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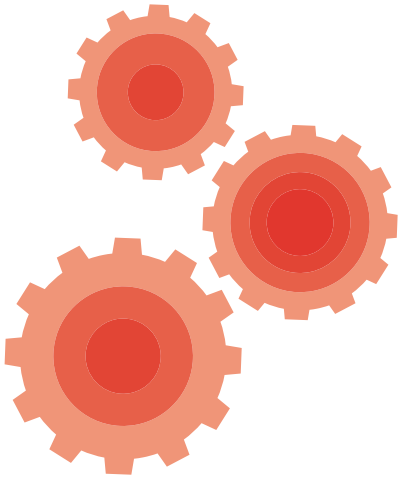
The Extra Cost of Swiss Banking Regulation

White Paper



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THE EXTRA COST OF SWISS BANKING REGULATION

Jean Charles Rochet
SFI Senior Chair and Professor of Banking, University of Zurich
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ABSTRACT

We study the impact of the banking regulations that were enacted by Swiss Authorities in 2012, in addition to the recommendations of the Basel Committee on Banking Supervision (Basel III). After recalling the main features of these additional regulations, we proceed in three stages:

- We analyse the "state of the art" methods that have been used in various countries for the assessment of on-going regulatory reforms in the financial sector.
- We adapt these methods to provide a tentative assessment of the extra cost of Swiss banking regulation.
- We analyse the pros and cons of a reinforced leverage ratio, as being currently discussed in different jurisdictions, including Switzerland.

[1] I benefitted from precious research assistance by Ethem Güney, Lea-Kathrin Heursen and above all Jorge Ponce.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

As a reaction to the Global Financial Crisis of 2007-09, the Basel Committee on Banking Supervision (BCBS) has reformed in depth its recommendations for the prudential regulation of international banks: Basel III will gradually replace Basel II. These reforms are essentially of two types:

- Reinforcing capital requirements, especially for systemic institutions.
- Introducing new regulations, such as liquidity ratios and resolution procedures.

Swiss regulatory authorities have decided to go further for Swiss banks, and impose more stringent capital and liquidity requirements, improved risk diversification and additional organisational measures. These new measures are particularly restrictive for the banks that have been deemed "Too Big to Fail" by the Swiss regulators (UBS, Credit Suisse and, as of November 12th 2013, the Zürcher Kantonalbank).

The first objective of this report is to evaluate the costs and benefits of these additional regulations, sometimes called the "Swiss Finish on Basel III". We focus on the long term impact of the main additional capital requirements[2], amounting to up to 9.2% common equity (instead of 7% in Basel III) for non-systemic banks and 19% total capital (instead of 13%) for systemic banks.

The second objective of this report is to evaluate the pros and cons of strengthening the leverage ratio, a reform that is part of the Basel III framework and that is planned to be implemented within the following years. However, some Swiss politicians are currently advocating for a leverage ratio that is higher than foreseen in Basel III.

Our main conclusions are as follows:

- All the impact studies that have been made in different countries suffer from serious methodological weaknesses that cannot be corrected easily. Thus it would be hazardous to precipitate another round of regulatory reforms, given that we know so little about the long term impact that such reforms would have.
- The social benefits of the Swiss Finish are difficult to evaluate precisely. However they are likely to outweigh the long term social costs, which are probably small. Imposing stricter regulations than the BCBS seems to have contributed to restoring the safety reputation of the Swiss banking system without really hampering credit and GDP growth.
- In spite of these stricter capital requirements, some commentators have argued that Swiss banks might not yet dispose of enough capital. Two political parties propose to increase the 3% minimum leverage ratio of Basel III to 6% or 10%. Their presumption is that risk weights might underestimate the real risks and that the three Swiss banks that have been deemed "systemic" might still be "Too Big To Fail" or even "Too Big To Save".
- These concerns have to be taken seriously. However, capital requirements and leverage ratios alone cannot ensure global financial stability. Tackling the Too Big to Fail Problem mostly

[2] We leave aside other additional regulations, such as the countercyclical capital buffer and liquidity requirements.

requires adequate resolution procedures for systemic banks. This topic is outside the scope of the present report.

- Coming back to bank capital, it should be understood that the two instruments analysed in this report, capital requirements and leverage ratios, have a distinctive role to play in limiting banks risk taking.
- Under normal circumstances, imposing a minimum risk weighted capital ratio is the method of choice for regulators to limit the risk taken by banks. Capital ratios are the proper instrument for calculating the buffers needed to absorb potential bank losses. The employed risk weights should reflect at any time the state of the art knowledge and experience available. Otherwise, BCBS or the Swiss Regulators can change the rules presiding to these risk calculations.
- The role of the leverage ratio is different. As a simple and easy to observe policy instrument, the leverage ratio is a suitable tool to trigger prompt regulatory intervention when and if needed. Special and unusual circumstances can at times emerge, be it idiosyncratic to one institution or globally, under which risk models do not work properly and risk weights computed on the basis of such models could be misleading. Under such circumstances, banks may be tempted to take excessive risks. What is required to avoid this scenario is "Prompt Corrective Action" by supervisors.
- The simplicity of the leverage ratio is then needed to make the supervisors accountable to the government and the general public. Therefore the leverage ratio should be used as a complementary instrument and early warning indicator of potential problems building up within banks, rather than a basis for computing capital buffers under normal circumstances.

The Swiss bank capital regulation

In this section we compare the key aspects of the revised Basel Capital Accord (Basel III)[3] and of the Swiss bank capital regulation. Swiss authorities have decided not only to transpose into Swiss law the capital adequacy rules promulgated by Basel III, but also to go further. For non-systemic Swiss banks, extra capital buffers may be required depending on their size and complexity. Moreover, Swiss Too-Big-To-Fail (TBTF) banks are subject to even stricter capital requirements.

The Global Financial Crisis of 2007-2009 has shown that there were many serious problems in the global regulatory framework and in banks' risk management practices. One central focus of regulatory authorities has been to strengthen capital requirements: the capital buffers of many commercial banks have revealed insufficient, both in quality and quantity, to bear the losses induced by the excessively risky investment strategies of these banks. This is why the new Basel III agreement is aimed at improving the banking sector's resilience to shocks by raising not only the quantity but also the quality of the banks' capital.

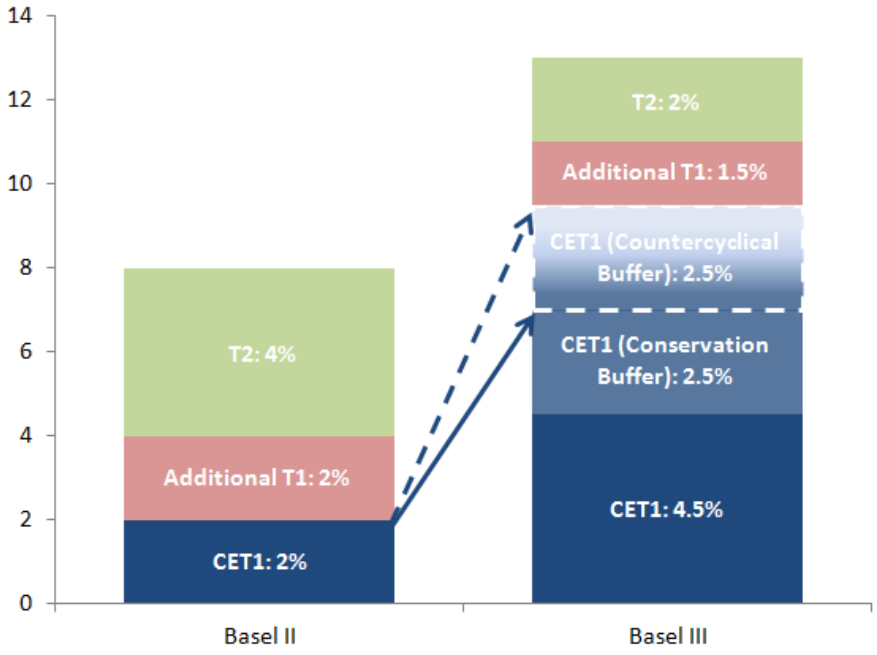
Basel III is intended to solve two failures on the previous framework (Basel II) which resulted in an insufficient capacity of banks to bear losses. First, the risk of certain assets classes was inappropriately measured and the calibration of risk weights for certain assets (RWA) was set too low. In response to this failure, regulators have raised the risk weights for selected asset classes through a set of measures known as Basel II.5,[4] which is part of the Basel III regulatory package. As explained by Frenkel and Rudolf (2010) regulators have introduce(d) higher risk weights for (re-)securitizations and higher capital requirements for trading book positions and counterparty credit risk exposures arising from derivatives, repo-like transactions and securities financing activities.

Second, the loss-absorbing capacity of other forms of capital than common equity has revealed insufficient. In response, regulatory authorities have agreed on a new and stricter capital definition in order to raise the quality of the capital base. The total level of required capital (not including additional buffers) has not been increased substantially. What has changed significantly is the composition of this capital, which now focuses much more on Common Equity Tier 1 capital (CET1): common shares plus retained earnings and other comprehensive income net of regulatory filters and deductions (see Lanz and Favre 2012). Banks must now hold a minimum of 4.5% of RWA under the form of CET1 in order to continue operating (under Basel II this requirement was 2%). In addition to this CET1 requirement, banks are required to have a minimum Tier 1 capital (T1 equals CET1 plus Additional Tier 1 capital) ratio of 6% of RWA (i.e. Additional T1 capital will amount to up to 1.5% of RWA). The Tier 2 capital (T2) will amount to up to 2% of RWA.

[3] See Basel Committee on Banking Supervision (2010b).

[4] See Basel Committee on Banking Supervision (2009).

Figure 1: Capital requirements under Basel II and Basel III regulatory regimes (as percentage of RWA)



Note: figures set within a dashed white line are the maximum of a variable requirement which minimum is 0%.

Furthermore, regulators have also decided to increase capital requirements. Banks are expected to hold additional CET1 of 2.5% of RWA as a capital conservation buffer, which leads to a total CET1 ratio of 7% and a total capital ratio of 10.5% of RWA. Figure 1 shows the capital requirements under Basel II and Basel III. The solid arrow highlights the changes on the CET1 ratio from 2% under Basel II to 7% of RWA under Basel III.

Macro-prudential authorities also have the discretion to activate temporarily a countercyclical buffer of CET1 (up to 2.5% of RWA) when they fear that an excessive credit growth might generate asset prices bubbles and financial instability. In case a bank's CET1 ratio falls below the total requirement (comprising the capital conservation buffer and when required, the countercyclical buffer) regulatory authorities are supposed to initiate a process of "prompt corrective action" until the bank's capitalization is restored.

Starting on 1 January, 2013, the Basel III rules were transposed into Swiss law.[5] However, the new capital standards are going to be phased in over a period extending to the end of 2018[6]. This

[5] Article 44 of the Capital Adequacy Ordinance (the Swiss Federal Ordinance of 1. June 2012 on Capital Adequacy and Risk Diversification for Banks and Securities Dealer; SR 952.03) has introduced the possibility of activating a countercyclical capital buffer (CCB). On February 13, 2013, and following a proposal by the Swiss National Bank (SNB),

implementation period will allow the banking sector to adapt to the higher requirements gradually, e.g. via the accumulation of earnings retention, and avoid abrupt changes that would undermine its efficiency and its capacity to provide credit to the economy.[7]

"The requirements of the Basel III framework are supplemented by additional capital requirements introduced as a so-called Swiss Finish by the Swiss Financial Market Supervisory Authority (FINMA) Circular 2011/2 (Additional Swiss Requirements)" (Lanz and Favre, 2012, p. 75). Under this regulation, banks are divided into five categories depending on their size and complexity. The smallest and less complex banks (category 5) must only fulfil the requirements of the Basel III framework. Banks falling in the categories 2-4 are subject to an additional capital buffer of up to 2.2% of RWA in the form of CET1 and total capital requirements of up to 14.4% of RWA. Category 1 banks (UBS and Credit Suisse) do not fall under this Circular, as they have to fulfil the separate requirement of the Too-big-to-fail package[8]. Table 1 shows the comparison of capital requirements under Basel III with the Swiss Finish regime.

Table 1: Capital requirements under Basel III and the Swiss Finish regime (excluding the countercyclical buffer, as percentage of RWA)

	Basel III	Swiss Finish
CET1	7%	7-9.2%
Total capital	10.5%	10.5-14.4%

Even stricter rules on capital adequacy apply to systemically important (or TBTF) banks in Switzerland: Credit Suisse, UBS and from November 2013, Zürcher Kantonalbank. The minimum CET1 ratio is set at 4.5% of RWA as in Basel III. However, TBTF Swiss banks must hold an extra 5.5% of RWA in the form of CET1 as a conservation (or security) buffer, resulting in an aggregate ratio of CET1 of 10% of RWA. Since the countercyclical buffer also applies to TBTF banks, this aggregate ratio of CET1 could increase up to 12.5% of RWA for Swiss TBTF banks. In addition to that, the conservation buffer must be complemented with 3% of RWA in the form of high-triggering Contingent Convertible Bonds

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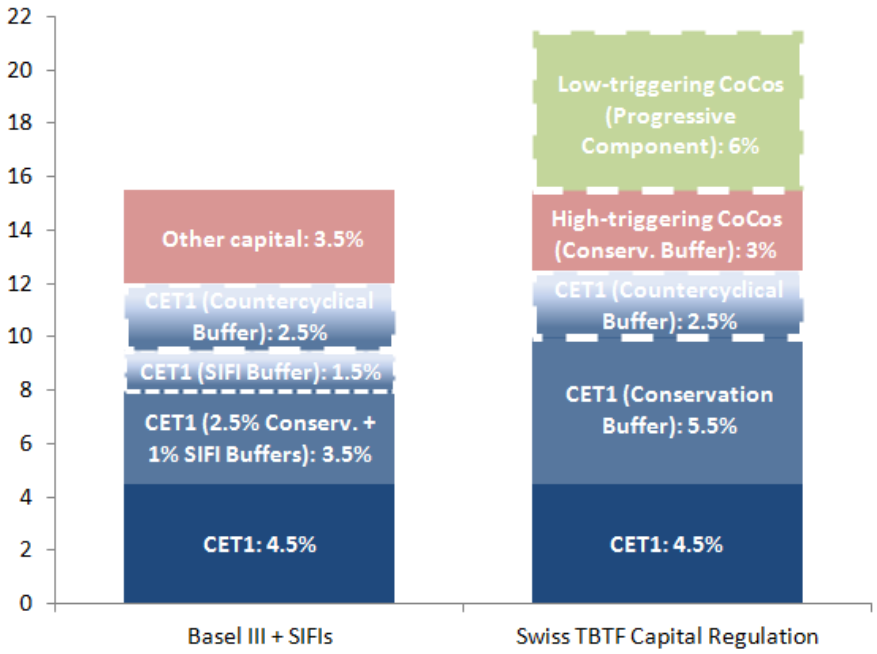
and in consultation with the Swiss Financial Market Supervisory Authority (FINMA), the Federal Council decided to activate this buffer at the level of 1% of risk-weighted positions associated to mortgage loans financing residential property located in Switzerland, and a deadline for compliance with the CCB of 30 September 2013.

[6] The Federal Council chose the same deadline (end of 2018) for the revised Capital Adequacy Ordinance (CAO). However it seems that most Swiss Banks will have implemented these changes much earlier than the official deadline.

[7] According to Lanz and Favre (2012, p. para. 11) "the Basel III framework will be implemented in Switzerland primarily through an amendment of the CAO, as well as through an amendment of various FINMA Circulars and the release of new ones."

(CoCos) or bonds with a write-down feature[9]. Finally, a variable progressive component of up to 6% of RWA may be required from TBTF Swiss banks depending of the systemic importance of the respective banks. This requirement may be satisfied in the form of low-triggering CoCos (i.e. CoCos that are converted in equity capital if the CET1 ratio of 5% is undershot). Hence, if the full progressive component is requested, the total capital required for a Swiss systemically important bank would amount to 19% of RWA. This figure may rise up to 21.5% of RWA if the full countercyclical buffer is also required. The right-hand side column in Figure 2 shows these capital requirements under the Swiss TBTF bank capital regulation and compares them with Basel III requirements.

Figure 2: Capital requirements under Basel III and Swiss regulation for systemically important (TBTF) banks (as percentage of RWA)



Note: figures set within a dashed white line are the maximum of a variable requirement which minimum is 0%.

For the sake of comparison of the Swiss TBTF bank capital regulation with the international standard we need to consider the additional capital requirements that are imposed to global Systemically Important Financial Institutions (SIFIs) under Basel III.[10] Indeed, Credit Suisse and UBS have been declared global SIFIs so that an additional capital requirement of at least 1% and at most 2.5% of RWA must be applied to them under Basel III. This requirement must be fulfilled in the form of CET1. In the

[9] High triggering CoCos are converted in equity capital if the CET1 ratio of 7% is undershot.

[10] See Basel Committee on Banking Supervision (2013).

left-hand side of Table 2 we add this SIFI capital requirement to the other Basel III capital requirements. In the right-hand side of Table 2 we show the requirements of the Swiss TBTF capital regulation. The minimum amount of CET1 (without taking into account any extra buffer) is 4.5 of RWA in both cases. When buffers are added (except for the countercyclical one), CET1 capital requirement ranges between 8% and 9.5% of RWA under Basel III and is equal to 10% of RWA under the Swiss TBTF bank capital regulation. The countercyclical buffer may add an extra capital requirement of up to 2.5% of RWA to these figures. Regarding total capital, the Basel III capital requirement for a systemically important bank ranges between 11.5% and 15.5% of RWA, while the requirement under the Swiss TBTF bank capital regulation ranges between 13% and 21.5% of RWA.

Table 2: Comparison of Basel III and Swiss regulation for systemically important (TBTF) banks (as percentage of RWA)

Basel III			Swiss TBTF		
	CET1	Other Capital		CET1	Other Capital
Minimum	4.5%	3.5%	Minimum	4.5%	
Conservation	2.5%		Conservation	5.5%	3%[11]
SIFIs	1-2.5%		Progressive		0-6%[12]
Countercyclical	0-2.5%		Countercyclical	0-2.5%	
Total	8-12%	3.5%	Total	10-12.5%	3-9%

To summarize, capital requirements increase significantly for Swiss banks with the implementation of Basel III. First, RWA increases for selected asset classes; so more capital is needed to fulfil the same capital ratio as before. Second, the CET1 capital ratio rises from 2% to 7% of RWA. It can rise further and up to another 2.5% if the countercyclical buffer is activated. Moreover, the new capital regulation for Swiss banks introduces an additional requirement of up to 2.2% of RWA in the form of CET1 and an additional requirement of up to 1.7% of RWA in the form of additional T1 and T2 to certain banks depending on their size and complexity. An even stricter regime is applied to the two systemically relevant (or TBTF) Swiss banks. More precisely, the CET1 capital ratio for those banks is lifted to 10% of RWA (without considering the countercyclical buffer). In addition to this, TBTF Swiss banks must hold a minimum of 3% in the form of high-triggering CoCos and up to 6% of RWA in the form of low-triggering CoCos. If this requirement fully applies, then the total capital ratio for a TBTF Swiss bank is of 19% of RWA. This figure compares to 13% corresponding to the application of the Basel III capital regulation with a full capital requirement for SIFIs (i.e. 2.5% of RWA).

[11] High trigger (7%) Cocos or write-down bonds.

[12] Low trigger (5%) Cocos or write-down bonds.

Table 3: The Swiss Finish for non-systemic banks (% of RWA)

Non systemic banks	CET1	Other	Total
Basel III	7	3.5	10.5
Switzerland	7 to 9.2	3.5 to 5.2	10.5 to 14.4
Swiss Finish	0 to 2.2	0 to 1.7	0 to 3.9

Table 4: The Swiss Finish for systemic banks (% of RWA)

Systemic Banks	CET1	Other	Total
Basel III	8 to 9.5	3.5	11.5 to 13
Switzerland	10	9	19
Swiss Finish	0.5 to 2	5.5	6 to 7.5

Although it is difficult to obtain aggregate numbers in all countries, it is fair to consider that in Switzerland, banks will be required to have on average around 4 to 5 % additional capital (per unit of risk weighted assets) than in countries adopting Basel III.

Survey of impact studies of higher capital requirements on economic activities

In this section we summarize a number of studies that have tried to assess the macroeconomic impact of heightened bank capital requirements. We focus exclusively on the long term impact of these measures[13]. Otherwise stated, we compare the GDP level in two steady states, one before and one after the introduction of higher capital requirements.

To facilitate the exposition we first describe the results on economic benefits, second the results on economic costs, and finally we analyse the overall cost-benefit comparisons.

The main justification of increasing capital requirements on banks is to protect the depositors and to enhance the stability of the financial sector. Better capitalized banks are less vulnerable, so that more bank capital reduces the probability of future bad outcomes, i.e. banking crises, and their expected costs. Despite differences on the estimates for these benefits, i.e. the avoided expected costs of future banking crises, studies find that they may be substantial in terms of GDP.

The main differences across studies come from the estimates of potential costs. Although most of the studies consider the same transmission channel from capital requirements to economic outcomes, i.e. that higher requirement imply higher lending spreads which in turn imply potential output reductions, their conclusions may be very different. Some studies conclude that the long-run impact on loan rates is likely to be modest (e.g. Kashyap et al., 2010). Other studies find than the economic impact of these reforms will be significant in terms of GDP foregone (e.g. Institute of International Finance, 2011). These differences stem from the different assumptions, methodologies and data sets that are used. Hence, we try to clarify the source of the differences whenever it is possible.

The economic benefits of higher capital requirements

The benefits of higher bank capital requirements are generally associated with a reduction in the frequency and severity of banking crises. So, the assessment of these benefits involves an estimation of the reduction on the annual probability of a banking crisis due to a rise on capital requirements, and an estimation of the social cost of banking crises. First these crises generally have a fiscal cost, related to the injection of taxpayers' money into the financial system of the country in crisis. But this is only a small part of this social cost; the most important component is likely to be the output losses consecutive to the credit crunch that almost inevitably follows a banking crisis. These output losses are difficult to assess. In particular, only a fraction of the GDP loss will be persistent, and it is difficult to evaluate this fraction.

[13] Some studies (e.g., Macroeconomic Assessment Group 2010 and IIF 2011) look at the transition costs and show that they might be very high. In the short run, bankers may indeed be reluctant to issue large amounts of new equity and may instead decide to reduce massively their lending activities, which is likely to be detrimental to growth and employment. This is why regulators only require a gradual implementation of the new measures. Interestingly, several large banks have managed to comply with the new rules well ahead of official deadlines.

The impact of higher capital requirements on the probability of a banking crisis

Miles et al. (2011) suggest that in recessions that are associated with banking crises, the capital losses of the banks are often of the same magnitude as the decline in GDP. This observation provides support for their assumption that the percentage fall in the value of risk-weighted assets moves in line with any permanent fall in the level of GDP. Based on this assumption, Miles et al. (2011, p. 27) use a calibrated "probability distribution for changes in annual GDP to calculate the probability of a banking crisis", i.e. a situation where the fall in the value of banks assets is as large as the amount of loss-absorbing equity capital they have. A common starting point is to assume a normal distribution. However, this normality assumption very likely understates the likelihood of extreme events. So, the authors calibrate a probability distribution of annual GDP changes, which are assumed to be normal but with the added chance of low probability extreme outcomes. They use GDP data over two centuries for a large group of countries. Based on such a distribution, they find that the probability of a banking crisis is as high as 6.95% when banks' capital is 5% of RWA, but only 2.48% when capital is 10% of RWA and 1.21% when capital is 15% of RWA.

In the report by the Basel Committee on Banking Supervision (BCBS, 2010a) other methods are used to assess the impact of higher capital requirements on the probability of crises. The first involves reduced-form logit and probit econometric models. These estimate the historical link between the capital ratio of banks and subsequent banking crises, controlling for the influence of other factors. The report uses results from three such models examining the experience of a panel of countries over a period of nearly 30 years (1980 to 2008). The second type of methodology involves treating the banking system as a portfolio of banks. Portfolio models employ standard portfolio credit risk analysis to quantify the impact of higher regulatory requirements on the probability of systemic crises. The results from three models are presented in the report. One model uses data for five banks in the United Kingdom. Another model analyses a system of more than 50 large global banks, while the third one relies on the Bank of Canada's stress testing framework. The report shows the average probabilities of a crisis implied by the various models for different levels of capitalization, e.g. 4.6% when capital is 7% of RWA and 0.4% when capital is 14% of RWA (Table 1 below presents the results for other capital ratios).[14]

Junge and Kugler (2013) estimate a probit model of the occurrence of banking crises using Swiss data from 1906 to 2010. They use as explanatory variables the leverage of large banks in addition to other control variables and find that a decrease in cyclical leverage leads to a decrease in the probability of a banking crisis.[15] More precisely, halving leverage from 28 to 14 leads to a decrease of 3.6% in the annual probability of a crisis.

[14] These are average probabilities of a banking crisis across the six models assuming no changes on liquid assets. Hence, these figures are comparable with the results of the other papers that are described in this Section. When considering models that incorporate changes in liquid assets the estimate probabilities of a banking crisis for a given capital ratio is lower than those that are reported on Table 1. Hence, strengthened liquidity standards also reduce the likelihood of a banking crisis.

[15] Two aspects of Junge and Kugler's (2013) probit analysis are worth to be highlighted. First, they use the trend and the cycle components of large banks leverage as explanatory variables. They only find a positive and statistically significant coefficient for the cyclical variability of leverage. There is no direct significant effect of the trend component of leverage,

Table 5: Annual probability of a banking crisis for given levels of capital to RWA (percentages)

Capital to RWA	5	6	7	8	9	10	11	12	13	14	15
Miles et al. (2011)	7.0					2.5					1.2
BCBS (2010a)		7.2	4.6	3.0	1.9	1.4	1.0	0.7	0.5	0.4	0.3
Junge and Kugler (2013) /1			4.2	3.0	2.2	1.8	1.4	1.0	0.8	0.6	0.5

/1 To convert leverage into capital to RWA we use an average risk weight of 0.5, which is the estimated reported by Le Leslé and Avramova (2012) for corporate lending in Europe (see Figure 12 on page 22).

Table 1 shows the estimate annual probability of a banking crisis for given levels of capital to RWA that are reported by the previously mentioned studies. In spite of the different methodologies and data sets that are used, there are a number of similarities. First, the estimates for a given capital ratio are very close across studies. The figures in Miles et al. (2011), who consider the chance of low probability extreme events, are consistently around 1 percentage point above the others. Second, there is a significant reduction in the likelihood of a banking crisis at higher levels of capitalization. For example, doubling capitalization from 7% to 14% implies a reduction in the annual probability of a banking crisis on the range of 3.6 to 4.2 percentage points. Third, the incremental benefit of higher capital requirements declines as banks become better capitalized.

The severity of banking crises in terms of GDP

In order to assess the economic benefits of higher capital requirements, one also needs estimating the long-run expected GDP losses that are due to banking crises. This is the topic of a large economic literature that aims at assessing the economic costs of banking crises in terms of persistent GDP losses . "On average the magnitude of the resulting GDP costs is estimated to be very large" (BCBS, 2010a, p.9).

However, it is important to point out that the cost of a banking crisis depends a lot on the way it is managed by the country's authorities. Therefore a crucial element in the reduction of the severity of banking crises is the crisis management protocol adopted by the country. This protocol is outside the scope of the present report. However the recent projects by Credit Suisse and UBS to improve their resolvability by creating separate legal entities and ring fencing their core domestic activities (see Letzing, J. and A. Morse, 2013) are interesting efforts in the direction of reducing the costs of banking crises management in the future.

which is the variable to be primarily affected by the rise on capital requirements. However, the authors show that there is an indirect impact resulting from the relationship between the variability of the cyclical component and the trend component. In particular, they provide empirical evidence of the positive relationship between the level of the trend component and the variance of the cyclical component. Second, the estimation of the probit model for all banks using data from 1881 to 2010 provides similar results as the ones reported for large banks.

BCBS (2010a) summarizes the academic assessments of the cost of banking crises. The existing literature is mainly based on crises prior to the 2007-09 one.[16] For some of these crises, there are apparently no permanent effects on the GDP trend, i.e. output eventually catches up with its pre-crisis path. Then the median cumulative discounted losses reported across studies is 19% of the pre-crisis GDP. However, BCBS (2010a, p.10) highlights that other studies found a permanent gap between the pre- and post-crisis GDP trend, and "estimate this gap to be between 2 and 10%, with a median of about 6%". The median cumulative discounted losses of this kind of crises, i.e. those that have permanent effects, is about 158% of the pre-crisis GDP.[17] Medians across models mask a significant range of crisis outcomes. For example, most studies report that the maximum cost of an individual episode is three to five times higher than the median cost (BCBS, 2010a).

Haldane (2010) provides a range of estimates for the cumulative losses of the 2007–09 banking crisis. Although he does not give any justification for this figure, he assumes that 25% of output losses experienced in 2009 will be permanent. Then he estimates the global cumulative output losses to be around 90% of 2009 world GDP. This figure could rise to as high as 350% if the whole output loss turns out to be permanent. This illustrates the fragility of the assessment of GDP losses due to banking crises.

Junge and Kugler (2013) estimate the impact of banking crises on economic output using annual Swiss GDP data starting from 1881. They use a deterministic time trend model that takes into account the effects of major shocks by including level shift dummy variables. They find that the permanent output loss due to a severe banking crisis is approximately 18% of pre-crisis GDP, with a standard error around 6%. Hence, the cumulative discounted losses are 360% relative to pre-crisis GDP (assuming a discount rate of 5% as used by BCBS, 2010a). While this figure more than doubles the median of the output losses reported across studies founding permanent effects, i.e. 158%, it is on the range of estimates by these studies and very close to the maximum reported by Haldane (2010). They also consider that the impact of banking crises on the Swiss economy is likely to be higher than the world median, given the importance of the banking sector in Switzerland.

All these results have to be taken with a grain of salt, to say the least. The causal relationships between GDP growth and banking crises are multiple and complex. GDP losses due to external factors may certainly provoke banking crises. Conversely banking crises can be due to external factors (like speculative activities of banks on secondary or derivative markets). These banking crises can in turn provoke credit crunches and necessitate massive injections of public funds, which is likely to hamper growth. Moreover the cost of banking crises varies a lot from country to country (see table below). The way these crises are managed has a big impact on the fiscal cost and the length of the crisis and presumably on the GDP losses. This implies that other prudential measures such as better resolution procedures for systemic banks (and other crisis management policies) may be equally important as increased capital requirements in order to increase the resilience of the financial system.

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[16] The list of studies that are summarized in this report is given in Table A1.1, page 35, of BCBS (2010a).

[17] Miles et al. (2011, p.32) estimate a cumulative discounted cost of a crisis in UK to be about 140% of GDP pre-crisis. This figure is obtained under the assumption that "if a banking crisis occurs, GDP falls initially by 10% and three quarters of this reduction lasts for just five years whilst one quarter is permanent".

To conclude this section on the social benefits of increased capital requirements, I would like to stress that even if there is a consensus among economists and practitioners on the facts that banking crises are costly and that excessive bank leverage increases the expected costs of these crises, it is not possible as of today (January 2014) to provide an accurate estimate of the marginal social benefit of increasing banks capital requirements. To do so would require developing a structural macroeconomic model with endogenous banking crisis and to calibrate this model. With a group of researchers at SFI, we have started working on such a model but the first results should not be available before the end of 2014.

The social costs of higher capital requirements

The social costs of higher bank capital requirements are mainly related to the possibility that they might lead to higher lending rates, which themselves are likely to provoke a decrease in GDP growth. The mechanism is thus two-fold. Higher capital requirements may increase the banks' weighted average cost of capital, which is likely to be reflected in higher lending spreads. In turn, higher lending spreads may determine a reduction in investment and GDP growth.

The impact of higher capital requirements on lending spreads

The main question is whether an increase in capital requirements provokes an increase in the funding costs of banks. This is the case when equity capital is more expensive than debt financing and the required return on equity is fixed. However, a better capitalized bank is less risky, which is likely to lead to reduced required rates of return on both debt and equity. Under certain idealized conditions, which are stated by Modigliani and Miller (1958), the movements on the required rates of return on debt and equity neutralize each other leaving the overall cost of funds unaffected. Thus, in comparing the results across studies it is important to seriously consider the assumptions under which the impact estimates are computed. Indeed, under the Modigliani and Miller's assumptions there will not be an impact of heightened capital requirements on lending spreads. By contrast, assuming no variation in the required rate of return on equity leads to the maximum possible value of the impact of capital requirements on the banks' weighted average cost of capital (Baker and Wurgler, 2013).

It is also important to consider the capacity of banks to pass higher funding costs to their customers and the effect of this passage on the economy-wide lending spreads. Indeed, strong competition among banks would impose constraints to increase lending spreads. These constraints may be reinforced if some banks already fulfil the heightened capital requirements so that they have no need for increasing lending spreads. In addition to that, bank lending may be a small proportion of companies' external financing. Hence, the economy-wide lending spread would increase less than the lending spread of banks. Some of the studies that are summarized below provide upper bounds for the impact of higher capital requirements by assuming a one-for-one passage of banks' cost of funding to lending spreads.

Baker and Wurgler (2013) study how leverage affects the risk and the overall cost of banks' capital using more than 40 years of historical data in the United States. They confirm that "the equity of better-capitalized banks has both lower systematic risk (beta) and lower idiosyncratic risk" (Baker and Wurgler, 2013, abstract). However, this reduction on risk does not translate to a reduction in the cost of equity implying that a 1 percentage point increase on capital requirements leads to an increase in the weighted average cost of capital of 6 to 9 basis points.

BCBS (2010a) uses data on 6,600 banks on 13 OECD countries and for a 15-year period from 1993 to 2007. The assessment of the impact of higher capital requirements on lending rates is done under two assumptions: (i) that the costs of equity and debt are not affected by the lower riskiness of banks, i.e. there is no Modigliani and Miller's effect; and (ii) that any higher cost of funding associated with changes on capital requirements is fully recovered exclusively by raising loan rates, i.e. 100% pass-through. The combination of these two assumptions implies that the estimates represent upper bounds for the impact of higher capital requirements on lending spreads. In particular, each

percentage point increase in the capital ratio results in a median increase in lending spreads across countries of 13 basis points. The inter-quartile range (i.e. 25th to 75th percentile) is 9 to 19 basis points (BCBS, 2010a).

Cosimano and Hakura (2011, p. 4/5) use "bank-by-bank data for advanced economies for the period 2001-2009" "on a generalized method of moment estimation procedure which captures banks' simultaneous decisions on how much capital to hold, at what level to set the loan rate, and the size of their loan portfolio". They find that a one percentage point increase in capital requirements is associated with a 12 basis points average increase in the loan rate for the 100 largest banks. "For banks in countries that experienced a banking crisis during 2007-09, it is associated with a 9 basis points average increase, while for banks in countries that did not experience a banking crisis during 2007-09 it is associated with a 13 basis points average increase" (Cosimano and Hakura, 2011, p. 5).

Elliott (2009) analyzes the long-term effect of increased capital requirements in the United States by applying a method similar to the one used by BCBS (2010a). Elliott estimates that lending rates would rise by about 20 basis points for each percentage point increase in the capital ratio if banks were able to translate their extra funding costs one-for-one to customers. However, given that banks only provide some of the credit in the economy, the overall increase in lending spreads is likely to be around 5 to 10 basis points.

Kashyap et al. (2010) also use data for the United States. Their empirical results show that the relation between banks' return on equity and banks' leverage can be explained quite well by the Modigliani and Miller's (1958) theorem. Hence, a one percentage point increase in the ratio of capital would lead to a 2.5 basis points increase in the banks' funding costs when differences in the tax treatment of debt and equity finance are the only departure from Modigliani and Miller's assumptions. If further possible departures are considered, this figure would raise up to 4.5 basis points.

King (2010) uses a similar method to the one used by BCBS (2010a) and Elliott (2009) in a data sample of 13 OECD countries. The main conclusion of this study is that "the higher cost associated with a one percentage point increase in the capital ratio can be recovered by increasing lending spreads 15 basis points for a representative bank" (King, 2010, p. 28).

MAG (2010) uses 53 models for 17 OECD countries to study the transition phase impacts of a one percentage point increase in capital requirements. The report finds that twelve years after the start of implementation the median across models lending spread would rise by 12.2 basis points.

Slovik and Cournède (2011) estimate the impact of heightened capital requirements on bank lending spreads based on accounting identities applied to aggregated banking sector balance sheets across 3 OECD countries. Considering that no Modigliani and Miller's effects hold and that banks pass one-for-one any extra cost of funding to customers, they conclude that a one percentage point increase in bank capital would lead to a 15 basis points increase in lending spreads.

Table 6: Impact of increasing by one percentage point the ratio of capital on lending spreads (basis points)

	Baker and Wurgler (2013)	BCBS (2010a)	Cosimano and Hakura (2011)	Elliott (2009)	Kashyap et al. (2010)	King (2010)	MAG (2010)	Slovik and Cournède (2011)
Impact	6 to 9	9 to 19	9 to 13	5 to 10	2.5-4.5	15	12.2	16
M-M	Yes	No	No	No	Yes	No	No	No
Pass-th.	100%	100%	100%	25 - 50%	100%	100%	100%	100%
Country	USA	13 OECD	12 OECD	USA	USA	13 OECD	17 OECD	3 OECD

Notes: M-M refers to the existence of Modigliani and Miller's (1958) effect. Pass-th. refers to the proportion of the increase in banks' weighted average cost of capital that is passed to customers through an increase in lending spreads. The figures for Impact on BCBS (2010a) correspond to the inter-quartile range.

Table 6 summarizes the results of studies that assess the impact of higher capital requirements on lending spreads. A couple of observations are worth to be highlighted. First, in spite of using different methodologies and data sets the results are quite similar across studies. Second, the long-run effects of higher capital requirements on lending spreads are likely to be small. More precisely, the maximum increase in lending spreads due to a one percentage point increase in capital requirements is about 20 basis points. This figure could be considered an upper bound because it is computed under the assumptions that no Modigliani and Miller's effects exist and that banks fully translate any higher cost of funding to customers. If these assumptions are relaxed, then impact estimates fall substantially.

Junge and Kugler (2013), and Miles et al. (2011) find that Modigliani and Miller's effects partially offset the rise on the weighted average cost of capital due to an increase in capital requirements for banks in Switzerland and the United Kingdom respectively. They also find that the impact of higher capital requirements on lending spreads is relatively small. We postpone a more complete description of their results to the next section.

The impact of higher capital requirements on the long-run GDP growth

The second step on the assessment of the economic costs of higher capital requirements is to evaluate the impact of higher lending spreads on the long-run level of GDP. Table 7 shows the estimated impacts of increasing by one percentage point the ratio of capital on the steady-state GDP level for three directly comparable studies. These impacts are pretty similar across the studies and relatively small. It is important to notice that the reported estimates represent upper bounds because the studies assume no Modigliani and Miller's effects and a one-for-one passage of any extra cost of funding to customers.

Table 7: Impact of increasing by one percentage point the ratio of capital on the steady-state GDP level

	BCBS (2010a)	MAG (2010)	Slovik and Cournède (2011)
Impact (median)	0.09%	0.10%	0.20%
Range	0.02% to 0.35%	Max. 0.15% after 8 years	After 5 years
Country	13 OECD	17 OECD	3 OECD

BCBS (2010a) computes the median impact across 13 OECD countries using a suite of models: structural models (including DSGE), semi-structural models, and reduced-form models. They find that a one percentage point increase in the capital requirement translates into a 0.09% median loss in the level of output, with a range from 0.02% to 0.35%.

MAG (2010) studies the economic impact of the transition phase to stronger capital requirements using a broader set of models than BCBS (2010a), which include a large-scale semi-structural one. "Since the simulation period is rather long (32 quarters), the end-of-period effect can be viewed as an alternative approximation to the long-run output cost of the new regulation" (BCBS, 2010, p. 26). Taking the median across 97 models for 17 OECD countries, MAG (2010) concludes that a one percentage point increase in the target ratio of capital would lead to a maximum decline in the level of GDP of about 0.15% from the baseline path, which would occur around eight years after the start of implementation. By the end of the transition period (i.e. after twelve years from the beginning) GDP has recovered to a level 0.10% below baseline.[18]

Slovik and Cournède (2011) use the OECD New Global Model (see Hervé et al., 2010) to estimate the impact of an increase in bank lending rates on the level of GDP. Scaling these estimates by the sensitivities of bank lending spreads to bank capital that we describe in the previous section they are able to estimate the impact of higher capital requirements on the long-run GDP level. In particular, they conclude that a one percentage point increase in the ratio of capital would result in an average decline on GDP level of 0.20% five years after the implementation.

Miles et al. (2011) test the existence of Modigliani and Miller's effects using data for six banks in the United Kingdom from 1992 to 2010. They conclude that the rise in the weighted average cost of capital for this group of banks is within 25% to 55% of what it would be if there were no Modigliani and Miller's effects. Put another way, the Modigliani and Miller offset is about 45% to 75% as large as it would be if the theorem held exactly. They assume that any rise in the funding cost of banks is passed on one-for-one by banks to their customers, and that bank lending represents around one third of firms' total financing. To estimate the economic costs of higher capital requirements they use a simple constant elasticity of substitution production function for GDP with capital and labour inputs and

[18] The findings of MAG (2010)) are based on both an increase in lending spreads and a reduction in lending volumes. The median MAG's (2010) estimate is for a decline of lending of 1.5% relative to baseline by the end of the simulation period. Brun et al. (2013) find a rather higher effect on bank lending in France. More precisely, they find that a one percentage point increase in capital requirements leads to a 6% to 11% reduction in lending. However, they do not report estimates for the impact on lending spreads.

technological progress. This production function provides an estimate of the long-run impact of an increased price of capital on production. In particular, they estimate that a one percentage point increase in firms' cost of capital would lead to a reduction in output of 0.25%. Hence, Miles et al. estimate the impact of halving bank leverage on the steady-state GDP level to be between 0.06% and 0.32% depending on the assumption on the Modigliani and Miller offset (75% and no Modigliani and Miller offset respectively).

Junge and Kugler (2013) are methodologically very close to Miles et al. (2011). They find that the Modigliani and Miller offset is about 64% for Swiss banks, a figure that is in the range estimated by Miles et al. They also estimate the impact of halving bank leverage on the long-run GDP level using the same methodology than Miles et al. However, Junge and Kugler find that the impact of increasing by one percentage point the Swiss firms' cost of capital would lead to a higher than in the United Kingdom reduction in output: 0.43% in Switzerland versus 0.25% in the United Kingdom. Junge and Kugler consider seriously the characteristics of the Swiss banking sector. First, the fact that only the two large Swiss banks (Credit Suisse and UBS) had to raise capital levels. Second, even if the large banks were able to pass on higher funding cost to their customers, economy-wide lending spreads will increase only by a certain proportion. More precisely, households' interest rate will increase by one third, i.e. the share of the two Swiss banks in domestic lending. Third, since the share of bank lending in the external financing of Swiss companies is also around one third, the interest rate for the non-financial corporate sector will increase around 11% of the increase on the cost of funding for large Swiss banks. Hence, they conclude that halving leverage on the Swiss banking sector will imply a fall of 0.05% on the long-run level of GDP if economy-wide lending spreads rise by 11% of the increase on banks' cost of capital. If however we make the extreme assumption that the economy-wide lending spread rise on the same proportion than the banks' funding cost of capital, then the level of GDP will fall 0.45%.[19]

Table 8 summarizes Miles et al. (2011) and Junge and Kugler (2013) results. As we already notice, the estimated Modigliani and Miller offset by Junge and Kugler falls in the range from 45% to 75% estimated by Miles et al. Moreover, if we consider a 33% pass-through as in Miles et al., the estimated impact on economy-wide lending spreads by Junge and Kugler, i.e. 4.7 basis points, also falls in the range estimated by the former study: 2.6 to 6 basis points. In spite of these similarities, the estimated impact on the long-run level of GDP by Junge and Kugler is higher than the comparable impact estimated by Miles et al.

[19] We report here the estimates that are computed by Junge and Kugler (2013) under the assumption that the equity market risk premium is 12.35%, i.e. an upper observed historical value for the period 1982 to 1998. The authors also report estimates under the assumption of a lower equity market risk premium of 4.66%, which of course will imply lower estimates for the impact of higher capital requirements on lending spreads and the GDP level.

Table 8: Impact of halving leverage on lending spreads (basis points) and steady-state GDP level (percentage)

Miles et al. (2011): United Kingdom			
Pass-through to customers: 33% - GDP elasticity to firms' cost of capital: 0.25			
Modigliani and Miller offset	75%	45%	0%
Impact on economy-wide spread	2.6	6.0	12.7
Impact on GDP	0.06%	0.15%	0.32%
Junge and Kugler (2013): Switzerland			
Modigliani and Miller offset: 64% - GDP elasticity to firms' cost of capital: 0.43			
Pass-through to customers	11% (corporations)	33% (households)	100%
Impact on economy-wide spread	1.5	4.7	14.1
Impact on GDP	0.05%	0.15%	0.45%

Notes: Modigliani and Miller offset refers to the percentage of the Modigliani and Miller's (1958) effect assumed on the estimation. Pass-through to customers refers to the proportion of the increase in banks' weighted average cost of capital that is passed to customers through an increase in lending spreads.

The Institute of International Finance also analyses the impact of doubling capital requirements for the banking sectors on five major, mature economies (see IIF, 2011). For the case of Switzerland its estimates are substantially higher than those in Junge and Kugler (2013). The IIF estimates an increase in lending spreads of 40 basis points for the period 2011 to 2020, which implies a corresponding decline of 0.3% in the level of GDP. These differences may stem from the different set of assumptions that are used by these two studies. First, IIF does not empirically estimate the parameters in its banking model. Instead, it calibrates those using expert opinions. Second, the IIF assumes that the Modigliani and Miller effect does not play a role without providing empirical evidence in support of this assumption. Third, the IIF considers that the increase in lending spreads will apply to the entire Swiss banking sector, not just to the two large banks, and that any extra cost of funding will be passed on a one-for-one basis to customers. Indeed, removing the Modigliani and Miller effect and considering a 100% pass-through in Junge and Kugler's framework the estimated increase in economy-wide lending spreads is about 39 basis points.

Buch and Prieto (2012) adopt a more direct approach to assess the effects of higher bank capital on business loans. Using data on German banks over a long sample period of almost 60 years, they find that the long-run impact of bank capital on loans is surprisingly positive! A one percent increase in the level of bank capital increases bank loans by about 0.22 percent. They only find a negative impact on bank loans at levels of the capital-to-asset ratio of 35 percent, i.e. at ratios far outside the range of values observed in the sample period or proposed in the current regulatory debates. They also find that levels of bank capital, deposits, and loans are non-stationary[20]. Even though their statistical

[20] The impact studies that do not take this non-stationarity into account are likely to suffer from a spurious regression problem

analysis is impeccable, the authors recognize some limitations as regards the applicability of their research to the policy debate. For example, for lack of data on capital requirements, they cannot distinguish the impact of regulatory capital requirements from capital requirements mandated by market forces. Also, they cannot assess the importance of substitution effects for firms that have access to other sources of finance that bank loans.

Cost benefit comparisons

Only three of the surveyed studies make a comparison between the estimated benefits and costs of heightened capital requirements. All of them conclude that the benefits exceed the costs.

BCBS (2010a) concludes that the net benefits of doubling the capital ratio from 7% to 14% when banking crises may impose large and permanent effects is about 5.8% measured in terms of the steady-state level of GDP. Junge and Kugler (2013) argue that the impact of doubling the capital ratio is even larger for the Swiss banking sector. More precisely, they find that the net benefit will be in the order of 12% of GDP. Miles et al. (2011) follow a different approach by computing the optimal capital ratio, i.e. the level of capital that maximizes the net social benefit (benefit of having less crisis minus costs of reducing investment and growth) Their estimate of the optimal capital ratio is that it should be around 20% of RWA, a figure substantially higher than current capital ratios.[21]

[21] Interestingly, Ratnovski (2013) suggests that a capital ratio of 18% would offer banks enough capital to fully absorb most asset shocks of magnitudes observed in banking crises in OECD countries over the last 50 years. However this calibration exercise is subject to the same caveats than the studies surveyed in the text. Without a proper structural model, no robust estimation of what would be " socially optimal" capital ratios for banks is illusory.

A tentative assessment of the net benefits of the Swiss Finish to Basel III

In this section we propose an assessment of the net effects of increased bank capital requirements in Switzerland. In so doing, we have to deal with the limitation of lacking access to all the data necessary to conduct a detailed evaluation of benefits and costs. Instead, our approach consists in critically evaluating the results of existing studies. In this respect, we consider the paper by Junge and Kugler (2013) as a very important benchmark for the study of the impact of higher capital requirements on the Swiss economy. We first summarize their findings and briefly contrast their results with other comparable studies. Second, we check the robustness of their results by realizing a sensitivity analysis. More precisely, we change some of the parameters in Junge and Kluger's framework in order to match particular, more demanding estimates by other studies. Overall, our analysis suggests that increased capital requirements for Swiss banks will entail more economic benefits than costs.

As already mentioned, Junge and Kugler (2013) estimate the economic benefits of higher capital requirements for the Swiss economy. They find that the expected annual economic benefit of doubling the capital ratio for Swiss banks, i.e. the expected annual GDP losses that may be avoided by having a less crisis-prone banking system, is around 0.65% of current GDP. Their assessment of the cumulative discounted economic benefit is around 13% (0.65% divided by 0.05) [22].

Junge and Kugler (2013) also assess the economic costs of doubling the capital ratio for Swiss banks. They provide empirical evidence supporting the existence of Modigliani and Miller's (1958) effects on Swiss banks. More precisely, the increase on the weighted average cost of funding for Swiss banks is about 36% of what it would be if the required returns on equity and debt remain fixed. They also evaluate the share of banks in the external financing of firms (i.e. around one third in Switzerland) in order to estimate the impact of the higher costs of bank funding on economy-wide lending spreads. Furthermore, they use econometric techniques to map the increase on lending spreads to a reduction on the level of GDP. Overall, they find that doubling the capital ratio for Swiss banks will lead to an annual reduction on the level of GDP of about 0.05%. Hence, the cumulative discounted economic cost of heightened capital regulations for Swiss banks is around 1% of current GDP (0.05% divided by a discount rate of 5%).

Cumulative discounted benefits of 13% and costs of 1% lead to net cumulative discounted economic benefits of doubling the capital ratio (i.e. halving leverage) for Swiss banks of 12% in terms of current GDP. This figure is our benchmark for further comparisons. In particular, we check the robustness of this result by changing some parameters in order to match particular, more extreme estimates by other studies. We first evaluate parameters related to the benefits side, then to the costs side, and finally we sensitize parameters on both sides simultaneously.

A reduction in the annual probability of a banking crisis of 3.6% is in line with results in other studies, e.g. BCBS (2010a) and Miles et al. (2011). It is indeed a rather conservative estimate because the average reduction in the probability of banking crisis reported by BCBS (2010a) is 4.2%. However, the estimated cumulative discounted GDP losses due to a banking crisis of 360% of pre-crisis GDP are close to the maximum in other studies, e.g. BCBS (2010a) and Haldane (2010). Although the

[22] As BCBS (2010a), they use a discount rate of 5%.

importance of the banking sector in Switzerland provides a rationale for a larger than the world's median impact of a banking crisis on GDP, it is worth to check the robustness of Junge and Kugler's results to changes on this parameter.

We assume that the cumulative discounted losses due to a banking crisis are equal to the median across the studies that are reported by BCBS (2010a), i.e. 158% of pre-crisis GDP. Hence, the cumulative discounted benefits of doubling the capital ratio for Swiss banks will be equal to 5.7% (i.e. 158% times 0.036) and net economic benefits will be around 4.7% in terms of current GDP. It is worth to note that this figure is of the same order of magnitude than the one estimated by BCBS (2010a). More precisely, BCBS concludes that the average net benefits of doubling the capital ratio when banking crises may impose large and permanent effects is about 5.8% of the steady-state GDP level.

Junge and Kugler (2013) estimate the Modigliani and Miller offset for Swiss banks to be about 64%. This figure is of the same order of magnitude than the one estimated by Miles et al. (2011), i.e. between 45% and 75%. Moreover, the estimated impact on lending spreads by Junge and Kugler (2013) (i.e. 4.7 basis points) also falls in the comparable range estimated by Miles et al. (i.e. 2.6 to 6 basis points). In spite of these similarities, the estimated impact of doubling the capital ratio on the long-run level of GDP is higher for Swiss banks (i.e. the economic costs estimated by Junge and Kugler (2013)) than for banks in the United Kingdom (i.e. Miles et al., 2011). This difference could be explained by a higher elasticity of output to the cost of capital in Switzerland: 0.43 versus 0.25 in the United Kingdom. However, IIF (2011) concludes that the decline in the long-run GDP level will be around 0.3%, a figure six times larger than the estimated by Junge and Kugler. This difference stems from the different set of assumptions that are used by these two studies. In particular, the IIF report assumes that the Modigliani and Miller effect does not play a role and that any extra cost of bank funding will be passed on a one-for-one basis to the economy.

Even though the IIF's (2011) assumptions are rather extreme, we assume that the economic annual cost of doubling the capital ratio for Swiss banks is 0.3%, as suggested by the IIF, instead of 0.05% as estimated by Junge and Kugler (2013). Hence, the cumulative discounted economic cost is 6% of the current level of GDP (i.e. 0.3% divided by the discount rate of 0.05). This leads to net economic benefits of doubling the ratio of capital for Swiss banks in the order of 7% of the current level of GDP.

Table 9: Net cumulative GDP benefits of doubling the capital ratio of Swiss banks under different assumptions

Assumption	Net benefits
Benchmark: Junge and Kugler (2013)	12.0%
1) Cumulative discounted losses due to a banking crisis equal to 158% of pre-crisis GDP (i.e. the median across crises that have a permanent effect). In the benchmark this figure is 360%.	4.7%
2) Impact on the steady-state GDP level equal to 0.3% (i.e. the IIF (2010) estimate). In the benchmark this figure is 0.05%.	7.0%
3) Assumptions 1) and 2) together.	-0.3%

Table 9 summarizes the results of our sensitivity or robustness check analysis. It includes the benchmark net benefits as estimated by Junge and Kugler (2013). It also includes the results when the cumulative discounted losses due to a banking crisis is reduced to match the median across crises that have had a permanent effect on the level of GDP, when the impact of doubling the capital ratio on the steady-state GDP level is set to match the estimates by IIF (2011), and the combination of these two assumptions.

Economic benefits are only offset by economic costs under the more conservative set of assumptions, although by a small margin. Indeed, a net economic benefit of minus 0.3% is obtained when we assume very conservative economic benefits and rather extreme economic costs. If we assume parameters that are more plausible for the Swiss economy, then Junge and Kugler's conclusion that there are net economic benefits of doubling the capital ratio for Swiss banks will hold. Overall, our sensitivity analysis suggests that heightened capital requirements for Swiss banks would entail more economic benefits than costs.

The Leverage Ratio

So far, this report has only considered the impact of additional capital requirements, based on risk weighted assets. But a minimum leverage ratio (computed on the basis of un-weighted assets) is an important element of the new regulations. The Basel Committee is indeed planning to introduce a 3% minimum leverage ratio[23], computed as the ratio of Common Equity Tier 1 (CET1) over the sum of total assets and some measure of off-balance sheet exposures. This is intended as a complement to the standard capital ratio, which is computed as the ratio of CET1 over the sum of risk-weighted assets. The US regulators are also currently discussing the possibility of introducing such a Supplementary Leverage Ratio (SLR), at a higher level[24] (5 or 6%) than Basel III, but with a more favorable treatment of derivatives and off-balance sheet positions than what the BCBS[25] does. Finally, two Swiss political parties have recently introduced motions supporting, among other things, a high level (6% or 10%) minimum leverage ratio for Switzerland.

This section examines in detail the arguments put forward in favor of the compulsory leverage ratio. We start with some empirical evidence on Canada, where such an un-weighted leverage ratio has been in place for more than 30 years.

Evidence from Canada

Since the early 1980s, the (un-weighted) leverage of every Canadian bank has to be above a regulatory minimum. This minimum was initially set at 30 (corresponding to a leverage ratio[26] of 3.33%). It was reduced at 20 in 1991 and then increased to 23 in 2000, subject to certain conditions[27]. In his remarks to the 19 November 2008 meeting of the Canada-United Kingdom Chamber of Commerce, Mark Carney, then Governor of the Bank of Canada, expressed the view that Canadian banks were "healthier than their international peers" because "their leverage was markedly lower".

It is true that before the implementation of this regulation, Canadian banks were highly leveraged, as suggested by the following chart, taken from Bordeleau et al (2009). However the same result could have been obtained by increasing the capital requirements based on a classical (risk weighted) capital ratio. As we discuss below, the un-weighted leverage is a very poor measure of riskiness for banks.

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23 Banks wil have to publish it as of 2015 but the minimum of 3% will only be requested as of 2018.

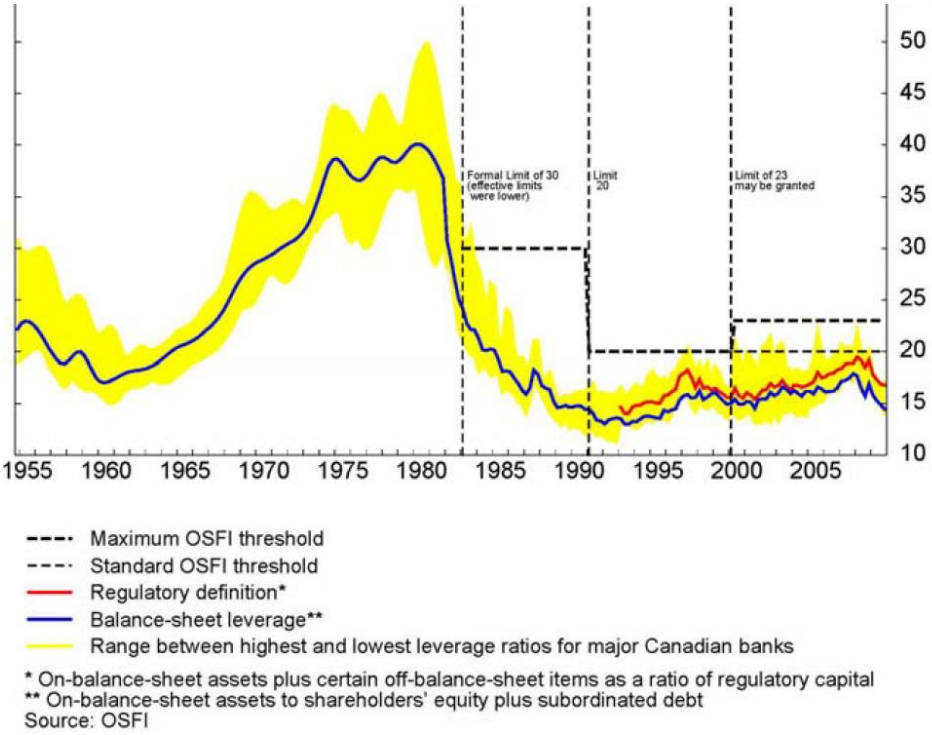
24 The FDIC justifies this policy proposal with the fact that, if a 3% leverage ratio had been in place in the run up to the GFC, it "would not have appreciably mitigated the growth in leverage of US SIFIs" (FDIC Press release, 9 July 2013).

25 The impact of this proposal on US banks is discussed below.

26 In conformity with academic practice, and contrarily to what Bordeleau et al (2009) do, we call leverage the quantity assets over equity, and leverage ratio the inverse of this quantity (i.e. equity over total assets). A máximum leverage of 30 corresponds thus to a mínimum leverage ratio of 3.33%. This convention allows a direct comparison between leverage ratios and capital ratios (computed as equity over risk weighted assets).

27 Details can be found in Bordeleau et al (2009), who suggest that this regulation might explain, among other factors, the better resilience of the Canadian banking system to the GFC.

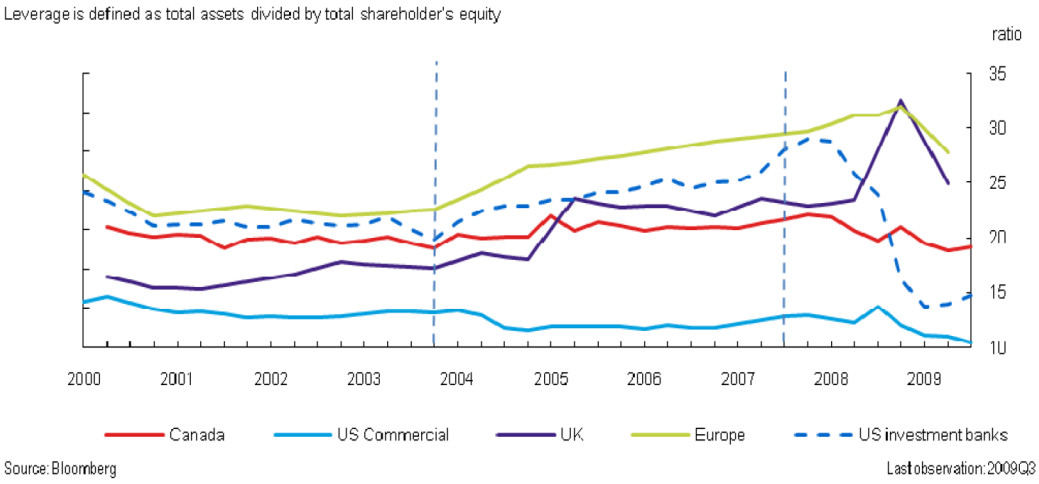
Figure 3: Leverage of major Canadian banks (from Bordeleau et al., 2009)



Using data provided by OSFI, the Canadian Supervisory agency, Bordeleau et al (2009) also provide the following chart for the more recent period 2000-2009, showing the large variability of banks' leverage in some OECD countries, as opposed to the remarkable stability of the Canadian banks' leverage. This suggests that risk weights are very volatile, and may not always reflect accurately the risks taken by the banks. This inaccuracy of risk weights, as well as some underestimation of risks by credit rating agencies seems to have played a big role during the 2007-09 crisis. Some commentators fear is that banks may still take a lot of risks even if complying with the increased capital requirements of Basel III. By construction, a Leverage Ratio is not sensitive to risk assessments, since its weighs all assets equally[28].

[28] However the LR can vary widely across jurisdictions, due to different accounting standards.

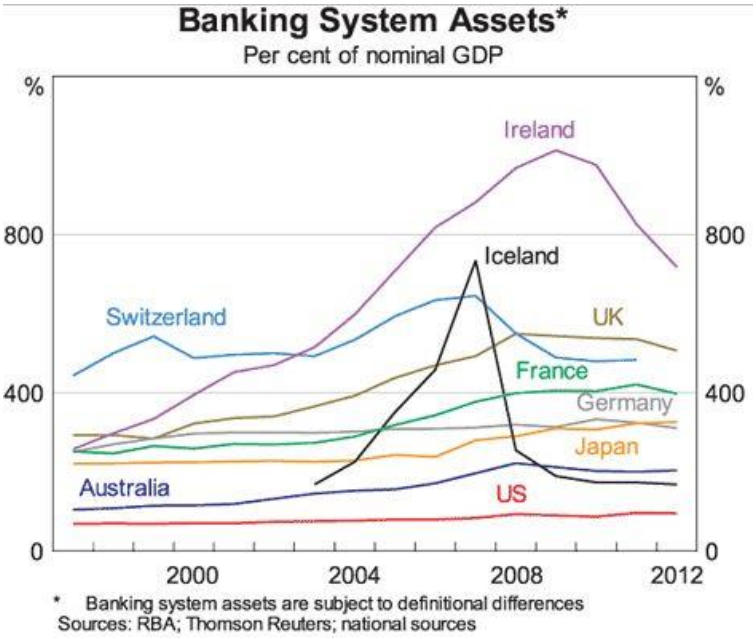
Figure 4: Comparing leverage in different jurisdictions (from Bordeleau et al., 2009)



Arguments put forward to support a higher leverage ratio in Switzerland

Argument 1: Swiss banks are still undercapitalized

Motion 13.3744 by the SP demands an increase of the un-weighted leverage ratio to 10 percent, on the grounds that expert studies, such as Junge and Kugler (2013) have shown that the social cost of increasing capital requirements for Switzerland is likely to be small (at least in the long run), while the social benefits (in terms of increasing financial stability) are likely to be very large. The SP considers that Basel III and the Swiss Finish have not gone far enough, and that Swiss banks are still insufficiently capitalized. Switzerland is indeed one of the countries where the ratio of banks assets to GDP is the highest (see figure below).



In April 2008, Mario Draghi, then chair of the Financial Stability Forum stated in his address to the G7 ministers and Governors "Our conviction is that [...]institutions have accumulated a level of leverage that was both misperceived and excessive" (see Hildebrand, 2008, p. 3). There is a wide spread view, both among the general public and among influential academics such as Admati and Hellwig (2011), that regulators have not gone far enough in their reforms and that banks leverage should be reduced further.

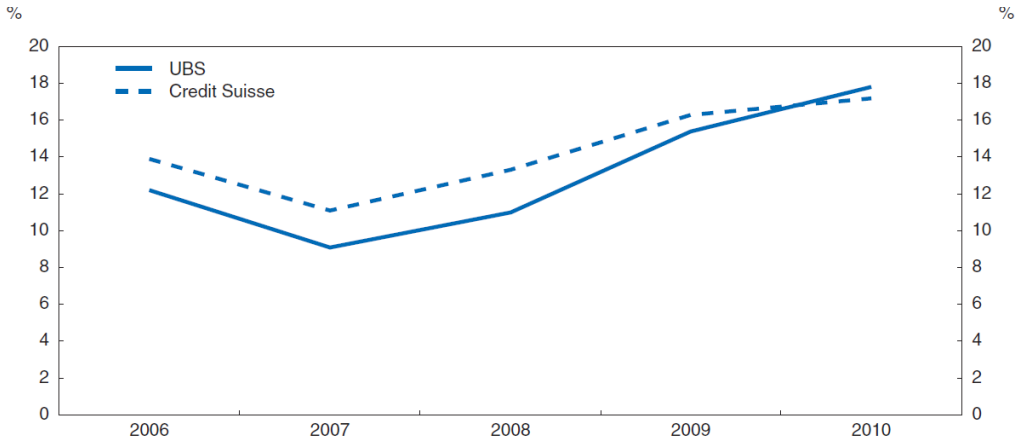
Argument 2: Risk weights underestimate risk

There is also a general sentiment of distrust in the risk weighted approach promoted by Basel II. A good illustration is given by a famous episode of the Northern Rock saga. On June 29, 2007, the British FSA allowed Northern Rock to use Basel II's advanced approach for its risk weight computations. Consequently, the risk weight on Northern Rock's mortgage portfolio was reduced from 50% to 15%. As a result, Northern Rock's capital became well in excess of regulatory requirements and Northern Rock was able to distribute fat dividends to its shareholders, a few weeks before being forced to ask for public support by the Bank of England and the UK Treasury (see Shin, 2009).

A recent IMF study (Le Leslé and Avramova, 2012) shows the huge variations in the calculations of risk-weighted assets across banks and jurisdictions. These huge variations may reflect idiosyncratic components of risk, but they are more likely due to the very imperfect way in which these weights are computed, the effectiveness of regulatory arbitrage in some jurisdictions and some degree of supervisory forbearance. Le Leslé and Avramova suggest some ways to fix these problems and improve the use of risk-sensitive capital ratios.

In the case of Switzerland, a recent OECD study (OECD 2012) shows that the two biggest banks have been able to comply rapidly with the higher risk weighted asset ratios (see table below) required by the Swiss Finish.

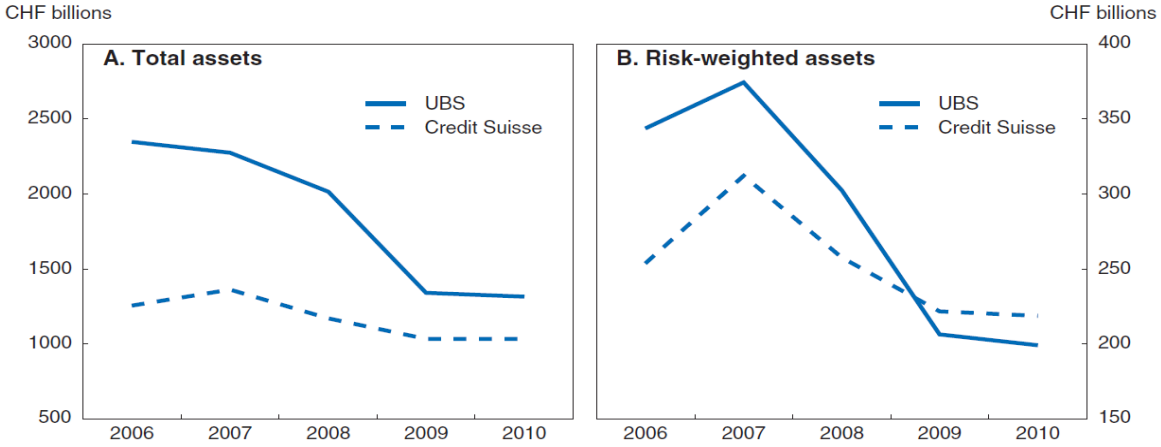
Figure 5: Capital Adequacy Ratio of Swiss Big banks (OECD 2011)



Source: Annual Reports of UBS and CSG.

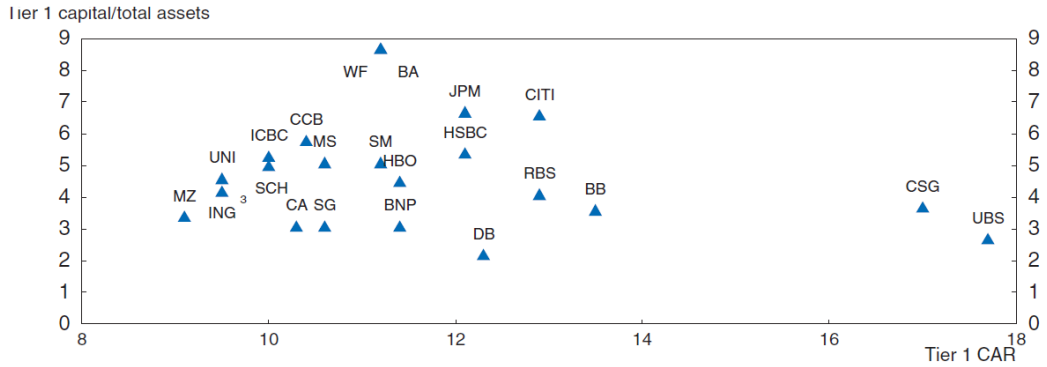
The same OECD study also shows that the reduction in risk-weighted assets is larger than the reduction in total assets:

Figure 6: Swiss big banks' total and risk-weighted assets (OECD, 2011)



In fact the OECD study expresses concerns about the high leverage of the two biggest Swiss banks, as compared with international banks of similar size. The table below suggests that these two banks are outliers among global banks.

Figure 7: LR and CR for major international banks (OECD 2011)

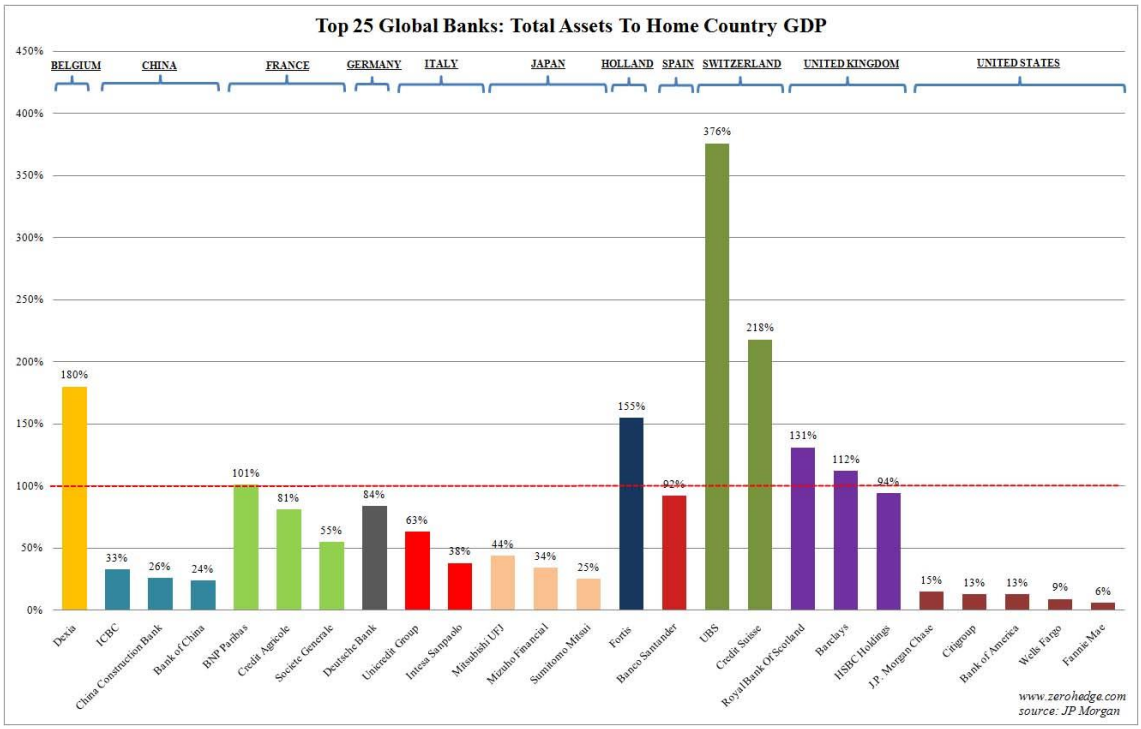


1. Banks' acronyms are the following: BA, Bank of America Corp.; BB, Barclays Bank; BNP, BNP Paribas; CA, Crédit Agricole Group; CCB, China Construction Bank; CITI, Citigroup; CSG, Credit Suisse Group; DB, Deutsche Bank; HBO, HBOS; HSBC, HSBC holdings; ICBC; ING, Ing Bank; JPM, JP Morgan Chase and Co.; MS, Mitsubishi UFJ Financial Group; MZ, Mizuho Financial Group; RBS, Royal Bank of Scotland; SCH, Santander Central Hispano; SG, Société Générale; SM, Sumitomo Mitsui Financial Group; UBS; UNI, Unicredit; WF, Wells Fargo and Co.
2. Data refer to the fiscal year from March 2009 to March 2010 for Japanese banks.
3. 2009 for tier 1 capital/total assets.

Source: Bureau van Dijk, *Bankscope Database*.

Argument 3: Swiss banks are still too big for the size of the Swiss economy

Motion 13.3740 by the SVP proposes new measures in order to curb the TBTF problem for Switzerland. The huge losses incurred by UBS and to a smaller extent by Credit Suisse during the Global Financial Crisis have even generated worries that the largest Swiss banks might be in fact "Too Big to Save"[29]. The SVP thinks that these problems are a matter of national security. He proposes a Supplementary Leverage Ratio of 6%[30]. The following chart shows that the ratios of Assets to GDP for Swiss global banks are still very big, as compared with their international counterparts.



Source: Zerohedge, 2010

[29] See Bertay, Demirgunt-Kunc and Huizinga (2013)

[30] The SVP also proposes to separate investment banks and commercial banks, a topic which is outside the scope of this study.

The impact of a leverage ratio

The starting point of our analysis is the simple remark that a leverage ratio is nothing but a particular case of a weighted capital ratio where all assets are weighted equally.

Computing the total assets of a bank is a meaningful accounting exercise, but from a risk management perspective, it amounts to adding apples and oranges. An investment in a Swiss Government bond does not generate the same risk as an investment of the same amount in a Japanese corporate bond. Capital buffers for different lines of business should reflect the relative risks of these different lines of business.

In Rochet (1993)[31], I provide a theoretical analysis showing that banks portfolio choices can be severely distorted if regulatory weights differ from market assessments of risk, which are normally in line with equilibrium excess returns. Risk-weights, even if they are imperfect, are supposed to reflect these market assessments of risks.

The model suggests that severe distortions can occur if the Leverage Ratio is binding, even leading sometimes and somewhat paradoxically, to a higher probability of failure for the banks. The intuition for this result is very simple. The portfolio choices of banks among different assets are determined by the ratios of expected returns (in excess of the riskless rate) over regulatory capital charges. These ratios express the expected net return of an asset per unit of regulatory capital. When capital charges are risk based, banks' portfolio choices reflect the risk return trade-off, even if risk weights are imperfect. By contrast, when capital charges are the same for all assets (as with the leverage ratio), banks' portfolio choices reflect exclusively the expected returns. Therefore if the leverage ratio is binding, banks will reduce their involvement in relatively safe activities such as investments in government bonds or Securities Financing Transactions like reverse repos (because the net returns on these activities are small) and invest more in riskier activities that provide a higher yield.

Hildebrand (2008) gives a regulator's perspective about the pros and cons of a leverage ratio (LR) as opposed to a risk weighted capital ratio (CR). In line with Rochet (1993), he states that "risk-weighted capital requirements... remain the most rigorous way to address banks' tendencies to incur excessive risks". However, he also recognizes that "we must address the serious shortcomings of the risk-weighted approach, which have become so powerfully manifest during this crisis" and that we need a "safeguard to provide the financial system with additional protection against the negative consequences of these short-comings". This is the role of the LR.

[31] Blum (2010) provides a thoughtful theoretical analysis of the potential role of a LR (combined with a CR) when regulators have limited information about banks' portfolio choices.

The respective roles of the capital ratio and the leverage ratio

Thus, under normal circumstances, imposing a minimum risk weighted capital ratio is a good way for regulators to limit the risk taken by banks. However, there are special circumstances, which could be idiosyncratic to one institution or global, under which risk models do not work very well and risk weights computed on the basis of these models are misleading. In such circumstances, banks may be tempted to exploit these errors in risk assessments in order to take excessive risks. What is required to avoid this scenario is a prompt corrective action by supervisors[32]. A useful analogy is with the counter cyclical capital buffer, which may be activated when aggregate indicators such as the credit to GDP ratio indicate large deviations from a "normal situation" on the credit market. Similarly, a sudden increase in the leverage of a bank and a large deviation between the LR and the CR (indicating that something is going wrong in the average risk weights of the bank's portfolio) can be an indicator of abnormal decisions by the top management of the bank.

Therefore the leverage ratio should be used as an early warning indicator of potential problems building up within a bank, rather than a basis for computing capital buffers in normal circumstances. This is in the spirit of the third "fundamental principle for reforming prudential regulation of banks" that I put forward in Rochet (2010)"The formulation by the regulator of simple and observable criteria that would define the conditions under which the supervisor should intervene. These criteria have to be simple enough to be assessed externally, and subsequently verified by a parliamentary control commission" (Rochet 2010, p. 103). Using the terminology of Basel II, a capital ratio belongs to pillar 1, whereas a leverage ratio belongs to pillar 2.

The problem is that some regulators, such as BAFIN[33], consider the LR as an element of the first pillar: namely they want to use it to control portfolio decisions of banks on a regular basis.

This is worrying; a recent note published by the US Financial Industry (The Clearinghouse 2013) assesses the impact of the SLR by using data submitted by the eight U.S. SIFIs for 2Q2103. Four different scenarios are studied, according to the level of the SLR (3% or the new US proposal of 5-6%) and the exposure definition (US or revised Basel III). The analysts estimate that, based on these current data, a 3% SLR would be not be binding for any of the US SIFIs (irrespective of the exposure definition). By contrast a SLR at 5-6% level would be the binding constraint for 23 % of total U.S SIFIs assets under the U.S. exposure definition and for 67% under the Basel III exposure definition. These findings suggest that, at least in the U.S. in 2Q2013, the SLR under the current Basel III calibration (i.e. 3%) would have worked as a backstop for prompting regulatory intervention, whereas a higher threshold had become the binding constraint for portfolio allocation for many banks in the sample.

[32] We use the vocabulary introduced by the U.S. Federal Deposit Insurance Corporation Improvement Act.

[33] See Becker and Newton (2013).

CONCLUSION

Deciding on the minimum capital requirements that banks have to satisfy is very complex. In spite of their merits, all the recent impact studies (either coming from regulators, practitioners or academics) suffer from serious methodological problems. Public authorities have to make their decisions on the basis of judgment rather than truly scientific recommendations by experts. This is why the concerns that Swiss banks might still be undercapitalized in spite of the Swiss Finish and that the biggest banks might still be Too Big to Fail (or even Too Big to Save) must be taken seriously.

However the respective roles of the CR and the LR must be well understood. The LR is there to prompt regulatory intervention. It is not the appropriate instrument to influence banks' portfolio choices on a regular basis, since it does not reflect differences in assets' risks. If the Swiss public authorities are still worried about the Too Big to Fail Problem, they should improve risk management protocols and in particular make resolution procedures safer and more transparent.

Using the leverage ratio for managing the TBTF problem is completely inappropriate. What is important is to give to the supervisor the power and the obligation to intervene before it is too late, in the spirit of the Prompt Corrective Action doctrine. The Too Big to Fail problem is an unavoidable consequence of the evolution of financial markets. Like Mark Carney (quoted by John Gapper in his FT article of October 30th, 2013), I believe that "It is not for the Bank of England[34] to decide how big the financial sector should be. Our job is to make it safe".

Thus public authorities should provide the regulator with the power to curb any excessive risk taking by large and complex financial organizations, and also the obligation to intervene early enough. The LR ratio is an important element of this early intervention system but crisis managements instruments such as special resolution procedures, especially for Global SIFIS, are probably equally important for limiting systemic risk.

[34] Or, we believe, of any other regulator.

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Swiss Finance Institute
Walchestrasse 9
8006 Zurich

Knowledgecenter@sfi.ch

www.SwissFinanceInstitute.ch/whitepaper