, and Vig (2016) use loan level data from Germany to show that internal models systematically under-predict actual default rates, that defaults and losses are higher for loans originated under the model-based approach and carrying low risk weights, and that banks had priced those loans in accordance with their higher actual risk. In contrast, Fraisse, Lé, and Thesmar (2015) do not find much support for corporate risk weight manipulation via internal models in France.

This paper differs from the literature in three important aspects. First, instead of using RWA density as proxy for banks' risk assessment, risk weights are evaluated at the portfolio level

[4] One portfolio composition difference is that the stock of mortgages is kept on the balance sheet of European banks whereas US counterparts offload such assets through securitization.

and across country of counterparty exposure. Second, whereas existing papers have generally looked for evidence of gaming by banks to minimize holdings of equity capital, this study aims to document the extent of risk weight heterogeneity across different dimensions, assess the sensitivity of corporate risk weights to fundamentals, and analyze the implications from applying less heterogeneous risk weights on bank capital positions under hypothetical counterfactual scenarios. Third, the data used cover a large sample of listed and non-listed European banks, compared with existing evidence on international listed banks or in a single country. Such a focus on Europe is important given concerns about the expected effects from risk weight harmonization rules on the capital required for European banks.

The novelty of the paper derives from using data published as part of the transparency exercise by the European Banking Authority (EBA), which allow for a better understanding of the extent of risk-weight heterogeneity across Europe.[5] Cross-country research is often handicapped by incomplete datasets on risk weights for private and publicly-listed banks or by availability of aggregate information at the institution level only. In contrast, the EBA data, for the first time, disclose three important dimensions of portfolio information that allow for the calculation of risk weights at a more granular level.[6] First, the data provide the distribution of bank portfolios across the standardized and internal risk assessment methods. Second, the data allow for the calculation of bank risk weights across major asset classes including corporate, retail, and mortgage portfolios.[7] Third, the data include the largest exposures by country of counterparty for each bank and each asset class.[8] This detailed level of disclosure allows for prima facie evidence on variations in risk weights at the portfolio level, by asset class, and by country of counterparty exposure for the major banks using internal models in Europe.

In addition, the study investigates possible determinants of corporate risk weights, assessing their sensitivity to indicators of firm fundamentals and corporate default. It also presents hypothetical counterfactual capital ratios if more harmonized risk weights were applied to bank portfolios, using as benchmarks other banks' risk weights for the same asset class (corporate/ retail/ mortgage) and country of counterparty exposure. The findings could inform policy discussions by regulatory bodies, which are currently seeking to reduce the

[5] The EBA data was previously used for another purpose, investigating whether employing total assets or RWA matters for the minimum requirement for own funds and eligible liabilities (European Parliament, 2016a and b).

[6] Prior to the release of the EBA data, a consistent reporting of RWA across banks was available at the aggregate level only.

[7] The EBA data also allow for the derivation of bank risk weights for sovereign exposures, which are outside the focus of this paper.

[8] Breakdown by country of counterparty is reported according to the minimum of 95 percent of total exposures at default and the top 10 countries in terms of exposure, resulting in exposures to a total of 60 countries around the globe for all banks.

complexity of internal models and improve their comparability, as well as addressing excessive heterogeneity in credit risk assessment methods.

The rest of the paper is organized as follows. Section II provides a brief background on the review of bank risk weights by international regulatory bodies. Section III describes variations in risk weights across bank portfolios and section IV presents their variations by SA/IRB approach, asset class, and country of counterparty exposure. Section V investigates the sensitivity of corporate risk weights to firm fundamentals using both accounting data and expected default frequencies. Section VI derives counterfactual capital ratios from hypothetical scenarios using alternative risk weights for banks' exposures at default. Section VII concludes.

II. Regulatory Review of Bank Risk Weights

> *Having substantially strengthened the banking system's regulatory framework, the Committee's attention is now turning to the framework's complexity and the comparability of capital adequacy ratios across banks and jurisdictions.*
>
> BIS, BCBS, The regulatory framework: balancing risk sensitivity, simplicity and comparability, July 2013.

Post-crisis reforms of the Basel capital accord have first focused on the numerator of the capital adequacy ratio (CAR), increasing both the quantity and quality of capital that banks must hold to increase their loss absorption capacity. More recently, the denominator of the CAR—RWA—has received more attention, with the issue of risk weight heterogeneity being at the forefront of discussions on the harmonization of banking rules.

RWA are derived using risk weights, which are expected to reflect the varying intrinsic risk characteristics of each asset, so that banks hold appropriate amounts of capital against them as a cushion to absorb future unexpected losses.[9] Hence, some variation in risk weights across portfolios is to be expected given the differences in the financial profile of counterparties, domestic conditions, specific business policy by the banks etc. The Basel framework allows banks to use a range of methods to measure portfolio risk subject to supervisory approval. One option is to follow a standardized approach (SA) and the alternative is to use a bank's own internal models subject to explicit supervisory approval.[10] Whereas the SA uses prescribed risk weights to assess bank portfolio risk, the IRB

[9] Variation in risk weights occurs not just between broad asset classes such as corporate versus mortgage credit, but also within classes depending on individual loan characteristics (e.g., borrower's credit rating, debt service performance). Further, even if an impaired loan is provisioned for, the residual amount not covered by provisions could well have a higher risk weight, as there likely remains a risk of unexpected losses for that loan.

[10] Under Basel II, banks can choose from two possible IRB approaches subject to supervisory review: Foundation Internal Ratings Based (F-IRB) and Advanced Internal Ratings Based (A-IRB).

approaches align risk weights more closely to sophisticated quantitative risk assessment techniques in the financial industry.[11]

Heterogeneity in bank risk weights also arises among internal models. IRB models require a number of key parameters, including probability of default (PD), loss given default (LGD), exposure at default (EAD), and effective maturity. These parameters are not always available and require calibration or the exercise of judgement, thereby generating different risk weights for the same assets. Adding to that, differences in risk weights produced by IRB models can arise from the exercise of supervisory judgment across jurisdictions.[12] In sum, regulation and supervision allow for risk weights to differ across banks, which translates into different levels of capital ratios across those institutions. To the extent that such variations in risk weights do not reflect differences in risk exposure, the consequence is reduced comparability of capital ratios across institutions.

In Europe, use of internal models results in significant variation in capital ratios across countries, varying from 12.5 percent for Portuguese banks up to as high as 28 and 25 percent, respectively, for the Netherlands and Sweden (see Figure 1). Whereas a number of studies have analyzed how much bank capital is enough, Dagher et al. (2016) find that CAR of 15–23 percent in advanced economies would have avoided creditor losses in the past. Such a range is also in line with the 16–20 percent estimate by the Financial Stability Board (FSB) for global systemic banks (FSB, 2014) and the US Federal Reserve's proposal of more than 18 percent in total loss-absorbing capacity (Board of Governors of the Federal Reserve System, 2015).

In order to mitigate regulatory and model uncertainties from risk-based assessments the leverage ratio was introduced by Basel III as backstop to risk-sensitive capital.[13] Some even contend that adopting a leverage ratio would "induce truthful risk reporting" (Blum, 2008).

The remarkable dispersion in RWA has prompted a review of their measurement by international regulatory bodies. As part of its regulatory consistency assessment programme (RCAP), the BIS has published two reports analyzing RWA for credit risk in the banking book. In 2013, it conducted a Hypothetical Portfolio Exercise for more than 100 major banks

[11] Barakova and Palvia (2014) provide evidence from the US that risk weights generated under the IRB method are considerably more risk sensitive than the fixed asset class based risk weights of Basel I.

[12] Supervisory judgement is likely to be exercised in reaction to outliers so that it tends to reduce differences in capital rules across jurisdictions.

[13] Currently set at 3 percent of Tier 1 capital, the calibration of the leverage ratio within the range of 4 to 5 percent could provide a more consistent and effective backstop to risk-weighted requirements (Fender and Lewrick, 2015). Other have argued for a minimum leverage ratio of 8 percent as the binding constraint, supplemented with a standardized system of risk weightings to force higher capital for banks taking higher risks (Bair, 2013).

and 32 large banking groups in 13 jurisdictions to investigate the level and variation of risk weights and identify some of the primary drivers of this variation (BIS, 2013). This study also used surveys to consider differences in the practices of national supervisory authorities, including areas of national discretion permitted in the Basel framework, and differences in the internal estimation practices of banks. Its main conclusion was that observed variations in risk weights are driven by a mix of differences in underlying risk and differences in banking and supervisory practices.

In 2016, a second report from the BIS's RCAP (BIS, 2016b) evaluated regulatory outcomes by examining variability in RWA (for loans to retail customers and small and medium-sized firms) and in exposure at default (across the entire banking book).[14] The analysis compares PD, LGD, and EAD estimates (E) to actual (A) default and loss outcomes or the A/E ratio in the form of a "back-testing" exercise. The findings indicate that, on average, there is a close alignment of actual PD outcomes and IRB estimates but not for LGD and loss rates—suggesting that differences in RWA are based more on differences in risk rather than varying estimation practices. The dispersion of all A/E outcomes (for PD, LGD, and EAD) across banks, however, is similar. The report also describes sound practices for the independent model validation of banks, highlighting the potential to either reduce practice-based RWA variation or to simplify the IRB capital framework and increase its comparability.

Prior to that in December 2015, the BCBS had engaged in a review of standardized approaches to credit risk (BIS, 2015). The review sought to reduce differences in the way risk weights were calculated under the SA, which had implications for real estate exposures. In addition, the review suggested removing certain types of exposures (large corporates and financial institutions) from the IRB approach.

In parallel, the EBA has similarly committed to increasing the robustness of the risk-based capital framework for banks.[15] In 2014, it performed a review of risk weights for residential mortgages to better understand risk weight sensitivity to key model parameters (EBA, 2014). The Single Supervisory Mechanism is also planning to review 7,000 IRB bank models over four years to ensure that internal models are "solid, credible, and consistent" (Nouy, 2015; European Central Bank (ECB), 2016).

In addition to the review of risk weights by the BIS and European authorities, the Basel Committee's oversight body has agreed in January 2016 to complete its work on addressing the problem of excessive variability in RWA. In this vein, the BCBS started in March 2016 a consultation process for the setting of additional constraints on IRB models for credit risk, in

[14] The analysis of RWA is based on a sample of 35 major internationally active banks across 13 jurisdictions and that of exposure at default used a sample of 37 banks across 17 jurisdictions, all collected between September and October 2014.

[15] The EBA was assigned such a mandate by article 78 of the 4th Capital Requirements Directive.

particular through the use of floors. The proposal aims to (1) reduce complexity and improve comparability of IRB approaches, and (2) address excessive variability in capital requirements for credit risk (BIS, 2016c).[16] The floor is meant to mitigate model risk measurement error from using IRB modeling, thereby enhancing the comparability and transparency of bank capital and ensuring its level does not fall below a certain level.[17] The new proposed constraints on the IRB approaches would complement the design of a capital floor based on the SA, non-IRB approaches (BIS, 2014).[18]

The proposed regulatory capital changes may have a significant effect on European banks, which have been using internal models since they were first developed. Figure 2 panel A shows the extent of variation in RWA density across Europe and, from panel B, the average RWA density is considerably lower for European (35 percent) than for U.S. (58 percent) Global Systemically Important Banks (G-SIBs), although this large difference partly reflects higher shares of mortgages and government securities in European banks.[19]

More recently in February 2017, the ECB began the implementation of the Targeted Review of Internal Models (TRIM) to assess whether internal models comply with regulatory requirements, and whether they are reliable and comparable (ECB, 2017a). A major objective of TRIM, which involves on-site missions to 68 banks in 15 countries stretching over 2019, is to reduce inconsistencies and unwarranted variability in risk weights. Whereas increases in RWA are not the intention, TRIM could either raise or lower the capital requirements for individual banks (ECB, 2017b).[20]

In March 2017, the EBA also published a report on the consistency of RWA for "high default portfolios"—which include residential mortgages, SME retail, SME corporate, and corporate-other portfolios—covering 114 institutions across 17 EU countries (EBA, 2017). The report, which calls for a cautious interpretation of the results, finds that RWA variability can be explained to a large extent by portfolio features, including the proportion of defaulted

[16] Although the aim is to simplify assessment methods and reduce divergences in risk weights, the final design and calibration of the proposal will be guided by the aim to not significantly increase overall capital requirements for banks.

[17] To replace the Basel I floor, one option the BCBS is considering is having an aggregate floor that could be calibrated in the range of 60 to 90 percent of exposures at default.

[18] Other changes to the regulatory capital framework include the calibration of the leverage ratio, total loss-absorbing standards, sovereign/operational risk, securitization, interest-rate risk in the banking book, and the Fundamental Review of the Trading Book.

[19] As of March 2015, the ratio of RWA to total assets for U.S. GSIBs varied between 40 and 74 percent, whereas it ranged between 21 and 55 percent for European GSIBs (SNL Financial).

[20] In March 2017, the ECB raised risk-weights for Finland's largest financial services group after finding "shortcomings" in its internal models. While this increase lowered CET1 by less than 2 percentage points, capital remains comfortably above minimum requirements.

exposures in the portfolio, the country of the counterparty, and the portfolio mix. The remaining variability is likely attributed to idiosyncratic features, modeling assumptions, and risk management and supervisory practices.

III. Variation in Risk Weights Across Bank Portfolios

This section uses the detailed data from the EBA to describe heterogeneity in risk weights across EU banks. As part of its commitment to enhance transparency in the banking sector, the EBA published in November 2015 bank-by-bank information on capital positions and risk exposure amounts, using December 2014 and June 2015 as reference dates. This EBA EU-wide transparency exercise aims at making regulatory capital ratios a more transparent metric to assess banks' financial strength. It provides detailed and comparable bank-level data for 105 banks across 21 European countries (representing around 70 percent of EU banking assets) both at the group level and for the largest ten countries of counterparty credit exposures.[21] The granularity of the EBA data allows investigating bank risk weights along three dimensions: portfolio type (IRB and SA methods), asset class (corporate, retail, and mortgage exposures), and country of counterparty exposure (across 60 reported countries).

Appendix A explains in more detail how risk weights are inferred from the EBA data. They are calculated as the ratio of what the EBA terminology labels as "Risk exposure amount" (RWA using the BIS lexicon) to "Exposure value" ("exposures at default" under the BIS lexicon). Table 1 summarizes risk weights as of June 2015 across portfolio type (IRB/SA) and major three asset classes (corporate, retail, and mortgage loans), and Figure 3 presents basic charts on their distribution averaged at the country level.

At 85 percent of total RWA, credit risk is its largest bank risk component, followed by operational risk which amounts to 10 percent of RWA (see Figure 3). Except for banks in Denmark, Germany, Hungary, Sweden, and the U.K., the market risk share of RWA is less than 5 percent for banks in all other EU countries. Since credit risk is the dominant source of bank risk, the focus of the analysis in the rest of the paper is the credit portfolio split by corporate, retail, and mortgage credit exposures across both IRB and SA portfolios.[22]

Banks in the EBA sample from Cyprus, Hungary, Latvia, Malta, Poland, and Slovenia rely on the SA approach to assess credit risk. For EBA banks from other EU countries, the share of the credit portfolio assessed using the IRB method is lowest in Portugal at one-half, whereas in Finland and Sweden the IRB portfolio share is highest at 97 percent.

Other notable differences across bank credit portfolios are credit risk weights that, on average, are twice as high for SA than for IRB portfolios.[23] The median IRB risk weight for

[21] The first EBA transparency exercise was conducted in 2013 for 64 banks from 21 countries across Europe.

[22] Other credit risk exposures such as sovereign, securitization, and equity exposures are not considered.

[23] Haldane and Madouros (2012) also find that an internal ratings-based approach leads to lower risk weights than the standardized approach.

banks in the EU is 34 percent as of June 2015, significantly below the SA median risk weight of 75 percent. Looking at country-level averages, IRB credit risk weights range from 22 percent in Sweden to close to 50 percent in Austria. For the SA, credit portfolio risk weights also exhibit some dispersion, varying between slightly less than 60 percent in Malta to 90 percent in Latvia.

Figure 4 presents the average risk weight by type of credit exposure across IRB/SA portfolios. For the corporate credit portfolio, IRB risk weights exhibit significantly more variability than SA RW. Banks in Denmark and Sweden apply the lowest corporate risk weights (on average 33 and 34 percent, respectively, of EAD) for their IRB corporate asset class, whereas average risk weight in Ireland and Portugal are highest at 69 and 80 percent, respectively.[24] In contrast, SA corporate risk weights vary between 76 and 103 percent, respectively, for banks in France and Hungary.

Cross-country heterogeneity in risk weights is also greater for the IRB than for the SA retail portfolios. In their IRB risk-based framework for capital adequacy, banks in Luxembourg use an average risk weight of 11 percent for their retail portfolio, whereas banks in Spain apply a 46 percent risk weight, although these differences again likely in part reflect differences in loan performance. In contrast, there is much less dispersion in risk weights under the SA across the EU at large, where the median risk weight for retail exposures is at 72 percent.

Finally, at 26 percentage points, the gap between the IRB and SA risk weights for mortgage exposures is, on average, narrower than for other types of credit exposures. Using IRB models, less than 10 percent of EAD in Finland and Sweden are subject to regulatory capital, whereas in Austria and Ireland risk weights are, on average, 25 and 32 percent, respectively.[25] For the retail SA portfolio, banks in Latvia apply a risk weight of 35 percent, on average, whereas the highest risk weight is for Polish banks at 85 percent of risk exposure amounts.

To summarize, Figure 5 depicts the IRB average risk weights that are applied by banks for each of their corporate, retail, and mortgage portfolios, averaged at the country level. It is such significant heterogeneity in IRB bank risk weights that has prompted their regulatory

[24] Portugal and Ireland have recently been through crises, such that differences in loan performance could be a contributing factor, and in Ireland's case, the corporate sector may include significant commercial real estate lending.

[25] In the case of Ireland, the deep housing crisis and legacy of mortgage payment arrears are a contributing factor to the high risk weight on a portfolio average basis. In Sweden, the financial supervisory authority applies a 25 percent floor to mortgage risk weights in Sweden.

review as well as concern that internal models do not "strike the right balance between simplicity, comparability and risk sensitivity" (BIS, 2016a).

IV. Variation in Risk Weights by Country of Counterparty and Asset Class

In addition to portfolio type (SA/IRB method) and asset class (corporate/ retail/ mortgage), the EBA transparency exercise provides an important third dimension in the data, which is the breakdown of total exposures at default by country of counterparty. Each bank in the EBA sample reports its counterparty exposures to the largest ten countries. This granularity in the data at the bank level allows for a comparison of risk weights that are used by banks for exposures to the same country for a particular asset class.

Since loan quality affects RW, the analysis focuses to the extent possible on good quality portfolios to better analyze risk weight comparability across banks. Indeed, risk weights may be skewed in a bank portfolio that carries, say, defaulted mortgages, in comparison with a bank for which the mortgage portfolio is not impaired. As explained in Appendix A, defaulted loans are not included in the calculation of risk weights to ensure that variations in the share of defaulted loans do not undermine the comparability of portfolios, although some variation in the quality of portfolios will remain.

The full set of average risk weights by portfolio type, asset class, and counterparty is presented in matrix format in Appendix B. Table B1 Panel A lists the average IRB corporate risk weight matrix for banks in the EU. For banks in each of the countries displayed in columns, the IRB risk weights applied in the country of their counterparty exposure are listed in rows. To illustrate, consider Germany as the country of counterparty in the IRB corporate credit exposures. For these exposures to German corporates, banks in Austria implement, on average a 59 percent risk weight to calculate their risk exposure amount, but this same ratio is as low as 9 percent at Danish banks and as high as 137 percent at Irish banks, whereas German banks use a 46 percent risk weight for their corporate risk exposures to Germany. Panels B and C of Table B1 likewise report risk weights by country of counterparty for the IRB retail and mortgage credit exposures, respectively. Table B2 displays similar statistics for the SA portfolios.[26]

Table 2 summarizes the findings of Tables B1 and B2. Panels A, B, and C display descriptive statistics for risk weights by country of counterparty for IRB/SA corporate, retail, and mortgage credit portfolios, respectively.[27] To interpret, consider IRB corporate exposures to the Netherlands row in Panel A from which the following facts emerge. First, banks from 10 different countries have IRB corporate credit exposures to the Netherlands. Second, the

[26] Similar statistics by bank are calculated from the EBA data but not reported.

[27] In Table 2, the standard deviation is reported only if there are at least 5 observations in a particular category. Where the number of observations is less than 5, the range (difference between the maximum and minimum values) could serve as a better indicator of heterogeneity in RW.

average corporate risk weight for these exposures across all banks and countries is 61 percent of exposures at default, whereas the median is lower at 47 percent indicating positive skewness in the distribution of risk weights to the Netherlands. Third, heterogeneity in risk weights is also reflected by the high standard deviation of 31 percent, where the minimum and maximum IRB corporate risk weights for exposures to the Netherlands are 41 and 137 percent, respectively. Briefly, in Panel A, the greatest variability in IRB and SA corporate risk weights is for counterparty exposures to Luxembourg and Poland; in Panel B, the largest dispersion in retail IRB and SA risk weights is in Ireland and Spain; and in Panel C, IRB and SA mortgage risk weights differ mostly for exposures to the U.S.

It is evident from Table 2 that there is significant heterogeneity in bank risk weights across portfolios for the same country of counterparty. When banks lend across borders, they are subject to more informational opacity relative to extending credit domestically because they are in a less favorable position to collect borrower information and closely monitor debtor performance in a foreign country. In turn, uncertainty regarding debtor performance could translate into higher risk weights by banks to capture riskier portfolios abroad. Alternatively, banks may only be willing to lend abroad because they want to cater to the needs of their own domestic clients who branch out to other countries, in which case they are likely to apply lower risk weights to such credit portfolios abroad. Regardless, given that bank portfolios are cleaned of defaulted loans and disaggregated by loan type and counterparty country, they should in principle control for some of the major factors shifting the RWA density. Yet, they still show major differences in risk weights, adding to challenges of the comparability of risk weights.

V. IRB Corporate Risk Weights and Firm Fundamentals

As the use of internal risk models provides room for maneuver, banks are often alleged to adjust IRB model parameters with a view to reduce their risk weights and, thereby, inflate their capital ratios (Vallascas and Hagendorff, 2013; Behn, Haselmann, and Vig, 2016).[28] We investigate the extent to which bank risk weights reflect asset risk by focusing on the corporate portfolio using the following baseline regression:

$$IRB\ Corporate\ RW_{i,c,t} = \alpha_1 + \beta_1 Fundamentals_{c,t} + \beta_2 Z_{it} + \beta_3 X_{ct} + C_i + \epsilon_{it} \quad (1)$$

$IRB\ Corporate\ RW_{i,c,t}$ denotes bank *i*'s risk weight for its corporate portfolio in country *c* at time *t*.[29] It is retrieved for each bank included in the EBA transparency exercise that uses the

[28] Le Leslé and Avramova (2012) show that other factors such as business mix, provision practices, economic cycles also play a role.

[29] Consistent with the EBA 2015 vintage of the transparency exercise, two time periods are considered, December 2014 and June 2015.

IRB method and reports its ten largest corporate exposures across countries.[30] $Fundamentals$, our main variable of interest, is a vector of firm characteristics detailed further below.

Z is a vector of bank controls that includes the share of the corporate portfolio in total bank loans (*Corporate portfolio*) and pretax return on assets (*Pretax ROA*). Higher corporate loan concentration could imply higher risk exposure and thereby associate positively with corporate risk weights, or it could convey more expertise using IRB methods for risk management potentially associating with lower risk weights. More profitable banks are likely to favor higher risk weights because their charter value is higher, but if their lending strategy is aggressive they could also apply lower corporate risk weights.[31] X represents the growth rate in real GDP in the country of counterparty exposure to control for domestic lending conditions[32], C is a vector of fixed effects for bank i's country (controlling for the parent lender's domestic conditions)[33], and ϵ is a random error term. Since the IRB corporate risk weights vary by bank and by country of counterparty exposure, we run regressions at the bank level with robust standard errors clustered by period and country of counterparty exposure.

$Fundamentals$ include both accounting-based indicators of firm risk and expected default frequencies. Accounting-based indicators are retrieved from the International Monetary Fund's Corporate Vulnerability Utility (CVU) for 2013 and 2014 (i.e. they are lagged relative to the periods of measurement of corporate risk weights, December 2014 and June 2015).[34] They include five main risk corporate risk indicators: Leverage (ratio of debt to assets), interest coverage (ratio of earnings before interest and taxes to interest expense), liquidity (ratio of current assets to total assets), stability (z-score)[35], and market value (ratio

[30] As noted in Figure 3 top right chart and Appendix B, European banks in 15 out of 21 countries use the IRB method to varying degree. For the total number of exposures by banks in each of those countries, see the descriptive statistic "Count" at the bottom of Table B1. As for the list of countries of counterparty exposure, it is the leftmost column in Table B1.

[31] *Corporate portfolio* and *Pretax ROA* are included in equation (1) as contemporaneous variables and also lagged in sensitivity checks. The reason is that, for instance, banks applying low risk weights could be currently more profitable just because they were able to leverage up more than other banks are able to. Such considerations are not investigated further in this paper.

[32] X is considered both as a contemporaneous and lagged variable.

[33] Variation in risk weights within a country exposure may be coming from parent country fixed effects that cannot be explained, e.g. such as from parent balance sheets and how much risk they are taking at home.

[34] The CVU provides annual indicators that measure corporate sector health of listed firms in 74 countries, providing a consistent framework for corporate surveillance across the IMF.

[35] The z-score is an inverse indicator of risk, measured as the number of standard deviation units by which profits can fall before firm equity is impaired.

of market-to-book value).[36] The indicators from the CVU are based on firm-level data from annual reports of publicly traded companies so that they may not necessarily mirror bank *i*'s spectrum of corporate borrowers. Yet, we assess the sensitivity of corporate risk weights to each of these indicators evaluated at the median and the 75th percentile of their risk distribution. If corporate risk weights are risk sensitive, they would be expected to positively correlate with higher leverage, lower interest coverage, lower liquidity, reduced stability, or lower market value.

Table 3 shows the correlation of corporate risk weights with each firm indicator evaluated at the median (Panel A) and at the 75th percentile (Panel B) of its distribution.[37] Model 1 considers firm fundamentals and fixed effects for bank *i*'s country of origin; Model 2 additionally controls for bank *i*'s share of corporate loans and its profitability, as well as the growth rate in the country of counterparty exposure.

Consistent with priors, the results in Panel A indicate that lower leverage, higher interest coverage, and greater liquidity for a median firm correlate with lower corporate risk weights. Further, better valuation and greater stability (higher z-score) for a median firm associate with lower corporate risk weights.[38] The strong significance of the estimated parameter on each variable in *Fundamentals* suggests that IRB corporate risk weights are sensitive to the financial strength of an average (median) firm in the country of counterparty exposure. The economic significance of parameter estimates also suggests that firm stability and market valuation matter more for the assessment of corporate credit risk than indicators of leverage and liquidity. Banks where the share of corporate portfolios is larger, and more profitable banks, are likely to apply higher corporate risk weights, although this finding is not maintained across all specifications—similar to the positive association between bank profitability and corporate risk weights. In countries of counterparty exposure where GDP growth is higher, corporate risk weights are also greater. Further, the country of origin of the bank is also a significant determinant of corporate risk weights, with banks from Denmark, Netherlands, and Sweden assigning lowest corporate risk weights on average compared to banks from other EU countries.

In Panel B, which considers either the riskiest or safest upper tail of the distribution depending on the indicator considered, all results are maintained except for firm leverage and interest coverage, which lose statistical significance. Noteworthy is that the economic significance of all parameter estimates is considerably reduced in Panel B compared with Panel A. This finding may lend some support to regulatory concerns that tail risk is captured

[36] Robustness checks that consider alternative indicators of leverage (the ratio of debt to equity), liquidity (the quick ratio and the current ratio), and market value (Tobin's Q) yield qualitatively the same results.

[37] Similar results (not reported) obtain when considering corporate financial indicators at the mean instead of the median.

[38] When considering the effect of all firm fundamentals together (not reported), only the significance of corporate leverage and market value are maintained.

less properly by bank internal models relative to average risk, which would suggest a mispricing of low probability/high impact events (Le Leslé and Avramova, 2012; Vallascas and Hagendorff, 2013; Behn, Haselmann, and Vig, 2016). But it is also possible that banks limit their lending exposure to riskier firms.

Overall, these results suggest that IRB risk weights reflect firm fundamentals using accounting data, albeit capturing more the riskiness of a representative median firm than one that falls in the upper tail (75th percentile) of the risk distribution of corporate indicators.[39] Therefore, the results do not provide evidence of regulatory arbitrage, a conclusion that that would instead require an analysis using loan-level data (Behn, Haselmann, and Vig, 2016).

To examine whether bank risk weights capture unexpected future losses, we re-estimate equation (1) using Expected Default Frequencies (EDFs) as another proxy for *Fundamentals* to capture a probability of corporate default. To that end, corporate EDFs and their distribution are retrieved from the Moody's database for the countries of counterparty exposure in the EBA sample, averaged over the six months ending December 2014 and June 2015, and then included as right-hand side variables in regressions of corporate risk weights (see Table 4).[40]

It would be expected that the sign of different thresholds of the EDF indicators would be positive, implying that higher probability of default associates with greater corporate risk weights. Yet, the results in Table 4 do not point to consistency in the sign of the parameter estimates and they are also largely insignificant.

In sum, corporate risk weights reflect average firm risk assessed using mostly accounting data, but they do not seem to be sensitive to a market-derived assessment of the probability of default. This finding is in line with Barakova and Palvia (2014) who find that IRB risk weights at U.S. banks are strongly aligned with historical loan performance but less so with external market-based risk indicators.

VI. HARMONIZATION OF RISK WEIGHTS: HYPOTHETICAL COUNTERFACTUAL ANALYSES

A natural question arises on the effect of applying less heterogeneous bank risk weights on the calculation of capital ratios. This section assesses how capital ratios (summarized earlier in Figure 1) would change if banks using internal models were to adjust their RWA under hypothetical scenarios to be more aligned with the risk-weighting schemes used at other banks in the EU. The resulting capital ratios are then compared to the minimum regulatory requirements under Basel III to see whether banks would experience a capital shortfall.

[39] In reality, bank portfolios are of course non-homogeneous.

[40] It could be that EDFs are themselves determined by bank risk weights, an issue that is not further investigated in this paper.

The scenarios used rest on the distribution of the IRB average risk weights by country of counterparty exposure for each of the corporate, retail, and mortgage portfolios. Similar to the analysis in the previous section, an important caveat is that, in reality, bank portfolios are not homogeneous so that applying uniform risk weights for their cross-border exposures is a purely theoretical exercise.[41]

In scenario 1, individual bank IRB RWA are calculated using the median risk weight of each asset class exposure (corporate, retail, and mortgage) in a particular country of counterparty exposure. In scenario 2, RWA are evaluated at the 75th percentiles of the distribution of risk weights for each asset class per country of counterparty exposure. In scenario 3, risk weights are evaluated at the maximum value by asset class and country of counterparty exposure.[42] Whereas scenario 1 can be considered as plausible, scenario 2 is more severe but perhaps still plausible, and scenario 3 is extreme.

The results from the hypothetical counterfactual analyses are illustrated as changes to regulatory capital ratios in Figure 6, averaged at the country level.[43] The impact on three regulatory capital ratios is displayed: Common Equity Tier 1 (CET1), Tier 1, and Total capital ratios. All three regulatory ratios use the same denominator, RWA, to derive the CAR. What differs among the three metrics is the value of loss-absorbing capital considered: common equity, Tier 1 equity, or total capital (i.e., Tier 1 and Tier 2 capital).

Under Scenario 1, if each bank in the EBA sample were to apply the median risk weight for their IRB credit exposures by asset class (corporate, retail, and mortgage loans) and by country of counterparty for their largest 10 exposures, then banks in the Netherlands would, on average, experience between 10.8 to 12 percentage point decline in their regulatory capital ratios. Capital ratios for banks in Germany and Sweden would be reduced by around 2 percentage points on average. In contrast, capital ratios of banks in Finland, Ireland, and Portugal would be boosted by more than 1 percentage points, and many other banking systems would be unaffected. Under this scenario, no bank would breach the 4.5 percent minimum ratio of CET1 to RWA, the 6 percent minimum requirements for Tier1 capital, or the 10.5 percent threshold of total regulatory capital. This counterfactual analysis, however,

[41] This point is of importance because applying a uniform risk weight negates the benefit of risk selection and origination practices by each bank.

[42] The counterfactual scenarios assumed in this section are hypothetical and do not capture the risk weights that would come out from harmonized regulation. Nor do they allude that risk weights should be tied to the industry/country average independent of the risk that a bank takes within each lending category.

[43] Changes to capital ratios as well as their new levels under each scenario are calculated for each individual bank but not reported.

does not preclude capital shortfall owing to other country-specific supervisory requirements.[44]

Under Scenario 2, if the 75th percentile of the risk weights distribution across asset classes and country of counterparty were used, banks in Austria, Ireland, Italy, Norway, and Spain are barely affected, whereas banks in Portugal still experience a slight boost to their capital ratios. In contrast, capital ratios for banks in the Netherlands would decline by around 14 percentage points, while banks in Belgium, France, Germany, and Sweden would experience a reduction in capital ratios of the magnitude of 3 to more than 4 percentage points. While these declines in capital ratios may seem alarming, no bank of the 77 in the sample breaches the minimum regulatory requirements under this severe but perhaps still plausible scenario.[45]

Finally, a worst case scenario applies the largest risk weight to each asset class by country of counterparty exposure. In this case, capital ratios for banks in France, Germany, Netherlands, and Sweden would decrease by more than 10 percentage points, and banks in all other countries would also adversely affected albeit to varying degrees. Under this extreme scenario, 7, 9, and 38 banks would not meet the minimum regulatory requirements for CET1, Tier1, and total capital, respectively, and 8 out of the 20 countries where internal models are used would be affected.

In sum, these counterfactual analyses suggest that, unless a very extreme scenario is envisaged, other hypothetical harmonization rules of bank risk weights are not likely to have a significant impact on the capital positions of banks in the EU, as no bank would have to raise more capital to meet regulatory requirements.

VII. CONCLUSIONS

Concern by regulatory bodies that excessive variation in bank risk weights is motivated by a desire for reducing regulatory capital requirements (rather than a reflection of underlying differences in credit risk assessment) has prompted additional regulatory work towards greater harmonization in risk-weights. This issue is most pertinent in the EU, where most large banks make a greater use of internal models to determine risk weights and where the RWA density is lower in aggregate by international comparisons.

Using the granular EBA data, this paper first documents substantial variations in bank risk weights across asset classes by country of counterparty exposure. It also finds that corporate risk weights are sensitive to firm fundamentals but not to market-inferred probabilities of

[44] Some European countries require additional capital buffers as part of Pillar II over and above the minimum regulatory requirements, which are not considered here.

[45] Similar to above, it could be that some banks breach the capital buffers required under Pillar II, an issue which is not investigated further here.

firm default. Yet, under non-extreme but severe hypothetical scenarios, counterfactual capital ratios would not breach Basel III's minimum regulatory requirements if more harmonized risk weights were applied to the corporate, mortgage, and retail portfolios for the same country of counterparty exposure.

The findings can encourage discussions and policy suggestions for the on-going international regulatory review and harmonization of risk weights. The hypothetical counterfactual analysis indicates that it is possible to harmonize risk weights without significant impact on bank capital, which is an objective by the BCBS. Alternatively, for those banks where risk weights are significantly below peers, detailed analysis of their own internal models would help determine whether holding greater capital is warranted to better reflect the riskiness of their assets. Such risk-based regulation would safeguard the greater risk sensitivity intended by the Basel framework while reducing the temptation to return to a simple leverage ratio. It is also in line with the ECB's most recent TRIM program, suggesting the importance to extend such an endeavor also to non-eurozone countries in Europe.

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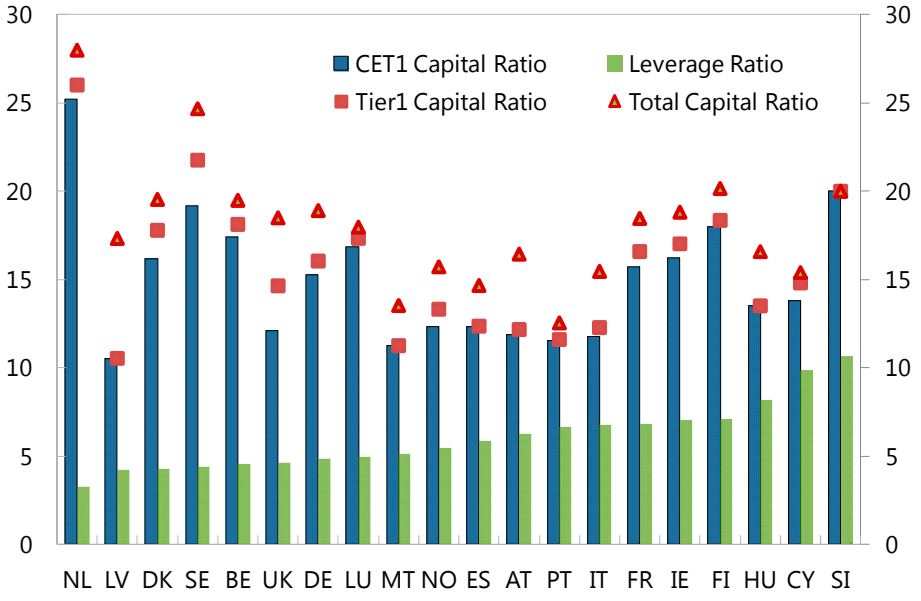
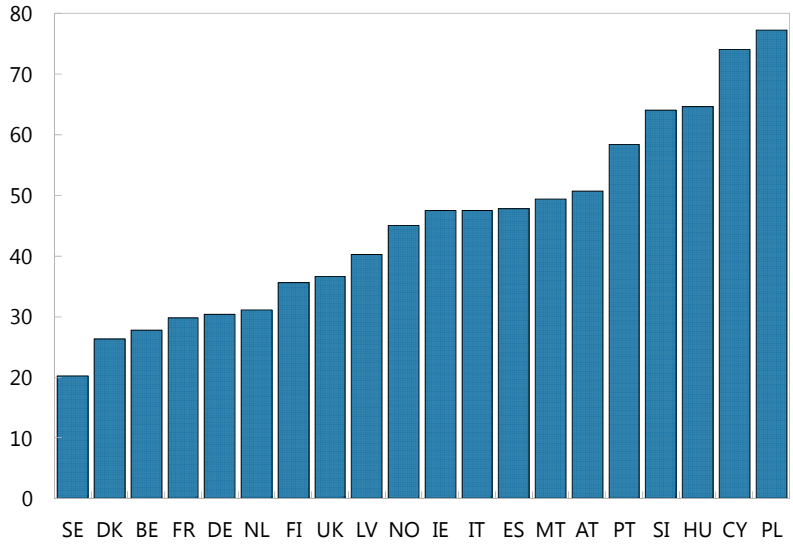
Figure 1. Capital Ratios for Banks in the EU (in percent), June 2015



Source: European Banking Authority.

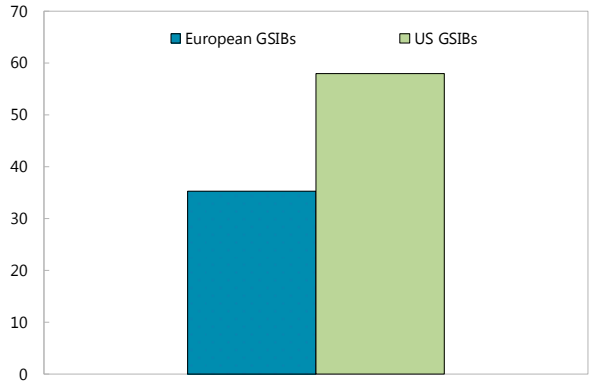
Figure 2. Risk Weighted Assets Density (RWA/TA, in percent)

Panel A. *EBA Banks (June 2015)*



Sources: European Banking Authority, Bankscope, and Author's calculations.

Panel B. *US, European G-Sibs (March 2015)**



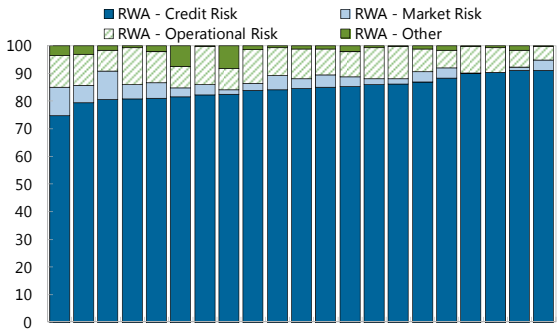
Sources: SNL and author's calculations.

* European G-SIBs are UBS AG, Nordea Bank AB, Deutsche Bank AG, Société Générale SA, Crédit Agricole Group, BNP Paribas SA, Barclays Plc, Credit Suisse Group AG, Groupe BPCE, ING Bank NV, Royal Bank of Scotland Group Plc, HSBC Holdings Plc, Banco Santander SA, UniCredit SpA, Standard Chartered Plc, Banco Bilbao Vizcaya Argentaria SA.
U.S. G-SIBs are State Street Corp., Bank of New York Mellon Corp., Bank of America Corp. JPMorgan Chase & Co., Citigroup Inc., Wells Fargo & Co.

Figure 3. RWA, IRB/SA Portfolio Decomposition, and Risk Weights

Credit risk is the main component of RWA.

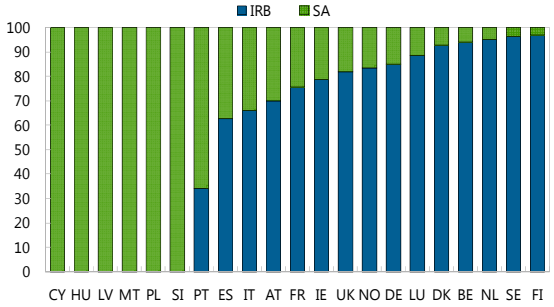
Components of Risk-Weighted Assets, June 2015
(Percent of Total RWA)



Sources: European Banking Authority and Author's calculations.

Banks in most of advanced Europe use the IRB method.

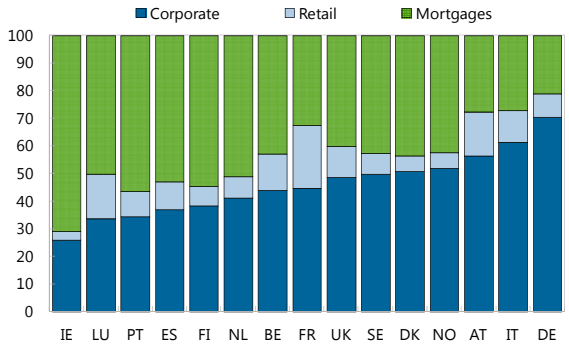
Credit Risk Portfolios, Internal Ratings-Based (IRB) and Standardized (SA) (Percent of credit portfolio, Jun 2015 1/)



Sources: European Banking Authority and Athor's calculations. 1/Credit portfolio covers corporates, retail, and mortgages, and excludes exposures to sovereigns, governments, financial institutions, equity, in default, and securitization.

IRB portfolio composition differs across banks in the EU…

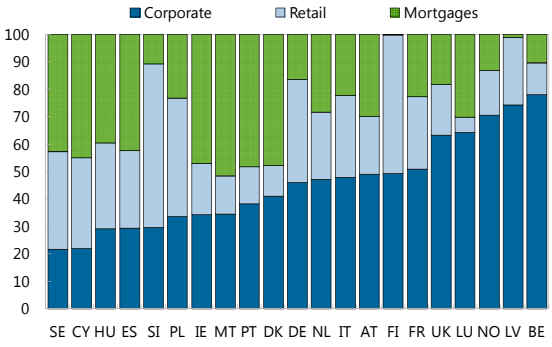
Distribution of IRB Credit Portofolios, June 2015
(Percent of Total Exposures at Default)



Sources: European Banking Authority and Author's calculations.

with greater variability across asset classes in SA portfolios

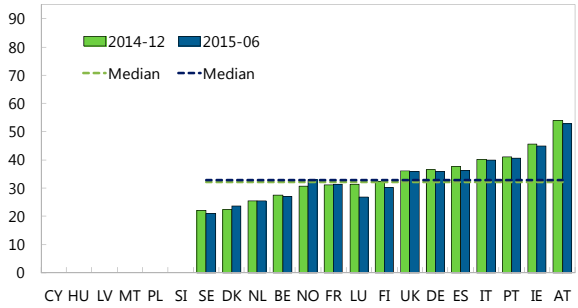
Distribution of SA Credit Portofolios, June 2015
(Percent of Total Exposures at Default)



Sources: European Banking Authority and Author's calculations.

The median IRB risk weight is 34 percent across the EU…

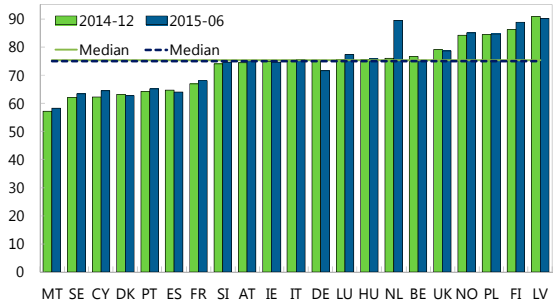
IRB Credit Risk Weights: Credit Portfolio 1/
(Risk Exposure Amount in Percent of Exposure at Default)



Sources: European Banking Authority and Author's calculations. 1/Credit portfolio covers corporates, retail, and mortgages, and excludes exposures to sovereigns, governments, financial institutions, equity, in default, and securitization.

…whereas as it is 75 percent for SA portfolios.

SA Credit Risk Weights: Credit Portfolio 1/
(Risk Exposure Amount in Percent of Exposure at Default)



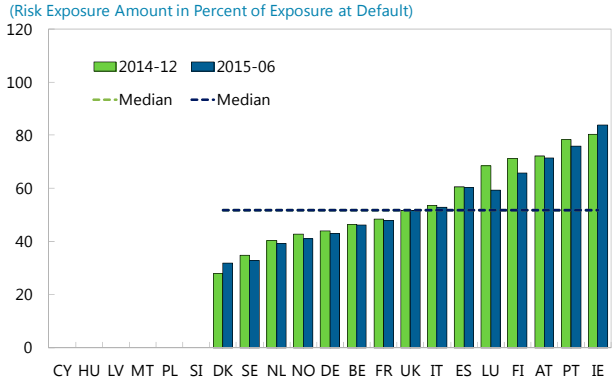
Sources: European Banking Authority and Author's calculations. 1/Credit portfolio covers corporates, retail, and mortgages, and excludes exposures to sovereigns, governments, financial institutions, equity, in default, and securitization.

Figure 4. IRB/SA Average Risk Weights by Credit Exposure

IRB corporate risk weights vary between 32 percent in Denmark and 84 percent in Ireland

IRB Credit Risk Weights: Corporate Portfolio

(Risk Exposure Amount in Percent of Exposure at Default)

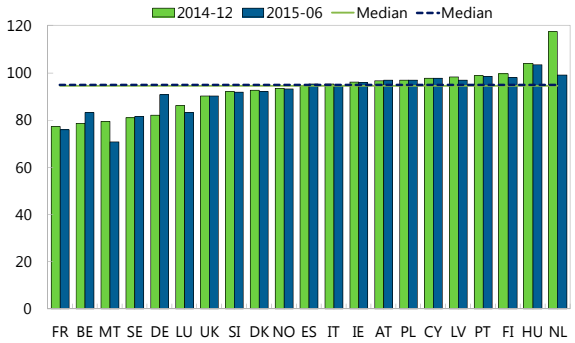


Sources: European Banking Authority and Author's calculations.

... whereas SA corporate risk weights are more uniform.

SA Credit Risk Weights: Corporate Portfolio

(Risk Exposure Amount in Percent of Exposure at Default)

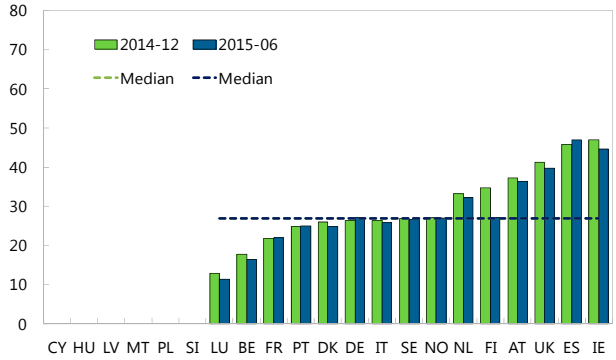


Sources: European Banking Authority and Author's calculations.

IRB retail risk weights vary between 11 percent in Luxembourg and 45 percent in Ireland

IRB Average Risk Weights: Retail Portfolio

(Risk Exposure Amount in Percent of Exposure at Default)

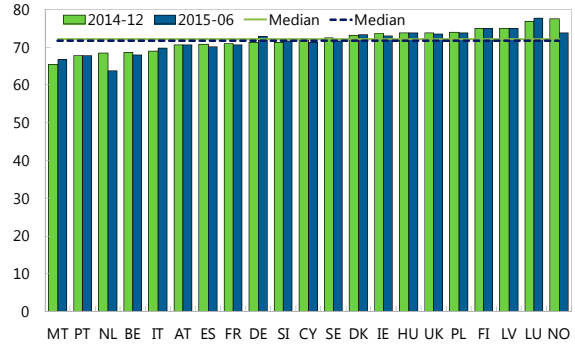


Sources: European Banking Authority and Author's calculations.

... and the median SA weight is 72 percent across the EU.

SA Average Risk Weights: Retail Portfolio

(Risk Exposure Amount in Percent of Exposure at Default)

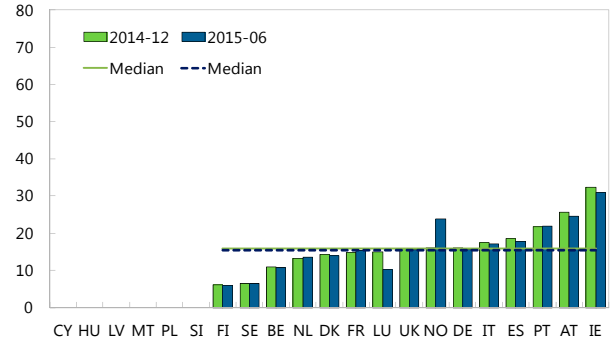


Sources: European Banking Authority and Author's calculations.

IRB mortgage risk weights vary between 6 percent in Finland and 31 percent in Ireland

IRB Average Risk Weights: Mortgages

(Risk Exposure Amount in Percent of Exposure at Default)

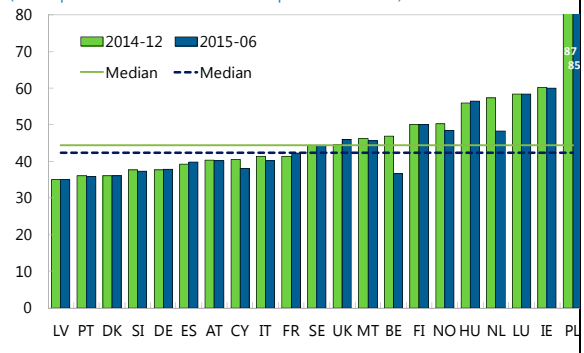


Sources: European Banking Authority and Author's calculations.

... and the median SA weight is 42 percent across the EU.

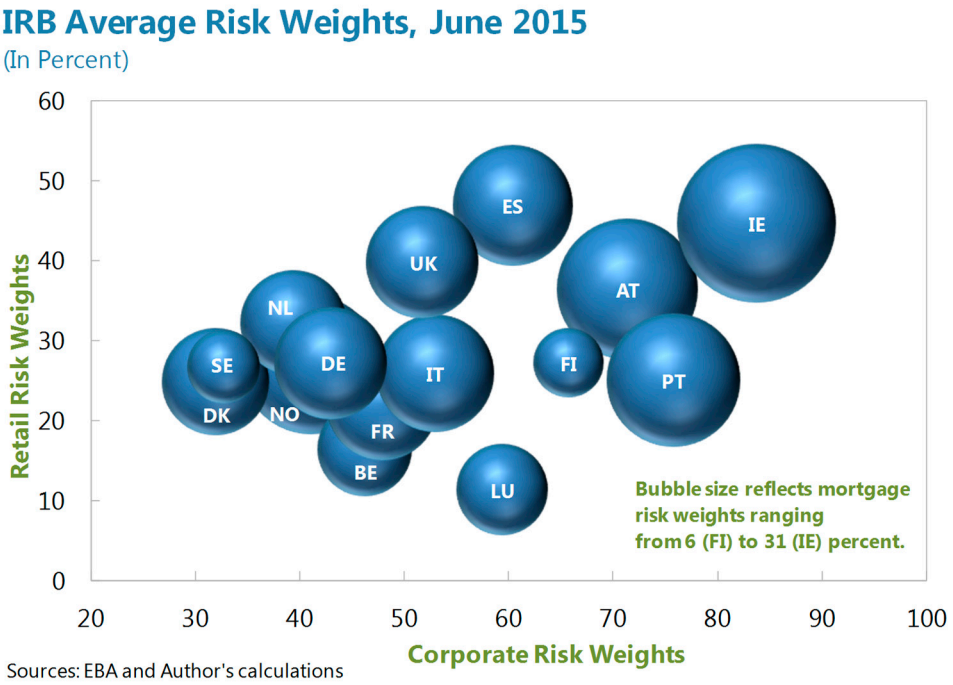
SA Average Risk Weights: Mortgages

(Risk Exposure Amount in Percent of Exposure at Default)



Sources: European Banking Authority and Fund staff calculations.

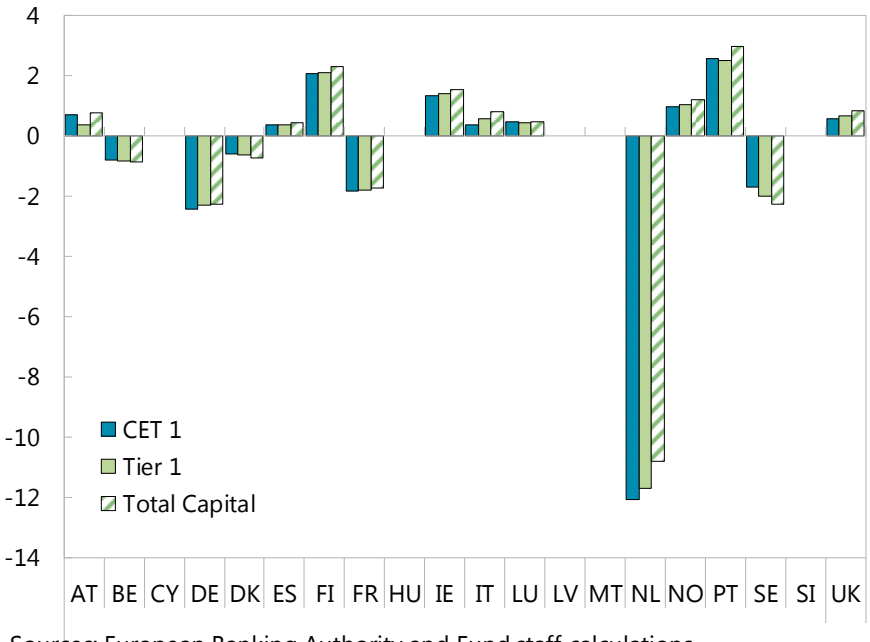
Figure 5. IRB Average Risk Weights in the EU (in percent), June 2015



Sources: EBA and Author's calculations

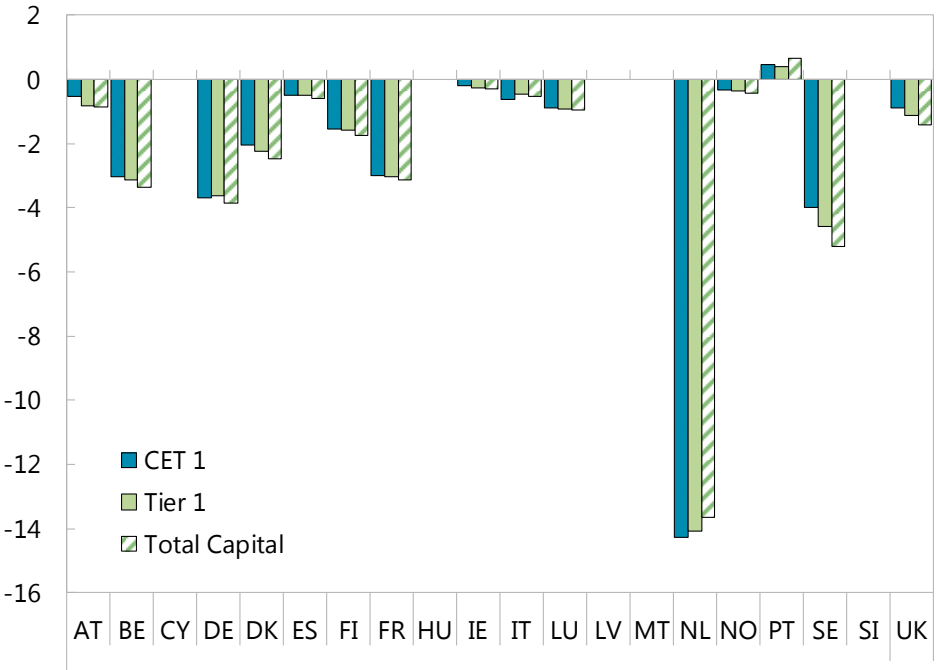
Figure 6. Changes to Capital Adequacy Ratios (In Percentage Points)

***Scenario 1**: RWA evaluated at the median risk weight by asset class exposure and country of counterparty.*



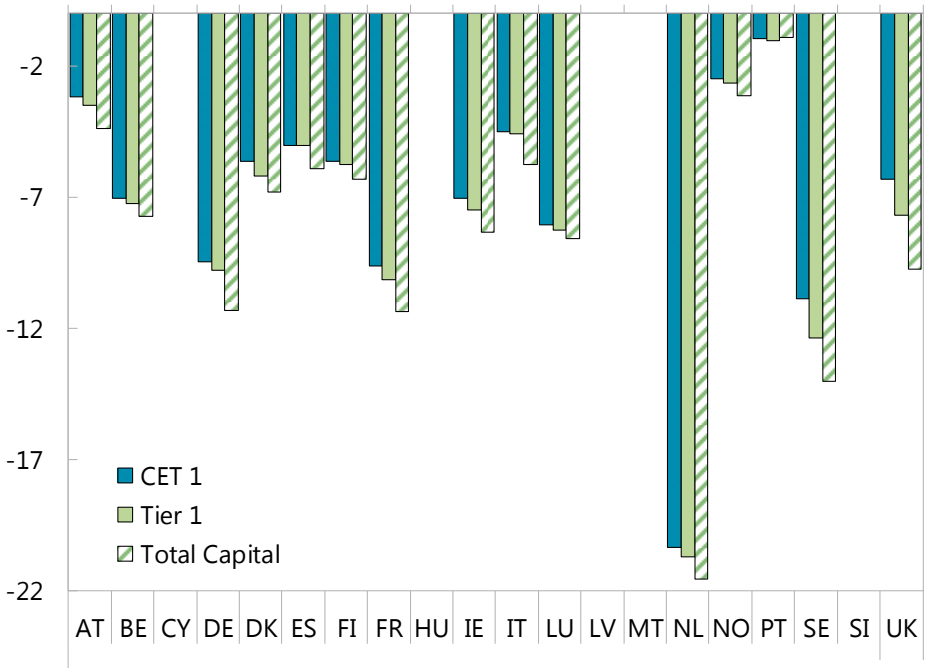
Sources: European Banking Authority and Fund staff calculations

***Scenario 2**: RWA evaluated at the 75th percentile of the risk weight distribution by asset class exposure and country of counterparty.*



Sources: European Banking Authority and Fund staff calculations

***Scenario 3:** RWA evaluated at the maximum risk weight distribution by asset class exposure and country of counterparty – Worst case scenario.*



Sources: European Banking Authority and Fund staff calculations

Table 1. Median Risk Weights across IRB/SA Portfolios of EU Banks, June 2015

Significant differences in risk weights across IRB/SA portfolios and credit exposures.

	IRB	SA
Corporate Exposures	51.8	94.9
Retail Exposures	27.0	71.6
Mortgage Exposures	15.5	42.3
Overall	*32.9*	*75.1*

Sources: EBA and Fund staff calculations

Table 2. Descriptive Statistics for Bank Risk Weights by Country of Counterparty Exposure

Panel A. Corporate Credit (in Percent, June 2015)

	IRB						SA						
Exposure to	Count	Average	Median	Std. Dev.	Min	Max	Count	Average	Median	Std. Dev.	Min	Max	
Angola	1	138	138		138	138							Angola
Australia	1	24	24		24	24	3	80	94		45	100	Australia
Austria	3	47	49		31	61	4	95	96		89	100	Austria
Belgium	5	51	46	17	38	81	6	72	71	25	49	98	Belgium
Bermuda	1	45	45		45	45							Bermuda
Brazil	3	59	59		56	62	4	99	100		98	100	Brazil
Bulgaria							1	100	100		100	100	Bulgaria
Croatia	2	124	124		105	142	3	98	100		93	101	Croatia
Canada	1	59	59		59	59	3	84	80		53	119	Canada
CaymanIsland	2	36	36		8	64	2	95	95		91	100	CaymanIsland
Chile	1	42	42		42	42	1	98	98		98	98	Chile
China	3	46	45		29	64	2	100	100		100	100	China
CookIsland							1	20	20		20	20	CookIsland
Cyprus							1	98	98		98	98	Cyprus
Czech_Rep	4	63	61		40	90	4	97	96		95	100	Czech_Rep
Denmark	3	34	35		31	35	1	85	85		85	85	Denmark
Estonia	1	58	58		58	58							Estonia
Finland	4	46	41		34	68	3	91	98		76	98	Finland
France	12	62	50	31	38	130	11	84	86	14	50	100	France
Germany	14	56	47	36	9	168	13	87	94	18	50	100	Germany
Greece							1	100	100		100	100	Greece
Hong_Kong	2	37	37		23	52	1	100	100		100	100	Hong_Kong
Hungary	2	91	91		82	100	3	93	94		91	96	Hungary
Ireland	5	65	66	24	30	92	6	84	96	25	37	100	Ireland
Italy	8	59	58	9	48	73	7	94	97	6	86	100	Italy
Japan	2	33	33		23	44	2	11	11		2	20	Japan
Korea_Rep	0				0	0	1	100	100		100	100	Korea_Rep
Latvia	1	82	82		82	82	1	99	99		99	99	Latvia
Lithuania	1	70	70		70	70							Lithuania
Luxembourg	10	63	47	53	14	206	8	98	100	3	91	102	Luxembourg
Malta							1	86	86		86	86	Malta
Marshall_Isl	1	28	28		28	28	1	100	100		100	100	Marshall_Isl
Mexico	2	58	58		48	68	2	97	97		94	100	Mexico
Montenegro							1	100	100		100	100	Montenegro
Mozambique	1	161	161		161	161							Mozambique
Netherlands	10	61	47	31	41	137	9	89	91	11	74	104	Netherlands
Norway	3	40	42		34	44	1	100	100		100	100	Norway
Peru	1	67	67		67	67	1	98	98		98	98	Peru
Poland	6	71	65	45	26	148	5	97	97	2	95	99	Poland
Portugal	4	96	94		73	125	2	98	98		95	100	Portugal
Romania	1	104	104		104	104	3	98	99		96	99	Romania
Russia	5	72	65	36	45	134	7	99	99	2	96	101	Russia
Saudi_Arabia	1	5	5		5	5							Saudi_Arabia
Singapore	2	38	38		29	47	1	100	100		100	100	Singapore
Slovakia	2	74	74		72	75	3	98	98		97	100	Slovakia
Slovenia	1	129	129		129	129	1	98	98		98	98	Slovenia
South_Africa	1	56	56		56	56							South_Africa
Spain	11	66	64	19	26	91	9	90	100	17	50	100	Spain
Sweden	5	39	35	22	19	75	5	82	97	24	51	100	Sweden
Switzerland	6	38	32	21	24	81	7	92	100	15	66	100	Switzerland
Turkey	4	53	51		38	73	4	97	98		93	99	Turkey
UK	15	47	40	31	6	126	14	77	79	22	25	100	UK
US	12	49	39	29	26	130	11	79	83	23	37	100	US
Ukraine	1	92	92		92	92	2	141	141		140	142	Ukraine
Venezuela	1	30	30		30	30	1	78	78		78	78	Venezuela
Virgin_Island	1	17	17		17	17	1	100	100		100	100	Virgin_Island

Panel B. Retail Credit (in Percent, June 2015)

	IRB						SA						
Exposure to	Count	Average	Median	Std. Dev.	Min	Max	Count	Average	Median	Std. Dev.	Min	Max	
Angola	1	37	37		37	37							Angola
Australia	1	24	24		24	24	5	72	75	8	57	76	Australia
Austria	4	38	36		21	61	5	73	75	3	69	75	Austria
Belgium	4	19	18		11	30	5	72	75	6	64	80	Belgium
Brazil	2	13	13		4	23	3	71	72		66	75	Brazil
Bulgaria							1	74	74		74	74	Bulgaria
Croatia	2	198	198		38	359	3	74	74		74	75	Croatia
Canada	1	34	34		34	34	2	75	75		75	75	Canada
CaymanIsland	1	6	6		6	6	1	61	61		61	61	CaymanIsland
Chile	1	6	6		6	6	1	71	71		71	71	Chile
China	2	17	17		10	24	2	75	75		75	75	China
Cyprus							1	72	72		72	72	Cyprus
Czech_Rep	4	52	52		46	58	4	65	64		60	75	Czech_Rep
Denmark	3	29	30		25	32	1	75	75		75	75	Denmark
Estonia	1	47	47		47	47							Estonia
Finland	4	35	33		26	49	2	75	75		74	75	Finland
France	11	26	19	17	7	63	12	71	72	5	59	77	France
Germany	13	34	33	13	12	53	13	71	75	7	58	75	Germany
Greece							1	75	75		75	75	Greece
Hong_Kong	2	23	23		21	25	1	57	57		57	57	Hong_Kong
Hungary	2	73	73		67	78	3	69	74		60	75	Hungary
Ireland	6	53	45	31	9	93	5	75	75	7	65	86	Ireland
Italy	8	31	28	20	8	61	6	76	75	6	71	88	Italy
Japan	2	9	9		2	17	1	74	74		74	74	Japan
Korea_Rep	1	39	39		39	39	1	75	75		75	75	Korea_Rep
Latvia	1	52	52		52	52	1	75	75		75	75	Latvia
Lithuania	2	32	32		21	42	0				0	0	Lithuania
Luxembourg	10	22	24	8	10	35	8	74	75	1	73	75	Luxembourg
Malta							1	67	67		67	67	Malta
Mexico	2	53	53		1	105	2	71	71		71	71	Mexico
Montenegro							1	75	75		75	75	Montenegro
Mozambique	1	5	5		5	5							Mozambique
Netherlands	8	32	29	22	10	77	7	70	73	9	51	75	Netherlands
Norway	3	25	27		22	27	1	75	75		75	75	Norway
Peru	1	9	9		9	9	1	50	50		50	50	Peru
Poland	6	44	43	5	39	52	5	71	69	3	68	75	Poland
Portugal	3	31	31		24	39	2	74	74		74	75	Portugal
Romania	1	58	58		58	58	3	69	71		62	73	Romania
Russia	5	32	34	21	9	53	7	72	75	6	59	75	Russia
Saudi_Arabia	1	21	21		21	21							Saudi_Arabia
Singapore	2	22	22		20	24	1	75	75		75	75	Singapore
Slovakia	2	50	50		46	55	4	71	72		65	75	Slovakia
Slovenia	1	30	30		30	30	1	72	72		72	72	Slovenia
South_Africa	1	65	65		65	65							South_Africa
Spain	10	35	36	29	0	98	6	75	74	8	65	90	Spain
Sweden	5	24	22	8	13	33	6	74	75	3	67	75	Sweden
Switzerland	6	20	20	11	5	39	7	73	75	7	57	80	Switzerland
Turkey	3	40	35		32	52	4	68	68		65	70	Turkey
UK	14	26	22	14	10	60	15	69	71	7	58	76	UK
US	11	33	26	21	7	74	10	71	75	7	57	75	US
Ukraine	1	61	61		61	61	2	72	72		68	75	Ukraine
Venezuela	1	14	14		14	14	1	74	74		74	74	Venezuela
Virgin_Island	1	50	50		50	50							Virgin_Island

Panel C. Mortgage Credit (in Percent, June 2015)

	IRB						SA						
Exposure to	Count	Average	Median	Std. Dev.	Min	Max	Count	Average	Median	Std. Dev.	Min	Max	
Angola	1	19	19		19	19							Angola
Australia	2	4	4		1	8	3	42	36		35	56	Australia
Austria	4	19	18		13	25	3	40	38		35	48	Austria
Belgium	4	11	12		6	14	4	44	42		26	66	Belgium
Brazil	1	10	10		10	10	1	55	55		55	55	Brazil
Bulgaria	0				0	0	1	56	56		56	56	Bulgaria
Croatia	1	45	45		45	45	3	57	37		35	100	Croatia
Canada	1	11	11		11	11	2	62	62		35	90	Canada
CaymanIsland							1	35	35		35	35	CaymanIsland
Chile	1	61	61		61	61	1	45	45		45	45	Chile
China	3	13	12		9	19	2	35	35		35	35	China
Cyprus							1	39	39		39	39	Cyprus
Czech_Rep	4	26	31		12	31	4	58	48		35	100	Czech_Rep
Denmark	3	17	12		11	29	1	17	17		17	17	Denmark
Estonia	1	17	17		17	17							Estonia
Finland	4	15	7		3	44	2	43	43		37	50	Finland
France	12	26	19	26	4	104	10	46	38	20	32	98	France
Germany	13	17	16	9	6	40	11	46	39	16	35	91	Germany
Greece							1	60	60		60	60	Greece
Hong_Kong	2	12	12		9	14							Hong_Kong
Hungary	2	63	63		46	80	3	45	43		41	50	Hungary
Ireland	5	40	35	24	16	81	3	42	35		35	57	Ireland
Italy	8	17	17	10	3	29	5	39	39	2	35	40	Italy
Japan	2	9	9		9	10	1	35	35		35	35	Japan
Latvia	1	38	38		38	38	1	35	35		35	35	Latvia
Lithuania	2	17	17		11	24							Lithuania
Luxembourg	9	14	17	5	4	19	6	42	36	17	35	77	Luxembourg
Malta							1	46	46		46	46	Malta
Mexico	2	19	19		13	25	1	37	37		37	37	Mexico
Montenegro							1	100	100		100	100	Montenegro
Mozambique	1	18	18		18	18							Mozambique
Netherlands	10	25	15	29	10	105	8	40	39	5	35	46	Netherlands
Norway	3	21	24		11	28	1	34	34		34	34	Norway
Peru	1	14	14		14	14	1	39	39		39	39	Peru
Poland	5	20	22	6	11	26	5	48	46	11	36	65	Poland
Portugal	3	33	24		22	52							Portugal
Romania	1	32	32		32	32	3	52	36		35	85	Romania
Russia	5	31	30	22	10	67	6	45	35	21	31	87	Russia
Saudi_Arabia	1	5	5		5	5							Saudi_Arabia
Singapore	2	12	12		8	16	1	35	35		35	35	Singapore
Slovakia	2	21	21		19	24	3	43	46		35	46	Slovakia
Slovenia	1	28	28		28	28	1	38	38		38	38	Slovenia
South_Africa	1	25	25		25	25							South_Africa
Spain	9	14	15	6	3	23	7	39	38	6	29	50	Spain
Sweden	5	10	5	11	3	29	4	36	35		34	39	Sweden
Switzerland	6	16	18	5	9	20	7	38	35	7	35	53	Switzerland
Turkey	2	19	19		18	19	4	46	44		35	61	Turkey
UK	15	16	16	6	4	30	13	42	37	12	30	64	UK
US	12	31	17	40	0	141	10	42	38	13	30	75	US
Ukraine	1	22	22		22	22	2	83	83		67	100	Ukraine
Venezuela	1	24	24		24	24	1	40	40		40	40	Venezuela

Sources: EBA and Author's calculations.

Table 3. IRB Corporate Risk Weights and Firm Fundamentals

Panel A. Firm fundamentals evaluated at the median.

	Dependent Variable: IRB Corporate Risk Weight									
Variable	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
Leverage	0.601	0.621								
	[0.113]***	[0.154]***								
Interest coverage			-0.656	-0.605						
			[0.278]**	[0.222]***						
Liquidity					-0.491	-0.314				
					[0.149]***	[0.158]*				
Stability							-8.085	-7.053		
							[1.874]***	[3.057]**		
Market Value									-7.142	-4.180
									[1.743]***	[2.231]*
Coporate portfolio		0.175		0.588		0.682		0.423		0.522
		[0.307]		[0.300]*		[0.267]**		[0.283]		[0.303]*
Pretax ROA		20.792		14.432		9.963		15.220		13.165
		[8.732]**		[7.689]*		[8.700]		[7.945]*		[9.072]
Real GDO growth		0.690		0.425		0.214		0.833		0.511
		[0.269]**		[0.279]		[0.346]		[0.317]**		[0.283]*
BE	-24.354	-21.589	-21.725	-18.980	-20.766	-17.487	-20.642	-18.688	-16.889	-17.043
	[6.644]***	[7.484]***	[6.988]***	[7.661]**	[6.598]***	[7.437]**	[6.428]***	[7.341]**	[6.607]**	[7.430]**
DE	-42.544	-38.167	-40.118	-34.619	-37.958	-33.186	-38.611	-34.899	-35.170	-32.340
	[4.934]***	[6.383]***	[5.252]***	[6.560]***	[5.384]***	[6.595]***	[4.737]***	[6.124]***	[5.407]***	[6.651]***
DK	-50.585	-44.457	-49.693	-44.716	-47.751	-44.192	-44.146	-41.170	-45.389	-43.799
	[6.180]***	[11.367]***	[6.152]***	[11.624]***	[6.315]***	[11.735]***	[6.246]***	[11.992]***	[6.308]***	[11.746]***
ES	-33.157	-28.863	-29.810	-23.941	-29.326	-22.980	-30.587	-24.532	-26.212	-22.186
	[4.852]***	[6.513]***	[5.139]***	[6.124]***	[5.259]***	[6.089]***	[4.943]***	[5.784]***	[5.327]***	[6.079]***
FI	20.965	-22.736	21.274	-23.275	24.889	-20.349	27.070	-17.087	26.834	-20.770
	[28.773]	[6.463]***	[27.579]	[6.379]***	[26.348]	[6.259]***	[27.407]	[6.382]**	[27.027]	[5.672]***
FR	-40.800	-36.981	-36.985	-33.483	-36.022	-33.254	-37.391	-34.402	-34.619	-33.524
	[4.249]***	[5.606]***	[4.011]***	[5.494]***	[4.039]***	[5.516]***	[3.858]***	[5.175]***	[4.263]***	[5.434]***
IE	26.219	24.553	27.882	27.242	28.138	28.608	32.213	28.003	34.992	29.834
	[8.504]***	[11.892]**	[8.401]***	[11.448]**	[8.565]***	[11.459]**	[9.473]***	[11.770]**	[9.329]***	[11.572]**
IT	-23.354	-14.056	-20.180	-12.324	-17.858	-10.423	-19.939	-11.792	-16.832	-10.323
	[5.898]***	[6.276]**	[5.967]***	[6.113]*	[5.943]***	[6.085]*	[5.816]***	[5.986]*	[5.766]***	[6.014]*
LU	-41.347	-40.914	-38.431	-37.715	-37.141	-36.397	-37.262	-37.395	-35.047	-36.386
	[7.583]***	[9.357]***	[7.236]***	[9.190]***	[6.634]***	[8.630]***	[7.457]***	[9.145]***	[6.584]***	[8.427]***
NL	-50.908	-49.326	-48.654	-48.243	-44.634	-45.350	-46.292	-46.216	-44.825	-46.768
	[4.522]***	[6.059]***	[4.573]***	[6.183]***	[4.633]***	[6.273]***	[4.225]***	[5.727]***	[4.437]***	[5.856]***
NO	-45.459	-46.738	-44.253	-47.416	-41.400	-45.811	-40.220	-44.449	-38.775	-44.822
	[3.938]***	[5.822]***	[3.784]***	[5.852]***	[4.018]***	[5.556]***	[3.866]***	[5.224]***	[3.743]***	[4.985]***
PT	32.351	42.642	34.069	47.008	34.467	47.036	33.882	44.138	36.025	48.842
	[28.107]	[34.217]	[28.242]	[32.857]	[28.254]	[32.513]	[27.954]	[33.104]	[27.453]	[31.458]
SE	-49.202	-48.821	-46.499	-48.188	-43.887	-47.706	-42.692	-44.573	-42.090	-46.666
	[4.151]***	[6.252]***	[4.173]***	[6.259]***	[4.007]***	[6.077]***	[3.908]***	[5.947]***	[3.587]***	[5.689]***
UK	-37.308	-31.815	-35.116	-29.686	-33.253	-28.505	-31.847	-28.118	-30.931	-28.949
	[6.005]***	[7.586]***	[5.933]***	[7.554]***	[6.068]***	[7.971]***	[5.749]***	[7.482]***	[5.876]***	[7.406]***
Observations	481	316	481	316	481	316	481	316	481	316
R-squared	0.407	0.413	0.396	0.408	0.405	0.407	0.415	0.418	0.409	0.405

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 3. IRB Corporate Risk Weights and Firm Fundamentals (concluded)

Panel B. Firm fundamentals evaluated at the 75th percentile of the distribution.

	Dependent Variable: IRB Corporate Risk Weight									
Variable	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
Leverage	0.129	0.149								
	[0.118]	[0.098]								
Interest coverage			-0.049	-0.047						
			[0.062]	[0.049]						
Liquidity					-0.272	-0.223				
					[0.120]**	[0.131]*				
Stability							-5.198	-4.743		
							[0.849]***	[1.478]***		
Market Value									-4.257	-2.802
									[0.919]***	[1.431]*
Coporate portfolio		0.658		0.606		0.669		0.098		0.413
		[0.267]**		[0.309]*		[0.290]**		[0.293]		[0.312]
Pretax ROA		17.382		15.328		12.438		16.194		13.056
		[8.831]*		[8.506]*		[8.650]		[8.371]*		[9.461]
Real GDO growth		0.569		0.483		0.271		0.841		0.531
		[0.295]*		[0.287]*		[0.357]		[0.289]***		[0.297]*
BE	-22.577	-19.620	-21.957	-19.271	-20.848	-17.749	-18.802	-17.891	-15.338	-15.884
	[6.715]***	[7.675]**	[6.852]***	[7.661]**	[6.525]***	[7.427]**	[6.186]***	[7.418]**	[6.663]**	[7.328]**
DE	-41.579	-35.797	-40.387	-34.531	-39.226	-33.590	-36.017	-33.078	-32.767	-30.603
	[5.293]***	[6.664]***	[5.211]***	[6.618]***	[5.401]***	[6.722]***	[4.643]***	[6.321]***	[5.129]***	[6.331]***
DK	-51.071	-46.680	-50.725	-45.885	-49.766	-45.290	-42.657	-39.232	-42.924	-41.216
	[6.241]***	[12.109]***	[6.064]***	[11.587]***	[6.180]***	[11.796]***	[6.245]***	[11.741]***	[6.099]***	[11.405]***
ES	-30.414	-24.404	-29.971	-24.007	-29.389	-22.929	-29.378	-25.145	-25.186	-21.556
	[4.974]***	[6.090]***	[5.123]***	[6.273]***	[5.208]***	[6.094]***	[5.147]***	[6.395]***	[5.427]***	[6.168]***
FI	20.363	-25.407	20.705	-24.384	22.246	-22.688	27.890	-15.579	28.954	-18.402
	[27.664]	[6.636]***	[27.906]	[6.458]***	[26.667]	[6.179]***	[28.075]	[6.427]**	[28.193]	[5.784]***
FR	-39.518	-35.581	-38.034	-34.465	-37.176	-33.831	-35.470	-33.414	-32.567	-32.203
	[4.459]***	[5.868]***	[4.124]***	[5.661]***	[4.133]***	[5.522]***	[4.161]***	[5.464]***	[4.474]***	[5.507]***
IE	27.291	26.678	27.908	26.985	28.131	28.444	34.203	28.617	36.990	30.990
	[8.805]***	[11.572]**	[8.263]***	[11.451]**	[8.578]***	[11.532]**	[9.200]***	[11.913]**	[8.371]***	[11.272]***
IT	-20.898	-12.623	-20.175	-12.140	-18.489	-10.818	-18.546	-10.405	-16.282	-9.673
	[5.663]***	[6.087]**	[5.918]***	[6.099]*	[5.954]***	[6.182]*	[5.652]***	[5.997]*	[5.837]***	[6.163]
LU	-40.305	-38.980	-39.286	-38.229	-38.664	-37.225	-35.550	-36.506	-32.875	-34.879
	[6.758]***	[9.114]***	[6.958]***	[9.022]***	[6.446]***	[8.594]***	[7.706]***	[9.299]***	[6.995]***	[8.365]***
NL	-49.948	-48.847	-49.552	-48.819	-46.505	-46.059	-44.347	-44.492	-43.576	-45.583
	[4.436]***	[6.204]***	[4.425]***	[6.228]***	[4.511]***	[6.144]***	[4.346]***	[5.970]***	[4.408]***	[5.725]***
NO	-45.367	-49.081	-44.440	-47.422	-42.947	-46.638	-37.832	-41.095	-35.831	-41.546
	[3.749]***	[6.446]***	[3.680]***	[6.104]***	[3.767]***	[5.645]***	[3.908]***	[5.564]***	[3.719]***	[4.916]***
PT	33.032	45.251	34.308	47.767	33.495	46.792	35.070	46.232	38.766	51.111
	[28.675]	[33.436]	[28.190]	[33.099]	[28.306]	[32.526]	[27.823]	[33.182]	[27.169]	[32.121]
SE	-47.994	-50.903	-46.739	-48.190	-45.021	-47.926	-40.608	-40.213	-40.016	-43.806
	[4.194]***	[6.637]***	[4.062]***	[6.249]***	[4.033]***	[6.290]***	[4.230]***	[6.589]***	[3.634]***	[5.753]***
UK	-37.204	-31.211	-36.208	-30.690	-34.920	-29.261	-29.165	-26.325	-29.128	-27.893
	[6.086]***	[7.743]***	[5.842]***	[7.599]***	[5.931]***	[7.817]***	[5.729]***	[7.703]***	[5.923]***	[7.490]***
Observations	481	316	481	316	481	316	481	316	481	316
R-squared	0.391	0.402	0.391	0.402	0.397	0.405	0.423	0.422	0.412	0.407

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 4. IRB Corporate Risk Weights and Expected Default Frequencies

	Dependent Variable: IRB Corporate Risk Weight							
Variable	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
EDF_25th perc.	7.321	-9.612						
	[4.671]	[3.692]**						
EDF_50th perc.			2.435	-1.029				
			[1.063]**	[1.436]				
EDF_75th perc.					0.681	0.331		
					[0.503]	[0.522]		
EDF_90th perc.							-0.136	-0.01
							[0.141]	[0.139]
Coporate portfolio		-0.658		-0.649		-0.681		-0.657
		[0.203]***		[0.200]***		[0.205]***		[0.212]***
Pretax ROA		25.708		26.199		27.526		27.555
		[8.812]***		[8.646]***		[8.752]***		[10.241]**
Real GDO growth		0.476		0.489		0.49		0.507
		[0.300]		[0.302]		[0.291]*		[0.307]
BE	-17.65	-15.65	-16.567	-14.743	-17.289	-12.796	-19.739	-12.283
	[6.929]**	[7.131]**	[6.889]**	[6.910]**	[6.978]**	[7.046]*	[7.298]***	[8.599]
DE	-36.411	-31.523	-35.422	-30.572	-35.797	-28.395	-39.416	-29.98
	[5.555]***	[6.311]***	[5.413]***	[6.003]***	[5.588]***	[6.312]***	[6.123]***	[8.796]***
DK	-46.542	-35.553	-45.555	-34.698	-46	-32.572	-50.303	-34.175
	[6.368]***	[10.532]***	[6.236]***	[10.346]***	[6.435]***	[10.439]***	[6.854]***	[12.520]***
ES	-26.312	-23.086	-25.036	-22.294	-24.994	-20.514	-27.049	-22.131
	[5.590]***	[7.069]***	[5.396]***	[6.845]***	[5.584]***	[6.992]***	[5.983]***	[9.236]**
FI	24.962	-6.166	25.969	-5.602	25.83	-2.643	21.46	-5.034
	[28.246]	[5.866]	[28.177]	[5.472]	[28.249]	[5.634]	[28.740]	[8.882]
FR	-34.467	-31.467	-33.425	-30.535	-33.592	-28.25	-38.083	-30.233
	[4.510]***	[5.654]***	[4.317]***	[5.281]***	[4.346]***	[5.381]***	[5.216]***	[8.018]***
IE	32.483	29.729	33.628	30.712	32.331	32.649	29.376	31.37
	[8.697]***	[11.583]**	[8.618]***	[11.314]***	[8.306]***	[11.069]***	[8.601]***	[12.139]**
IT	-23.746	-14.98	-23.097	-14.643	-22.688	-13.211	-26.999	-13.851
	[6.102]***	[6.620]**	[5.966]***	[6.452]**	[6.006]***	[6.444]**	[7.475]***	[9.805]
LU	-35.05	-34.895	-33.846	-33.922	-34.266	-31.577	-38.837	-33.398
	[7.446]***	[9.315]***	[7.560]***	[9.248]***	[8.011]***	[9.428]***	[7.727]***	[10.818]***
NL	-45.895	-41.624	-44.957	-41.201	-44.934	-39.387	-48.993	-41.031
	[4.760]***	[6.288]***	[4.666]***	[6.145]***	[4.809]***	[6.252]***	[5.343]***	[8.812]***
NO	-40.195	-34.846	-39.345	-34.052	-39.841	-32.229	-43.415	-33.605
	[4.181]***	[5.714]***	[4.076]***	[5.443]***	[4.313]***	[5.518]***	[4.636]***	[8.381]***
PT	37.68	50.314	38.43	51.343	38.082	53.417	35.728	51.942
	[27.808]	[33.490]	[27.753]	[33.459]	[27.612]	[33.237]	[28.078]	[33.282]
SE	-43.525	-37.065	-42.767	-36.264	-42.876	-34.299	-46.536	-35.916
	[4.279]***	[5.586]***	[4.143]***	[5.302]***	[4.268]***	[5.421]***	[4.854]***	[8.253]***
UK	-29.969	-24.495	-28.954	-23.802	-29.469	-22.001	-33.031	-23.37
	[6.038]***	[7.326]***	[5.943]***	[7.148]***	[6.206]***	[7.428]***	[6.650]***	[9.595]**
Observations	471	308	471	308	471	308	453	292
R-squared	0.391	0.406	0.392	0.404	0.391	0.405	0.385	0.398

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Appendix I. The 2015 EU-Wide Transparency Exercise

The 2015 EU-wide transparency exercise discloses detailed and comparable data for 105 individual banks in Europe (see Table A1), which are classified in 10 categories (see Table A2). Each of capital, RWA, Profit and Loss (P&L), market risk, credit risk, nonperforming exposures (NPE), forborne exposures, collateral, sovereign exposures, and leverage are uniquely identified by an item number.

Table A1. EBA Transparency Exercise: Distribution of 105 Banks across Countries

Country	Banks	Country	Banks
AT	5	LU	2
BE	5	LV	1
CY	3	MT	1
DE	20	NL	6
DK	4	NO	1
ES	14	PL	1
FI	1	PT	3
FR	10	SE	4
HU	1	SI	2
IE	3	UK	4
IT	14		

Table A2. EBA Transparency Exercise: Bank Information by Category and Item

Category	Items	Nb. of Items
Capital	150101 - 150137	37
RWA	150201 - 150210	10
P&L	150301 - 150336	36
Market Risk	150401 - 150491	25
Credit Risk	150501 - 150556	74
NPE	150601 - 150626	18
Forborne exposures	150701 - 150726	18
Collateral	150801 - 150812	4
Sovereign exposures	150901 - 150914	14
Leverage	151001 - 151003	3

Bank information is also classified according to three types of portfolios across a wide range of exposures (see Table A3). These are portfolios for which there is no breakdown, portfolios that are classified according to the standardized approach (SA), and portfolios that are assessed using the internal ratings-based approach (IRB).

Portfolios with no breakdown reflect aggregate information on NPE,[1] forborne exposures,[2] and information on collaterals (mortgage loans)[3] for different types of exposures. They are not examined further herein, and nor are sovereign exposures.

Rather, this paper focuses on bank credit risk which, as shown later, is the largest risk category of banks. With 74 related items provided (Table A2), credit risk is also the category with the largest amount of information, making the 2015 EU-wide transparency exercise the first of its kind to provide granular information on bank credit portfolios in Europe.

From Table A3, credit risk is assessed using SA and IRB portfolios for corporate, retail, and mortgage credit exposures.[4] For SA portfolios, credit risk information is stored under exposures numbered 303, 404, and 501, respectively, for corporate, retail, and mortgage loans. For IRB portfolios, these data are found under exposures numbered 303, the sum of 409 and 410, and 406, respectively for corporate, retail, and mortgage loans.[5]

For each of these SA and IRB portfolio exposures, risk weights are defined as the ratio of RWA to exposures at default. In the EBA terminology, the former are denoted as *Risk exposure amount* and the latter are referred to *Exposure value* which, unlike the original exposure amount, is reported after taking into account any effect due to credit conversion factors or credit risk mitigation techniques.

[1] NPE include nonperforming exposure gross carrying amounts, accumulated impairment, and collaterals and financial guarantees received, all of which for each of debt instruments other than held for trade (debt securities/ loans and advances) and off-balance sheet exposures.

[2] For the definition of forborne exposures please refer to Commission Implementing Regulation (EU) 2015/227 of 9 January 2015, ANNEX V, Part 2-Template related instructions, subtitle 30.

[3] Collaterals for mortgage loans include immovable property collaterals that are classified by borrower type (financial corporations other than credit institutions, nonfinancial corporations, and households). In accordance with the Implementing Technical Standards (ITS) on supervisory reporting, the sum of the amounts of the collateral shall not exceed the carrying amount of the related loan.

[4] In the EBA terminology, mortgages are referred to as "Secured by mortgages on immovable property".

[5] The treatment of mortgage loans to corporates differs under SA and IRB. Whereas they are included under exposure 501 (mortgages) for the SA, they are part of exposure 303 (corporate) under IRB.

Table A3. EBA Transparency Exercise: Credit Portfolios and Exposures

Exposure	Description	No Breakdown	SA Portfolio	IRB Portfolio
0	No exposure breakdown	✓	✓	✓
101	Central banks	✓		
102	General governments	✓		
201	Credit institutions	✓		
202	Financial corporations other than credit institutions	✓		
301	Non-financial corporations	✓		
401	Households	✓		
103	Central governments or central banks		✓	✓
104	Regional governments or local authorities		✓	
105	Public sector entities		✓	
106	Multilateral Development Banks		✓	
107	International Organizations		✓	
203	Institutions		✓	✓
302	Corporates – SME		✓	✓
303	Corporates		✓	✓
304	Corporates - Specialized Lending			✓
404	Retail		✓	✓
405	Retail – SME		✓	
406	Retail – Secured by real estate property			✓
407	Retail – Secured by real estate property – SME			✓
408	Retail – Secured by real estate property - Non SME			✓
409	Retail – Qualifying Revolving			✓
410	Retail – Other Retail			✓
411	Retail – Other Retail – SME			✓
412	Retail – Other Retail - Non SME			✓
501	Secured by mortgages on immovable property		✓	
502	Secured by mortgages on immovable property - SME		✓	
601	Exposures in default		✓	
602	Items associated with particularly high risk		✓	
603	Covered bonds		✓	
604	Claims on institutions and corporate with a ST credit assessment		✓	
605	Claims in the form of CIU		✓	
606	Equity exposures		✓	✓
607	Other items		✓	
608	Securitization		✓	✓

However, different risk weights may simply reflect different credit quality of bank portfolios, since not all portfolios recorded under Exposure Value and Risk Exposure Amount are performing assets. To compute risk weights that are more comparable in the sense that they are calculated from good quality assets[6], defaulted assets are subtracted from both the

[6] Portfolios with a lot of NPE (e.g., the Irish commercial loan portfolio) increase the average risk weight, thereby distorting cross-country comparison of risk weights.

numerator and denominator of the RWA density.[7] This information is provided by the 2015 EU-wide transparency exercise and is recorded in the items listed in Table A4.[8]

Table A4. EBA Transparency Exercise: Item Numbers for Different Portfolios

		Corporates	Retail	Mortgages
SA Portfolio	*Exposure Value*	150522	150522	150522
	Risk Exposure Amount	150532	150532	150532
IRB Portfolio	*Exposure Value*	150522	150525	150525
	Of Which Defaulted	150512	150515	150515
	Risk Exposure Amount	150532	150535	150535
	Of Which Defaulted	150542	150545	150545

An Illustrative Bank

To illustrate the granularity of the EBA data, the example of Nordea Bank, the financial conglomerate headquartered in Sweden, is used. In the EBA data, Nordea Bank is identified by a code, e.g., 6SCPQ280AIY8EP3XFW53, and its accounts are provided both at the consolidated group level and for the largest 10 country exposures for two periods, December 2014 and June 2015. Information on Nordea Bank's credit risk includes 567 entries for each period considered, or a total of 1,134 observations in the sample. These data are distributed among three types of portfolios at the consolidated group level (87 entries) and for each of the largest 10 country exposures (480 entries), as shown in Table A5. Further, credit risk is the largest risk type that Nordea Bank is exposed to, followed by operational risk and market risk (see Table A6), and the overwhelming majority of its credit portfolio is assessed using the IRB method (see Table A7).

Table A5. Nordea Bank's Data Distribution by Portfolio Type in each Period

Portfolio	Portfolio label	Obs. at the group level	Obs. for each of largest 10 country exposures*
0	No breakdown	35	n/a
1	SA	21	28
2	IRB	31	20
	Total	*87*	*480*

[7] This adjustment is needed for IRB portfolios only, since provisions are already deducted from Exposure Value for SA portfolios.

[8] A better account of good quality portfolios would be to exclude all non-performing exposures, which include both defaulted and impaired exposures as per the EBA definition. However, whereas the data are classified by performing status (including performing, non performing, performing but past due less than 90 days, and nonperforming and defaulted), this breakdown is not available for the three classes of credit portfolios considered in this paper.

* The largest 10 country exposures reported are for Denmark, Finland, Germany, Luxembourg, Norway, Poland, Russian Federation, Sweden, United Kingdom, and the United States.

Table A6. Components of Nordea Bank's Risk Weighted Assets (in percent)

Period	RWA - Credit Risk	RWA - Market Risk	RWA - Operational Risk	RWA - Other*
Dec-14	81.8	5.0	11.6	1.6
Jun-15	78.4	5.8	11.4	4.4

* Other risk exposure amounts include counterparty value adjustments (CVA).

Table A7. Nordea Bank Credit Portfolio Shares, June 2015 (in percent)

	Corporate Portfolio	Mortgage Portfolio	Retail Portfolio	Total Credit Portfolio[1]
IRB share	98.8	96.5	88.6	96.7
SA share	1.2	3.5	11.4	3.3

[1] The credit portfolio considered includes corporate, retail, and mortgage loans, and it excludes exposures to sovereigns, governments, financial institutions, equity, in default, and securitization.

On average, risk weights used by Nordea Bank are lower for portfolios using the IRB than the SA approach (see Table A8). They vary between 8 and 42 percent for portfolios evaluated using the IRB approach, whereas the corresponding risk weights for the SA vary between 59 and 100 percent.

Table A8. Average Risk Weights used in the IRB and SA Approaches at Nordea Bank

	IRB		SA	
	Dec-14	Jun-15	Dec-14	Jun-15
Corporate portfolio	40.1	38.4	100	99.6
Mortgage portfolio	7.2	8.0	58.9	60.3
Retail portfolio	27.3	27.1	74.0	74.1
Total credit portfolio[1]	*25.8*	*24.9*	*72.1*	*72.7*

[1] The credit portfolio considered includes corporate, retail, and mortgage loans, it and excludes exposures to sovereigns, governments, financial institutions, equity, in default, and securitization.

Finally, Nordea's average risk weights also differ across country of counterparty and credit exposures. From Table A9, the average IRB corporate risk weight at Nordea varies between 35 percent for counterparty exposures in Sweden to about 50 percent in Luxembourg. For the IRB retail portfolio, the range of risk weights is between close to 22 percent in Norway and 53 percent in the Russian Federation. Dispersion in risk weights is much more pronounced for IRB mortgage exposures, ranging between 4 percent for exposures in Sweden to

100 percent in Poland. For SA portfolios, risk weights are more homogenous across country of counterparty and credit exposures.

Table A9. Nordea Bank Risk Weights for Different Credit Portfolio Exposures by Country[1]

	Corporate Portfolio		Mortgage Portfolio		Retail Portfolio	
	IRB	**SA**	**IRB**	**SA**	**IRB**	**SA**
Denmark	35.2	99.9	10.8	-	31.0	74.5
Finland	35.5	100.0	7.3	-	27.2	72.7
Germany	44.9	100.0		-	48.4	75.0
Luxembourg	49.8	99.8	33.7	-	29.6	73.6
Norway	40.2	100.0	11.9	-	21.6	73.8
Poland	33.8	100.0	100.0	-	42.4	75.0
Russian Federation	45.0	100.0	30.0	35.2	53.3	75.0
Sweden	35.3	100.0	3.8	35.0	24.2	73.4
United Kingdom	38.9	-	-	-	46.8	75.0
United States	36.2	100.0	-	-	47.2	75.0

[1] Excludes exposures to sovereigns, governments, financial institutions, equity, in default, and securitization.

Appendix II

Table B1. Average Risk Weights, IRB Portfolio, in Percent (June 2015)

Panel A. Corporate Credit

Exposure Of:	AT	BE	DE	DK	ES	FI	FR	IE	IT	LU	NL	NO	PT	SE	UK
To: Angola													138		
Australia											24				
Austria	61		49						31						
Belgium		46	81				43			46	38				
Bermuda			45												
Bosnia_Herz															
Brazil					56						59				62
Bulgaria															
Croatia	105								142						
Canada															59
Cape_Verde															
CaymanIsland			64	8											
Chile					42										
China			29						45						64
CookIsland															
Cyprus															
Czech_Rep	90	40					58		64						
Denmark				31								35		35	
Estonia														58	
Finland				36		68						45		34	
France	72	40	39		64	130	57	116	46	53	38	46			40
Germany	60	53	47	9	57	80	40	168	31	67	38	47		45	44
Greece															
Hong_Kong											23				52
Hungary	100	82													
Ireland	66	30		54				92							82
Italy	73	61	54		52		63		67	48					51
Japan							23								44
Korea_Rep															
Latvia														82	
Lithuania														70	
Luxembourg		72	32	14			46	47		75		41	206	50	44
Macao															
Malta															
Marshall_Isl			28												
Mexico					68										48
Montenegro															
Mozambique													161		
Netherlands	82	50	42				43	137	76	43	44			52	41
Norway				44								42		34	
Peru					67										
Poland	92		76						26		54		148	34	
Portugal		83	125		73								105		
Romania	104														
Russia	65		134				47		70					45	
Saudi_Arabia															5
Serbia															
Singapore											29				47
Slovakia	72								75						
Slovenia	129														
South_Africa															56
Spain	57	57	64		69		66	89	91	26	62		89		57
Sweden			19	35		75						38		26	
Switzerland			24	25			34			81	33				31
Turkey					73		43		59		38				
UK	65	43	40	14	49	49	27	100	36	6	35	39	126	25	53
US	79	39	33		56		39	130	41	26	33	34		31	41
Ukraine	92														
Venezuela					30										
Virgin_Island											17				
Count	*18*	*13*	*19*	*10*	*13*	*5*	*14*	*8*	*15*	*10*	*15*	*9*	*7*	*14*	*19*
Average	*81*	*54*	*54*	*27*	*58*	*80*	*45*	*110*	*60*	*47*	*38*	*41*	*139*	*44*	*48*
Median	*76*	*50*	*45*	*28*	*57*	*75*	*43*	*108*	*59*	*47*	*38*	*41*	*138*	*40*	*48*
Std. Dev.	*19*	*17*	*32*	*16*	*13*	*30*	*13*	*37*	*30*	*24*	*13*	*5*	*38*	*17*	*15*
Min	*57*	*30*	*19*	*8*	*30*	*49*	*23*	*47*	*26*	*6*	*17*	*34*	*89*	*25*	*5*
Max	*129*	*83*	*134*	*54*	*73*	*130*	*66*	*168*	*142*	*81*	*62*	*47*	*206*	*82*	*82*

Sources: EBA and Author's calculations.

Panel B. Retail Credit

Exposure Of:	AT	BE	DE	DK	ES	FI	FR	IE	IT	LU	NL	NO	PT	SE	UK
To: Angola													36.6		
Australia											24.5				
Austria	27.1	60.7	21.2						44.0						
Belgium		13.4					22.3			11.2	29.7				
Bermuda															
Bosnia_Herz															
Brazil											23.3				3.6
Bulgaria															
Croatia	37.7								358.8						
Canada															33.7
Cape_Verde															
CaymanIsland				6.0											
Chile					5.9										
China			24.0												9.6
CookIsland															
Cyprus															
Czech_Rep	46.2	49.1					55.7		57.8						
Denmark				25.3								29.7		32.2	
Estonia														47.3	
Finland				48.9		26.3						36.5		28.9	
France	63.0	30.3	16.7		50.7	17.9	19.7		32.6	7.1	18.2	19.0			12.0
Germany	31.4	38.1	27.0	36.2	52.7	17.8	33.3		27.8	12.3	49.9	25.2		50.0	45.7
Greece															
Hong_Kong											21.3				25.2
Hungary	77.9	67.1													
Ireland	92.7	45.6		42.9				44.0		8.9					86.9
Italy	38.7	15.8	56.8		11.4		60.7		26.8	7.9					29.1
Japan							2.1								16.8
Korea_Rep							39.1								
Latvia														51.9	
Lithuania												20.8		42.4	
Luxembourg		23.9	23.4	17.5		11.6	27.0			10.5		18.1	25.9	29.6	35.4
Macao															
Malta															
Marshall_Isl															
Mexico					104.9										1.3
Montenegro															
Mozambique													4.5		
Netherlands	76.6	46.7	18.5				10.0			10.4	33.1			27.1	31.7
Norway				27.1								27.0		22.2	
Peru					8.6										
Poland	41.4		46.2						52.1		44.6		39.2	42.4	
Portugal			23.6		38.9								30.6		
Romania	57.7														
Russia	51.9		8.8				12.9		33.7					53.3	
Saudi_Arabia															20.5
Serbia															
Singapore											19.5				24.4
Slovakia	45.8								55.1						
Slovenia	29.6														
South_Africa															65.3
Spain	43.9	10.2	52.4		41.0		22.4		0.4	5.4	50.7		30.7		97.6
Sweden			21.7	13.3		33.4						30.8		22.4	
Switzerland			14.3	18.0			5.4			38.9	22.2				21.8
Turkey					31.8				52.1		34.7				
UK	32.6	40.5	13.5	15.5	59.7	13.1	33.9		22.1	10.0	15.8	22.7	28.9	16.7	42.1
US	58.7	43.9	7.1		47.5		15.3		32.7	8.5	22.4	22.3		25.9	73.7
Ukraine	60.9														
Venezuela					14.1										
Virgin_Island											50.0				
Count	*18*	*13*	*15*	*10*	*12*	*6*	*14*	*1*	*13*	*11*	*15*	*10*	*7*	*14*	*19*
Average	*51*	*37*	*25*	*25*	*39*	*20*	*26*	*44*	*61*	*12*	*31*	*25*	*28*	*35*	*36*
Median	*46*	*40*	*22*	*22*	*40*	*18*	*22*	*44*	*34*	*10*	*24*	*24*	*31*	*31*	*29*
Std. Dev.	*18*	*18*	*15*	*14*	*28*	*8*	*17*		*91*	*9*	*12*	*6*	*11*	*12*	*27*
Min	*27*	*10*	*7*	*6*	*6*	*12*	*2*	*44*	*0*	*5*	*16*	*18*	*5*	*17*	*1*
Max	*93*	*67*	*57*	*49*	*105*	*33*	*61*	*44*	*359*	*39*	*51*	*36*	*39*	*53*	*98*

Sources: EBA and Author's calculations.

Panel C. Mortgage Credit

Exposure Of:	AT	BE	DE	DK	ES	FI	FR	IE	IT	LU	NL	NO	PT	SE	UK
To: Angola													18.8		
Australia		1.4									7.5				
Austria	16.6	19.5	13.0						25.1						
Belgium		5.8					13.9			12.6	11.4				
Bermuda															
Bosnia_Herz															
Brazil															9.8
Bulgaria															
Croatia	45.0														
Canada															11.2
Cape_Verde															
CaymanIsland															
Chile					61.1										
China			19.1						9.3						11.9
CookIsland															
Cyprus															
Czech_Rep	31.2	30.1					31.2		12.2						
Denmark				12.0								29.2		10.8	
Estonia														17.0	
Finland				2.8		5.5						44.3		8.6	
France	19.8	9.0	18.3		35.6	4.1	15.2	103.9	22.0	16.0	29.6	18.1			20.0
Germany	22.9	12.3	15.9	18.3		6.2	14.4	39.8	15.7	15.1	22.4	19.1		6.2	6.5
Greece															
Hong_Kong											9.3				14.3
Hungary	79.7	45.8													
Ireland	15.8	34.7		35.6				31.1							80.7
Italy	26.6	2.6	4.7		29.4		14.9		18.1	11.7					27.0
Japan							9.9								8.6
Korea_Rep															
Latvia														38.0	
Lithuania												10.5		24.5	
Luxembourg		17.8	18.5	17.5		3.7	13.3			9.7		19.4	18.5		9.9
Macao															
Malta															
Marshall_Isl															
Mexico					24.5										13.2
Montenegro															
Mozambique													17.6		
Netherlands	11.0	12.1	16.2				17.2	105.2	22.0	12.5	12.9			9.7	26.8
Norway				27.9								23.8		10.8	
Peru					13.8										
Poland	22.5		25.9						10.8		20.6		22.3		
Portugal			51.6		22.5								24.1		
Romania	32.2														
Russia	19.5		66.7				9.9		31.1					30.0	
Saudi_Arabia															5.0
Serbia															
Singapore											8.5				15.8
Slovakia	23.7								18.6						
Slovenia	27.5														
South_Africa															24.7
Spain		3.4	15.3		15.4		17.6		14.2	22.7	7.8		16.2		15.1
Sweden			2.9	9.8		5.0						29.0		4.2	
Switzerland			20.0	17.4			20.2			19.1	11.5				9.3
Turkey									18.8		18.4				
UK	23.5	29.8	21.6	13.8	16.0	3.8	12.0	18.8	18.6	15.1	12.2	20.6	18.0	9.4	9.6
US	0.1	5.5	14.6		32.3		14.9	79.4	18.8	15.4	20.4	20.0		6.7	141.1
Ukraine	21.8														
Venezuela					24.0										
Virgin_Island															
Count	*17*	*14*	*15*	*9*	*10*	*6*	*13*	*6*	*14*	*10*	*13*	*10*	*7*	*12*	*19*
Average	*26*	*16*	*22*	*17*	*27*	*5*	*16*	*63*	*18*	*15*	*15*	*23*	*19*	*15*	*24*
Median	*23*	*12*	*18*	*17*	*24*	*5*	*15*	*60*	*19*	*15*	*12*	*20*	*19*	*10*	*13*
Std. Dev.	*17*	*14*	*17*	*10*	*14*	*1*	*5*	*38*	*6*	*4*	*7*	*9*	*3*	*11*	*33*
Min	*0*	*1*	*3*	*3*	*14*	*4*	*10*	*19*	*9*	*10*	*8*	*11*	*16*	*4*	*5*
Max	*80*	*46*	*67*	*36*	*61*	*6*	*31*	*105*	*31*	*23*	*30*	*44*	*24*	*38*	*141*

Sources: EBA and Author's calculations.

Table B2. Average Risk Weights, SA Portfolio, in Percent (June 2015)

Panel A. Corporate Credit

Exposure Of:	AT	BE	CY	DE	DK	ES	FI	FR	HU	IE	IT	LU	LV	MT	NL
To: Angola															
Australia				94										45	100
Austria	94			89				100			98				
Belgium		96		50				49				93	50		98
Bermuda															
Bosnia_Herz															
Brazil				100		98		100							100
Bulgaria									100						
Croatia	101								93		100				
Canada			80										119	53	
Cape_Verde															
CaymanIsland				91	100										
Chile						98									
China				100							100				
CookIsland				20											
Cyprus			98												
Czech_Rep	95	100						95			96				
Denmark					85										
Estonia															
Finland					98		98						76		
France	100	96	77	77		95		78		100	88	81		50	86
Germany	99	100	76	94	100	100		82		100	85	94	50	53	99
Greece			100												
Hong_Kong															100
Hungary	94	91							96						
Ireland	75	100			100					94	98	37			
Italy	100	98		89		100		90			97	86			
Japan		20						2							
Korea_Rep								100							
Latvia													99		
Lithuania															
Luxembourg	100	100		97	100			91		100	102	97			
Macao															
Malta														86	
Marshall_Isl				100											
Mexico				100		94									
Montenegro									100						
Mozambique															
Netherlands	100	84		92				91		100	86	74		74	104
Norway					100										
Peru						98									
Poland	95			98		97					99				97
Portugal		100				95									
Romania	96		99						99						
Russia	96		96	100				99	100		99		101		
Saudi_Arabia															
Serbia															
Singapore															100
Slovakia	97								98		100				
Slovenia	98														
South_Africa															
Spain	50	100		100		82		76		99	100	100			100
Sweden				97	51		100						100	61	
Switzerland	100			99	100			100				66	76		100
Turkey						99		93			99				97
UK	79	71	96	69	99	99		25	100	98	57	80	83	49	78
US	100	53	83	81		98		72		100	91		37	52	100
Ukraine	140								142						
Venezuela						78									
Virgin_Island															100
Count	*20*	*14*	*9*	*21*	*10*	*14*	*2*	*17*	*9*	*8*	*17*	*10*	*10*	*9*	*15*
Average	*95*	*86*	*90*	*88*	*93*	*95*	*99*	*79*	*103*	*99*	*94*	*81*	*79*	*58*	*97*
Median	*98*	*97*	*96*	*94*	*100*	*98*	*99*	*91*	*100*	*100*	*98*	*83*	*80*	*53*	*100*
Std. Dev.	*16*	*24*	*10*	*20*	*16*	*7*	*2*	*28*	*15*	*2*	*11*	*19*	*27*	*14*	*7*
Min	*50*	*20*	*76*	*20*	*51*	*78*	*98*	*2*	*93*	*94*	*57*	*37*	*37*	*45*	*78*
Max	*140*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*142*	*100*	*102*	*100*	*119*	*86*	*104*

Sources: EBA and Author's calculations.

Panel B. Retail Credit

Exposure Of:	AT	BE	CY	DE	DK	ES	FI	FR	HU	IE	IT	LU	LV	MT	NL
To: Angola															
Australia		75	76	75										75	57
Austria	69	75		75				75			70				
Belgium		64		75				68				80			75
Bermuda															
Bosnia_Herz															
Brazil				66		72		75							
Bulgaria									74						
Croatia	74								75		74				
Canada			75											75	
Cape_Verde															
CaymanIsland					61										
Chile						71									
China				75							75				
CookIsland															
Cyprus			72												
Czech_Rep	60	75						67			60				
Denmark					75										
Estonia															
Finland					74		75								
France	59	73	75	75		68	75	70		75	67	77		67	71
Germany	59	58	75	73	75	75	75	73		75	74	75	75		58
Greece			75												
Hong_Kong															57
Hungary	60	75							74						
Ireland		65			75					74	75	86			
Italy	75			75		75		71			73	88			
Japan								74							
Korea_Rep								75							
Latvia													75		
Lithuania															
Luxembourg	75	75		75	75		75	73			75	73			
Macao															
Malta														67	
Marshall_Isl															
Mexico				71		71									
Montenegro									75						
Mozambique															
Netherlands		73		66				75		75	72	75			51
Norway					75										
Peru						50									
Poland	68			75		69					73				68
Portugal				75		74									
Romania	71		62						73						
Russia	75		59	75				74	75		74		75		
Saudi_Arabia															
Serbia															
Singapore															75
Slovakia	65	75							70		75				
Slovenia	72														
South_Africa															
Spain				74		75		65			74	90			75
Sweden			75	67	75		75						75	75	
Switzerland	75		75	74	76			75				80			57
Turkey						69		67			65				70
UK	67	58	65	75	68	74	75	61	75	71	75	76	75	64	58
US	59	75	74	75		74		75		75	75			66	57
Ukraine	68								75						
Venezuela						74									
Virgin_Island															
Count	*17*	*13*	*12*	*19*	*10*	*14*	*6*	*17*	*9*	*6*	*17*	*10*	*5*	*7*	*13*
Average	*68*	*71*	*72*	*73*	*73*	*71*	*75*	*71*	*74*	*74*	*72*	*80*	*75*	*70*	*64*
Median	*68*	*75*	*75*	*75*	*75*	*73*	*75*	*73*	*75*	*75*	*74*	*78*	*75*	*67*	*58*
Std. Dev.	*6*	*7*	*6*	*3*	*5*	*6*	*0*	*4*	*2*	*2*	*4*	*6*	*0*	*5*	*9*
Min	*59*	*58*	*59*	*66*	*61*	*50*	*75*	*61*	*70*	*71*	*60*	*73*	*75*	*64*	*51*
Max	*75*	*75*	*76*	*75*	*76*	*75*	*75*	*75*	*75*	*75*	*75*	*90*	*75*	*75*	*75*

Sources: EBA and Author's calculations.

Panel C. Mortgage Credit

Exposure Of:	AT	BE	CY	DE	DK	ES	FI	FR	HU	IE	IT	LU	LV	MT	NL
To: Angola															
Australia		75	76	75										75	57
Austria	69	75		75				75			70				
Belgium		64		75				68				80			75
Bermuda															
Bosnia_Herz															
Brazil				66		72		75							
Bulgaria									74						
Croatia	74								75		74				
Canada			75											75	
Cape_Verde															
CaymanIsland					61										
Chile						71									
China				75							75				
CookIsland															
Cyprus			72												
Czech_Rep	60	75						67			60				
Denmark					75										
Estonia															
Finland					74		75								
France	59	73	75	75		68	75	70		75	67	77		67	71
Germany	59	58	75	73	75	75	75	73		75	74	75	75		58
Greece			75												
Hong_Kong															57
Hungary	60	75							74						
Ireland		65			75					74	75	86			
Italy	75			75		75		71			73	88			
Japan								74							
Korea_Rep								75							
Latvia													75		
Lithuania															
Luxembourg	75	75		75	75		75	73			75	73			
Macao															
Malta														67	
Marshall_Isl															
Mexico				71		71									
Montenegro									75						
Mozambique															
Netherlands		73		66				75		75	72	75			51
Norway					75										
Peru						50									
Poland	68			75		69					73				68
Portugal				75		74									
Romania	71		62						73						
Russia	75		59	75				74	75		74		75		
Saudi_Arabia															
Serbia															
Singapore															75
Slovakia	65	75							70		75				
Slovenia	72														
South_Africa															
Spain				74		75		65			74	90			75
Sweden			75	67	75		75						75	75	
Switzerland	75		75	74	76			75				80			57
Turkey						69		67			65				70
UK	67	58	65	75	68	74	75	61	75	71	75	76	75	64	58
US	59	75	74	75		74		75		75	75			66	57
Ukraine	68								75						
Venezuela						74									
Virgin_Island															
Count	*17*	*13*	*12*	*19*	*10*	*14*	*6*	*17*	*9*	*6*	*17*	*10*	*5*	*7*	*13*
Average	*68*	*71*	*72*	*73*	*73*	*71*	*75*	*71*	*74*	*74*	*72*	*80*	*75*	*70*	*64*
Median	*68*	*75*	*75*	*75*	*75*	*73*	*75*	*73*	*75*	*75*	*74*	*78*	*75*	*67*	*58*
Std. Dev.	*6*	*7*	*6*	*3*	*5*	*6*	*0*	*4*	*2*	*2*	*4*	*6*	*0*	*5*	*9*
Min	*59*	*58*	*59*	*66*	*61*	*50*	*75*	*61*	*70*	*71*	*60*	*73*	*75*	*64*	*51*
Max	*75*	*75*	*76*	*75*	*76*	*75*	*75*	*75*	*75*	*75*	*75*	*90*	*75*	*75*	*75*

Sources: EBA and Author's calculations.