THE GREEN SUPPORTING FACTOR

Quantifying the impact on European banks and green finance

Executive Summary

In the context of mobilising policy actions with regard to sustainable finance, the European Parliament and Commission are considering introducing a Green Supporting Factor (GSF) or Brown Penalty (BP) for capital reserve requirements.

The policy initiative suggests the introduction of a GSF or BP may support capital allocation that is consistent with EU climate and sustainability objectives. This paper seeks to estimate the potential impact that such a policy intervention may have both on capital reserves of European banks, as well as the cost and availability of capital to 'green' and 'brown' investments.

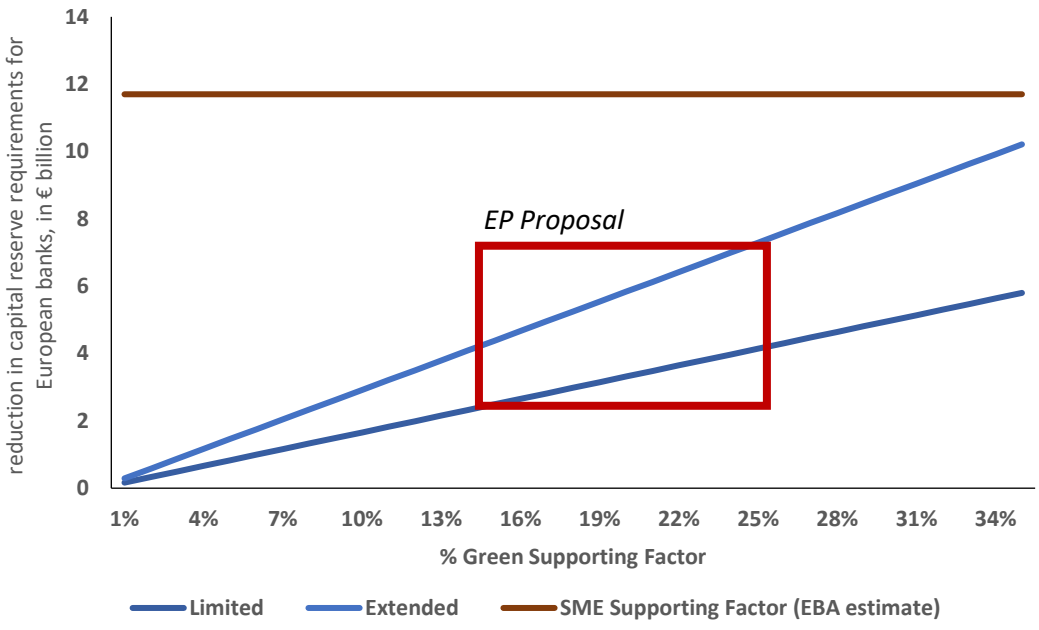
Regarding the effect on overall capital reserve requirements of banks, the analysis suggests that a Green Supporting Factor would have an overall limited effect if compared to the SME supporting factor.

The estimated effect is a reduction in capital requirements associated with a GSF of around €2-4 billion based for a limited definition and €5-8 billion for the expanded definition. In absolute terms and even under an expanded application, the total 'capital savings' related to the introduction of a GSF would likely be significantly lower than those identified in response to the SME SF, estimated by the EBA in 2016 at about €12 billion.

A brown penalty through strengthening capital reserves may have a more noticeable impact on investments in high-carbon assets.

Assuming a similar capital adjustment than for the GSF (15-25%), the simulated effects are in the ranges of €8-13 billion additional capital requirements for a limited application and €14-22 billion for an expanded application. Even stronger adjustments, such as 50% could lead to a €27-44 billion penalty. The main reason behind the stronger effect is the larger universe of high carbon assets compared to green assets on which such a penalty would be applied.

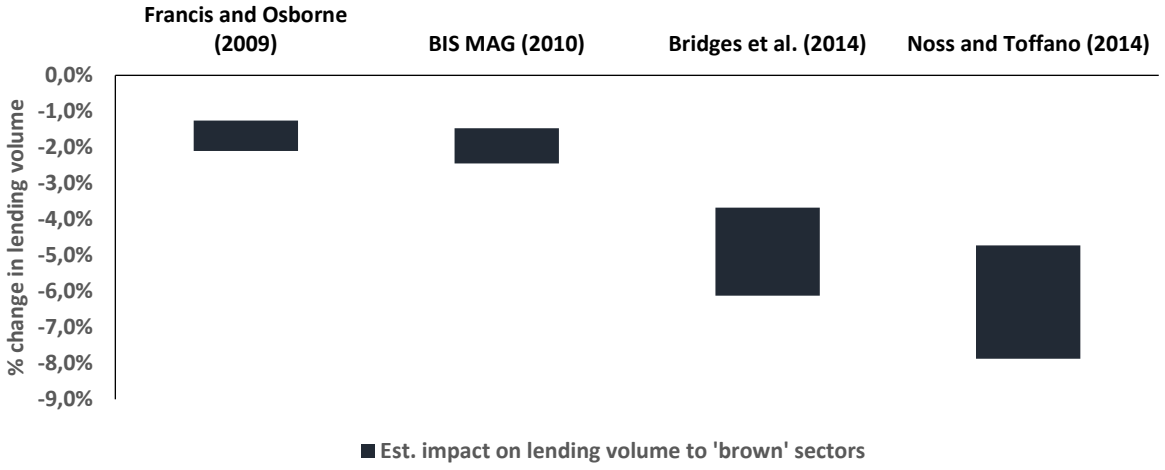
Figure 0.1: Estimated impact of a Green Supporting Factor on additional capital available to European banks (Source: Authors)



The economic analysis in turn suggests a potential positive impact on cost of capital for green investments for a GSF and a potential reduction in lending to brown assets for the BP.

The estimates suggest a reduction in the cost of capital of 5 to 25 basis points for green projects (with inverse expected effects for a Brown Penalty). This figure compares to first empirical evidence for a green premium of Green Bonds, which is estimated to be of a similar magnitude.[1] In absolute terms, an adjustment of 5-25 basis points, while meaningful, is unlikely to fundamentally change the financing conditions for green assets and their attractiveness. To put this number into context, the range of the weighted average cost of capital – expressed in basis-points – for onshore wind projects in Europe is around 900 basis points. In terms of availability of capital, analysing a Brown Penalty suggests a potential reduction in lending to brown assets of up to 8%.

Fig. 0.2: Estimated impact of a Brown Penalty on lending volume to 'brown' assets (Source: Authors)



A significant challenge remains in defining 'green assets' as well as "high carbon" assets.

Suggestions for the GSF include the application of definitions such as those used by the Climate Bonds Initiative (CBI). However, these only cover definitions related to 'real' assets, not 'financial assets', which limits their application to companies as a whole. Moreover, there are a range of accounting challenges for physical assets. Thus, in order to reach the more significant 'expanded' application, a taxonomy of not just physical, but also financial assets is needed. Examples could include companies that have committed (and adhere to) science-based targets, as defined by the Science-based targets Initiative or the Sustainable Energy Investing metrics project, funded by the EU H2020 programme.

Similarly, for "high carbon" assets there is no consensus on one taxonomy, although the taxonomies that do exist tend to more directly respond to financial assets. Examples are the environmental risk classification by Moody's, or the models applied by the Sustainable Energy Investing metrics project. Where it becomes particularly challenging is identifying 'brown assets' in high-carbon sectors with no clear transition pathway – notably industry and non-road transport – although a simple short-term solution would be to exclude them.

[1] See Ehlers et al. (2017)

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1. Introduction

In the context of mobilizing policy actions on the topic of sustainable finance, the European Commission is currently exploring introducing a Green Supporting Factor (GSF).

The European Commissioner V. Dombrovskis has argued for reducing capital charges on green financial products. Specifically, in a speech at the One Planet Summit, he argued:

> *"To incentivise lending, we are looking positively at the European Parliament's proposal to amend capital charges for banks to boost green investments and loans by introducing a so-called green supporting factor. This could be done at first stage by lowering capital requirements for certain climate-friendly investments, such as energy-efficient mortgages or electric cars. We could model it on existing capital requirement adjustments for investments in SMEs or high-quality infrastructure projects."*[2]

The proposal by the European Parliament specifically would reduce risk weights on green investments by 25% for investments below €1.5 million and by 15% for the portion exceeding €1.5 million.[3]

The determination of what qualifies as green investment should according to the proposal be based on the Climate Bonds Initiative's definition. The GSF would not be combined with other supporting instruments. The discussion to date has focused on the 'green supporting factor' logic proposed by the European Parliament and endorsed by the Commissioner, although some think tanks[4] and NGOs[5] have also argued for a 'brown penalty' on high-carbon assets. Here the logic is the inverse of the green supporting factor, where 'brown' (i.e. high-carbon) assets are penalized with a higher risk-weight.

The paper is organized as follows.

Section II provides background on the capital reserve requirements framework, the potential logic of adjusting the framework by introducing a 'green' or 'brown' factor, and the broader empirical analysis as to the potential effects of such adjustments (not specific to the GSF or Brown Penalty). Section III then seeks to quantify the potential absolute changes in capital among European banks as a result of introducing a GSF or Brown Penalty. Section IV translates these effects into potential changes to basis points and changes in lending. Section V provides some concluding remarks.

[2] See European Commission (2017)
[3] See Sustainabonds (2017)
[4] See Boot & Schoenmaker (2018)
[5] See Finance Watch (2018)

2. Capital reserve requirements and policy

The capital reserve requirements framework forms part of the Basel III Accords and in Europe is implemented via the Capital Requirements Directive (CRD) IV for banks.

The rules for insurance companies are regulated through Solvency II. Capital reserve requirements involve the following levers. The amount of capital financial institutions need to hold is a function of the 'riskiness' of the assets on their balance sheets. Each asset is given a 'risk-weight' that determines how much of it is counted when calculating capital reserve requirements. For example, a sovereign bond from the United States or Germany – both with a AAA rating – have a risk weight of 0%. By extension, they are considered to have zero risk and thus require no capital whatsoever. A sovereign bond in turn with a below B- rating has a risk weight of 150%.[6]

Once the risk weight is determined, the second lever is determining the amount of capital that needs to be held against that instrument. Pillar 1 of Basel III governs this, defining a minimum amount of capital of 4.5% of risk-weighted assets, as well as an additional capital conservation buffer of 2.5%. Pillar 1 also covers a countercyclical buffer that can be imposed in times of credit expansion of 0-2.5% of risk-weighted assets.

In addition to the standard framework, the Basel Accords provide financial supervisory authorities under Pillar II with additional leeway to adjust capital reserve requirements for individual financial institutions based on individual risk profiles, internal risk management frameworks, and potential concentration risk. One area where this supervisory discretion is applied for example is in the form of additional constraints placed on so-called Systemically Important Financial Institutions (SIFIs).

One reason for introducing the green supporting factor would be based on the logic that 'climate-related risks' are mispriced.

In this logic, an adjustment of the risk-weight would seek to 'correct' for this mispricing. It could either operate by reflecting a lower than anticipated risk of green assets or a higher than anticipated risk of 'brown' (i.e. high-carbon) assets. Based on the pros-cons described below, this objective is likely one that does not seem appropriate for further policy action in this case, given the caveats around the evidence related to the mispricing of risks.

> *Pro: Assuming that such a mispricing did exist, the green supporting factor would simply correct a market failure and thus in theory improve the efficient intermediation of capital, without negative effects on financial stability.*
>
> *Con: There is no meaningful empirical evidence that climate-related risks are indeed mispriced.[7] The literature that does exist simply shows that there are risks (e.g. CTI, Oxford, CISL, Mercer, CO-Firm, CarbonDelta), not however whether these risks are mispriced or not in financial markets. Indeed, in some respects proving mispricing is impossible – which is the reason that supervisors have very limited input – usually in the form of high-level statements – on the mispricing in specific asset classes, not to speak of specific assets. While there is some theoretical evidence of such mispricing,[8] it is likely not sufficient to justify a regulatory intervention.*

[6] See BCBS (2006)
[7] See Griffin et al (2015)
[8] See Thomä & Chenet (2017)

Another objective of the green supporting factor may be to respond to potential concentration risk.

This objective could be implemented either in the context of the countercyclical buffer (Pillar 1) in the form of a penalty on 'brown' assets or under Pillar II. This factor could also be applied under Pillar II, either as a non-asset specific additional capital requirement in response to elevated 'climate-related' concentration risk, in response to evidence of poor climate-related risk management practice, or a reduction in additional reserve requirements in response to evidence of positive 'diversification effects' (these could also be coupled with diversification effects defined in terms of a green-brown ratio).

> *Pro: This objective would strengthen the stability of financial institutions, without necessarily having to take a view on specific assets and their market, credit, or operational risk.*
>
> *Con: Using this approach with a green supporting factor may be difficult since in order not to contravene Pillar 1 minimum requirements, it could only be applied on any additional capital reserve requirements imposed on a financial institution. Moreover, the logic of diversification benefits for credit portfolios is not intuitive, indeed with some literature suggesting that banks with more concentrated credit portfolios perform better across a range of financial metrics (obviously only under the assumption that the concentrated exposure doesn't become a liability). Diversification thus may only be interesting from the perspective of a banks' equity exposure, where these benefits do exist. Exposures here however are generally marginal.*

The third objective may be simply policy driven, without a reference to risk frameworks.

In this case, any of the type of instruments described above could hypothetically be applied, although a specific focus needs to be placed on the question of whether the policy instrument achieves the desired outcome.

> *Pro: The instrument can be designed in a way that is directly focused on the policy objectives. Given the relative size of 'green instruments' in the market – at least currently – the intervention is likely to be relatively constrained. Role models for this policy intervention exist in the case of the 'SME supporting factor' in Europe and preferences for export finance in the Basel frameworks themselves.*
>
> *Con: This objective injects an external factor into a framework designed – at least in theory – exclusively to govern aspects of financial stability. The policy instrument thus risks diluting the original objective of the framework and potentially be relatively less focused compared to more direct industrial policy interventions.*

The objective related to concentration risk or policy objectives appear as the only two that could sensibly be explored further.

A few role models exist for related policy actions, the most prominent being a 'SME support factor' introduced in 2014. A capital discount of 0.7619 was introduced in January 2014. The European Banking Authority estimates that the within the by the third quarter of 2015, the total minimum required capital has been reduced by ~€11.7 billion[9]. These are only short term observed effects, and it remains to be seen if there are stronger effects to be observed in the medium term. A similar policy instrument is already reflected in the Basel III accords focusing on export finance.

[9] See EBA (2016)

The evidence of the impact of these policy instruments is mixed.

Analysis by the European Banking Authority (EBA) from March 2016 found "no evidence that the SME [Supporting Factor] provided additional stimulus for lending to SMEs." Analysis by the Banco de España from January 2017 in turn found some evidence of impacts for medium-sized enterprises, albeit not for micro/small firms. The Banque de France in turn analysing data for France and Germany found that the SME Supporting Factor is consistent with the estimated significantly lower systematic risk of SMEs in France and Germany relative to large corporates.

Beyond specific analysis, there is significant literature on the effects of capital reserve requirements.

Credit rating agencies, such as Moody's, have warned that a GSF could weaken banks as the real risks associated with green investments may not be lower than for traditional investments, pointing to immature technologies as well as regulatory and policy risk.[10]

In terms of economic effects, the paper seeks to explore the potential effects the cost and availability of capital for both 'green' and 'brown' investments. The paper here uses four empirical studies of effects on basis points (Slovik and Cornede 2011, Baker and Wurgler 2013, BCBS 2010, King 2010, Kashyap et al. 2010). The key differences between these studies is the geography, type of intervention, and time series of the analysis. Another difference is that the studies take different assumptions on whether the Modigliani-Miller irrelevance theorem holds. The table below summarizes the results.

Table 2.1: Estimates for changes in lending rates due to a one percentage point increase in capital requirements (Source: Martynova et al. 2015).

Study	*King (2010)*	*BCBS (2010)*	*Kashyap et al. (2010)*	*Slovik and Cournede (2011)*	*Baker and Wurgler (2013)*
Effect on lending rates, basis points	15	13	2.5-4.5	14.4	6-9
Modigliani-Miller assumption holds	No	No	Yes	No	Yes

In addition to looking at basis points, the analysis will also draw on the empirical literature of changes to lending volume.

Specifically, the focus is on estimates identified in Francis and Osborne (2009), BIS MAG (2010), Bridges et al. (2014) and Noss and Toffano (2014). Here, the studies informing further analysis on this paper were limited to those looking at lending reduction in percent specifically, rather than other studies looking at credit growth reduction (Ajyar et al. 2014, Messonier and Monks 2014).

Table 2.2: Estimates for lending reduction due to a one percentage point increase in capital requirements (Martynova et al. 2015).

Study	*Francis and Osborne (2009)*	*BIS MAG (2010)*	*Bridges et al. (2014)*	*Noss and Toffano (2014)*
Lending reduction, %	1.2	1.4	3.5	4.5
Sample	UK	15 countries	UK	UK
Period	1996-2007	-	1990-2011	1986-2010

[10] See Moody's (2017)

3. Potential capital implications of implementing a GSF or a 'brown penalty'

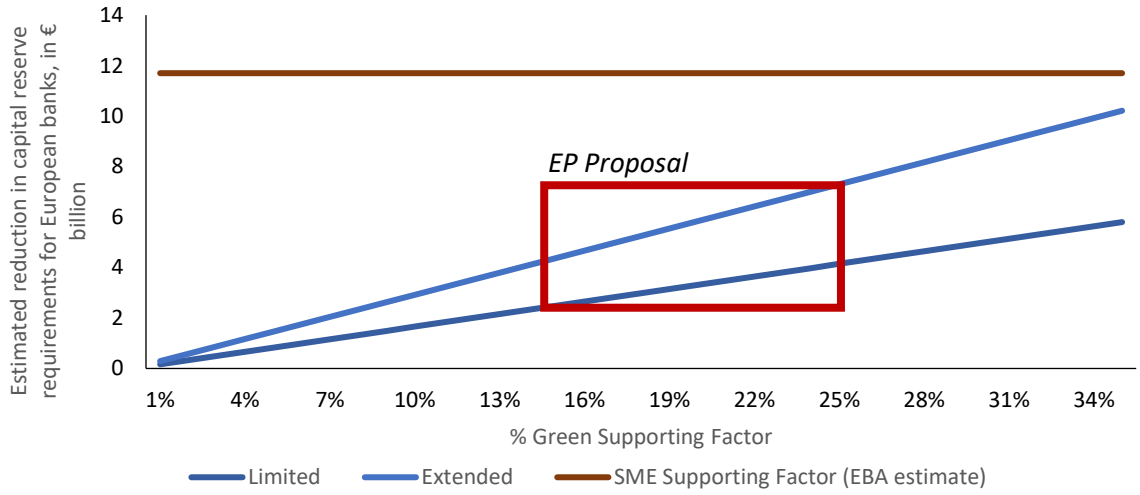
This section seeks to quantify the potential implications of implementing a green supporting factor or brown penalty for European banks. Annex 1 provides further background details on the methodology.

Based on current definitions (covering mortgages and hybrid & electric vehicle finance), the total impact of a green supporting factor in the range suggested by the European Parliament (15-25%) is estimated to be between €2-4 billion.

The risk-weighted value of these assets is estimated at roughly €244 billion,[11] implying a current total capital charge of €17 billion (assuming a 7% total capital charge).

Assuming the definition of 'green assets' could be meaningfully and appropriately extended to a broader suite of assets – the GSF generates between €5-8 billion in capital savings. This compares to around €12 billion in estimated capital savings for the SME Supporting Factor.

Figure 3.1: Estimated impact of a Green Supporting Factor on additional capital available to European banks (Source: Authors)



The alternative is instituting a brown penalty factor.

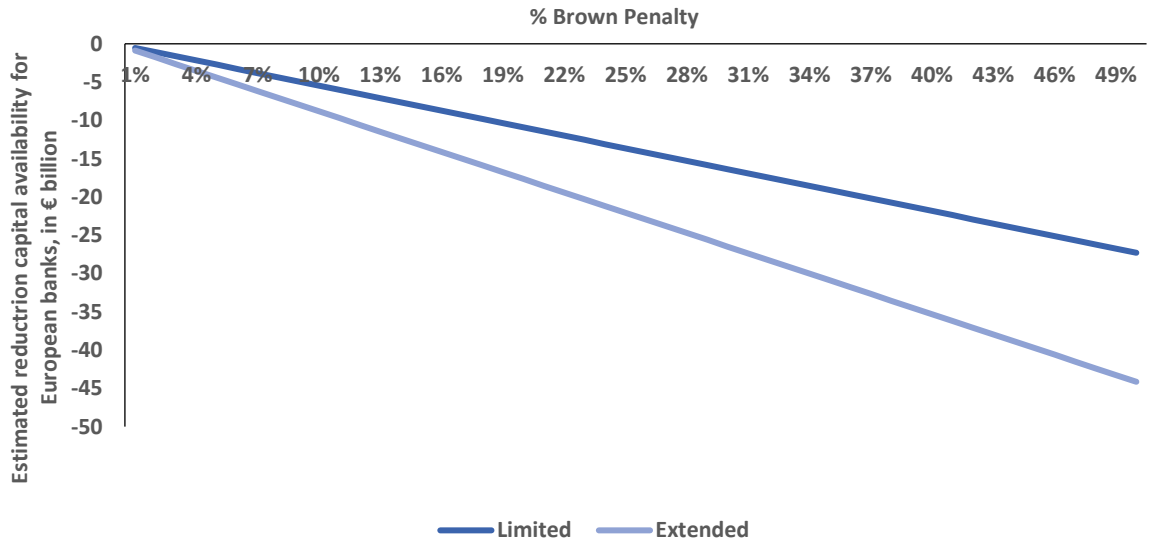
In order to estimate the potential effect of a brown penalty factor, two potential policy models were applied. The first policy model involves a 'partial' penalty, applied above a certain concentration threshold for high-carbon assets, set here at 5% in any individual asset class. In this iteration, a penalty is only applied to the part of the exposure that exceeds the 5%. The alternative is a 'total' penalty, applied to the entire high-carbon exposure.

[11] The estimates assume a 50% risk-weight on mortgages and a 100% risk-weight on consumer credit.

The results suggest that 'brown penalties could create total additional capital charges for the EU banking sector of up to €25 billion if the European Parliament proposal is reversed, and up to almost €40 billion if the penalty goes as high as 50%.

At a 25% increase in the risk-weight, these results would roughly align with an aggregate increase of 0.1% in the capital reserve requirements of banks. The analysis clearly demonstrates that 'brown penalties' are likely to have more pronounced capital effects than 'green supporting factors'. This is somewhat intuitive since the universe of brown assets – even given a partial application – is larger than the universe of green assets. Effects are thus more pronounced. The figure below shows the potential capital shortfall in € billion under various levels of 'penalty' applied either partially (limited) or totally (extended).

Figure 3.2: Estimated impact of a Brown Penalty on additional capital of European banks (Source: Authors)



Of course, here too a definitional issue may be a challenge.

There is no consensus on one taxonomy, although the taxonomies that do exist tend to more directly respond to financial assets. Examples are the environmental risk classification by Moody's, or the models applied by the Sustainable Energy Investing metrics project. Where it becomes particularly challenging is identifying 'brown assets' in high-carbon sectors with no clear transition pathway – notably industry and non-road transport – although a simple short-term solution would be to exclude them.

4. Estimated impact on lending volume and cost of capital

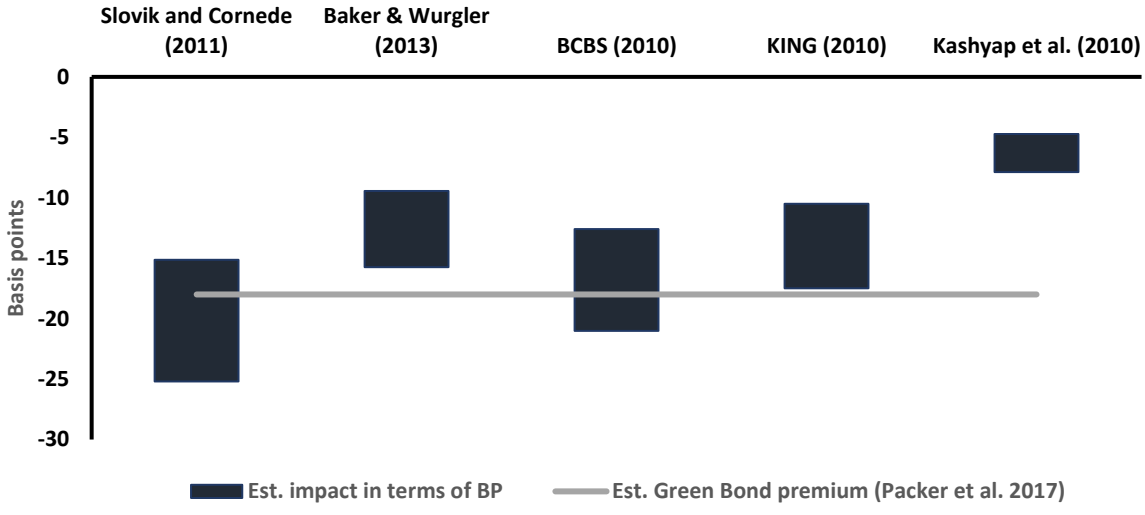
The associated question as to capital effects then of course is on the impact on the cost of capital and overall lending levels.

Forecasting such effects is notoriously difficult, given the myriad external effects influencing these levels and the non-linearity of the interplay between these factors. Nevertheless, such forecasts can build on a significant body of literature regarding the impact of changes on capital reserve requirements more generally. Here, these estimates are used to estimate the potential impact of a GSF on the cost (measured in basis points) and availability (measured in % changes in lending volume) of capital for green investments.

The literature on the impact of changes in capital reserve requirements suggest a GSF is likely to reduce the cost of capital for green projects by about 5-25 basis points, applying the factors identified in the literature.

The figure below summarizes these results, with the different estimates based on the factors from the literature. These estimates are based on the ranges implied in the academic literature in terms of the sensitivity of lending conditions on capital reserve requirements. Here, the 15%-25% adjustment in the risk-weighted assets is translated into an 'implied' adjustment of the level of capital reserve requirements. In other words, a 15-25% reduction in the risk-weight is the equivalent of a 1.05-1.75% reduction in the capital reserve requirement itself (from 7% to 5.25-5.95%, assuming a 100% baseline risk-weight). This reduction in basis points is at a similar level to the 'Green Bond Premium' identified in the literature (Ehlers et al. 2017).

Fig. 4.1: Impact of a Green Supporting Factor on the cost of capital for green assets (Source: Authors)



In absolute terms, an adjustment of 5-25 basis points, while meaningful, is unlikely to fundamentally change the financing conditions for green assets and their attractiveness.

To put this number into context, the range of the weighted average cost of capital – expressed in basis-points – for onshore wind projects in Europe is around 900 basis points. The analysis for a 'brown penalty' is then exactly the inverse, with a commensurate increase in basis points of around 5-25 basis points for brown assets.

Another potential impact may be on the lending volume.

Here, the analysis represents the estimated lending impact in terms of % change in lending volume, building on four analyses from the literature (Francis and Osborne 2009, BIS MAG 2010, Bridges et al. 2014, Noss and Toffano 2014). Interestingly, the literature does not suggest a one-to-one impact in all cases. Thus, a 1.05-1.75% increase in the capital reserve requirements implies a reduction in lending volume of roughly 1-8% to brown assets (Fig. below). The estimates apply the impacts identified in the literature generally to the specific issue of the Brown Penalty.

In absolute terms, the brown penalty would imply an 'implicit' aggregate increase in capital reserve requirements for European banks of around 0.1%. This in turn would imply an aggregate lending reduction in the economy of around 0.1-0.45%. Of course, such analysis would not consider any potential offsetting effects related to more stable balance sheets, which can have a positive impact on lending (Martynova 2015). While the results presented here are in terms of the Brown Penalty, they would seem identical assuming the inverse.

Fig. 4.2: Estimated impact of a Brown Penalty on lending volume to 'brown' assets (Source: Authors)

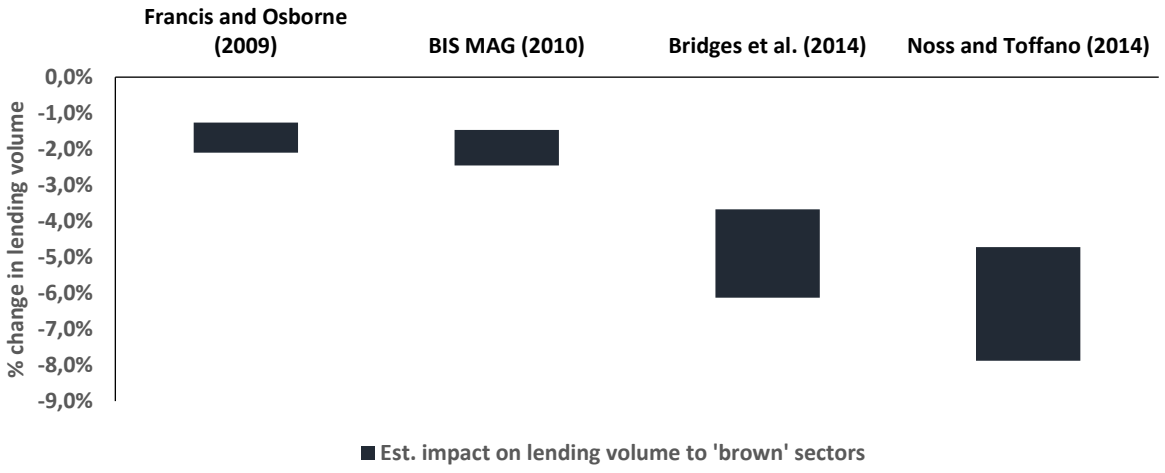
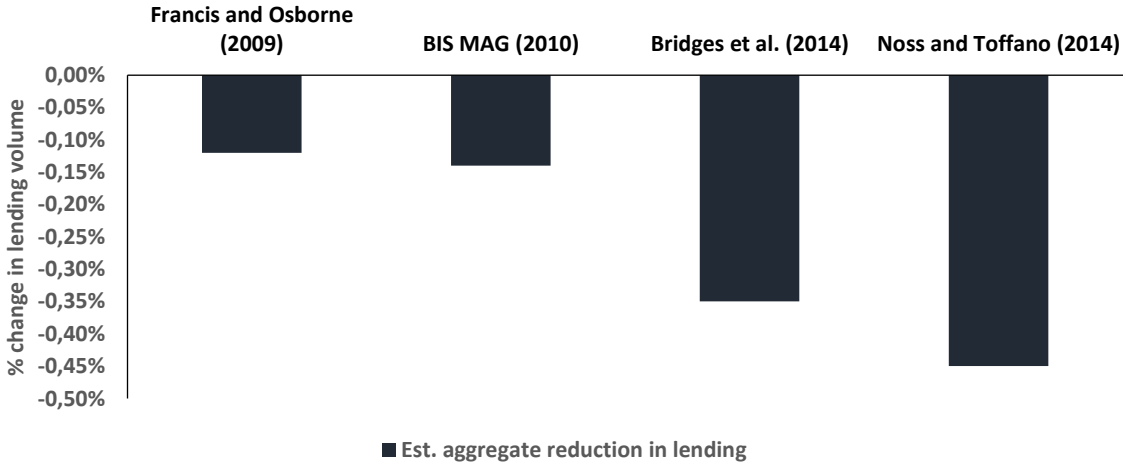


Fig. 4.3: Estimated impact of a Brown Penalty on overall lending volume (Source: Authors)



5. Conclusion

The objective of the working paper is to identify the potential impacts of introducing a GSF or a Brown Penalty.

The analysis did not seek to respond to the political question of whether or not it is appropriate to adjust the existing policy frameworks to serve a broader policy goal – namely 'green finance'. These questions are much broader than a simple cost-benefit or impact analysis and speak to the broader questions of the use of policy instruments for different purposes. Instead, this article seeks to identify what would be expected to happen – in terms of capital reserve requirements and lending trends – should these policy instruments be implemented. The results help inform on what impacts may be expected and whether these impacts are significant enough to justify a policy intervention

The analysis shows that a green supporting factor would unlikely significantly alter the current capital reserve requirements frameworks at least in the short term.

In absolute terms, the total 'capital savings would likely be significantly lower than those identified in response to the SME SF, even under an expanded application. The current proposals from the European Parliament and highlighted in speeches by EU Commissioner Dombrovskis suggest a more constrained application, where effects are estimated to be 66-82% lower than for the SME SF.

A brown penalty through strengthening capital reserves would similarly not be expected to have a negative impact on financial stability but would be expected to generate noticeable capital effects.

While this policy instrument enjoys higher support from the NGO community, it is also likely to see stronger resistance from the private sector. Thus, the European Banking Federation (2018) has expressed support for the Green Supporting Factor, but not for a Brown Penalty. Effects for individual financial institutions may of course differ significantly. The effects described in this paper are macro effects. Thus, some banks may not be affected at all by these adjustments, whereas other banks may be particularly exposed. The ultimate exposure will be a function both of the asset allocation of a bank across asset classes, but also between high-carbon and low-carbon financial instruments. Understanding potential distributional effects would require further analysis.

A significant remaining challenge is defining 'green assets'.

The suggested reference to the Climate Bonds Initiative (CBI) only covers definitions related to 'real' assets, not 'financial assets'. Thus, it can only be applied to project finance that exclusively targets the 'real assets' within the CBI categories or ring-fenced project bonds. The approach would thus disqualify 95% of green bonds. It would also not directly allow for application of companies that may be involved only in certain business segments, since the translation of 'assets' to business activities is not one-to-one. Moreover, there are a range of accounting challenges for physical assets. The emissions scandal in the automobile sector is one example.[12] Similarly, energy performance gaps also exists in the case of energy performance certificates for buildings in Europe.[13] Further research will be needed on this topic. Thus, in order to reach the more significant 'expanded' application, a taxonomy of not just physical, but also of financial assets is needed. Examples could include companies that have committed (and adhere to) science-based targets, as defined by the Science-based targets Initiative or the Sustainable Energy Investing metrics project, funded by the EU H2020 programme.

[12] See The International Council on Clean Transportation (2017)
[13] See Van den Brom et al. (2017)

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ANNEX 1: Methodology

Estimating shares of green and brown assets on banks' balance sheets

The first step of the analysis presented here is estimating the current 'green' and 'brown' assets on banks' balance sheets. This information was taken from the ECB Statistical Data Warehouse. The analysis excluded fixed, remaining, and external assets. The table below summarizes the estimated balance sheet by credit instrument for European banks.

The second step is then estimating the share of green and brown assets in each of these instruments. The proposal suggested by the European Parliament and Commission suggests a preliminary focus on mortgages and car loans. This suggests that only mortgages and consumer credit would be eligible.

Green vehicles and mortgages

Currently, hybrid and electric vehicles make up roughly 5% of global car sales currently, with a targeted growth to around 15% over the next five to ten years.[14] The composition of consumer credit in turn is somewhat uncertain, given lack of European data on this question.[15] Using US household debt data as a proxy however, excluding student loans which play a marginal role in European household debt relatively to the US, roughly 35%% of non-mortgage consumer credit can be linked to car loans. Assuming a 35% share of car loans in consumer credit and up to 15% share of hybrid and electric vehicles, this suggests that roughly 5% of consumer credit may eventually be affected.

For mortgages, the estimates may of course differ widely. Assuming that buildings ranked as A or B in the Energy Performance Certificate suggests that around 10% of mortgages may be eligible.[16]

Green corporate credit and equity

While the current focus may be on mortgages and car loans, the GSF could eventually be expanded to a broader set of assets, notably related to corporate credit and equity. The challenge is quantifying the potential share of green that may be eligible. Estimates suggest that the green revenue share of a corporate portfolio is around 3-4%.[17] This of course also includes companies that are only partially green. Reflecting this uncertainty, the estimates applied here are 2% of corporate loans, debt, and equity portfolios.

[14] IEA ETP 2017
[15] FED HOUSEHOLD DEBT QUARTERLY REPORT
[16] See European Commission Online <https://ec.europa.eu/energy/en/content/epc-distribution-energy-label>
[17] See The Financing the Future Consortium (2015)

Exclusion of green sovereign bonds

For the purpose of the analysis, issuance of green instruments by sovereign issuers has not been included. There have been so-called green bonds issued by countries like Poland and Belgium, and municipalities at sub-national level. At the same time, these instruments are not ring-fenced and thus legally are basically identical to traditional instruments. Given the need to ensure a capital supporting factor finances specifically green activities and not a balance sheet more generally (even if a virtual ring-fencing takes place), these instruments are not considered as eligible. Indeed, an expansion of these instruments would likely create a significant regulatory quagmire and legal risk, as well as potentially significantly increase the risks for abuse more generally – while not addressing the fundamental logic of supporting 'green' financial instruments.

The overall volume excluded here is unlikely to increase dramatically the overall 'potential' green universe, which in these estimates reaches €579 billions of European banks balance sheets. This compares to potential growth estimates by the Climate Bonds Initiative, which see the green bonds market peak at around €1 trillion globally in the next few years, of which European banks, given their balance sheets, would only own a fraction.

Assumptions on brown asset shares

In terms of the brown share, the estimates from the Financing the Future consortium suggest around 10-15% 'brown' share (focused on fossil fuels, the high-carbon power sector, and the high-carbon transport sector). Reflecting this uncertainty, the estimates applied here, consistent with other analysis (Thomä et al. 2016), are 10%. In terms of the charge, as will be discussed in further detail later, two potential applications are assumed. The first (baseline) assumes that only exposures above 5% are charged as part of a Brown Penalty, whereas the potential application assumes all 'brown' assets are exposed.

Defining the baseline risk-weight

The final challenge in the application is defining the baseline risk-weight for the asset class, which obviously within an asset class will differ based on different parameters (e.g. ratings). For this paper, general risk-weights are assumed, based on the academic literature (NYU, BIS).[18] Finally, the baseline assumption in terms of capital reserve requirements applied in this paper is 7%, focusing exclusively on Pillar I of Basel III and assuming no countercyclical buffer.

The table below summarizes the data basis applied in this paper.

[18] See Reserve Bank of New Zealand (2007) & BCBS (2006)

Table A.1 Estimated ownership of European banks of selected financial instruments, as well as the potential share

Type of instrument	Total (in billion)	Green share		Brown share		Risk-weight
		Baseline	Potential	Baseline	Potential	
Loans financial corporations	€ 1,047	0%	0%	0%	0%	20%
Loans non-financial corporations - Large	€ 2,848	0%	2%	5%	10%	100%
Loans non-financial corporations - SMEs	€ 1,500	0%	0%	0%	0%	100%
Consumer credit	€ 654	5%	5%	30%	30%	100%
Loans - House purchase	€ 4,220	10%	10%	5%	5%	50%
Other loans - Household	€ 723	0%	0%	0%	0%	100%
Loans government	€ 1,016	0%	0%	0%	0%	100%
Loans non-euro area residents	€ 2,898	0%	0%	0%	0%	100%
Equity funds	€ 1,532	0%	2%	5%	10%	300%
Government debt securities	€ 1,505	0%	0%	0%	0%	20%
MFI debt securities	€ 970	0%	0%	0%	0%	20%
Debt securities - 'Residents' non-euro area	€ 2,151	0%	2%	5%	10%	100%
Total	€ 21,064					

Application of the above assumptions

On this basis, a GSF and BP on the risk-weight is applied in order to first estimate the impact on capital reserves. The range of the factor applied in the analysis is between 0-50%, with an emphasis on the 15-25% range suggested by the European Parliament.

As a second step, the adjustment of the risk-weights is translated into an implied equivalent adjustment of the capital charge. In other words, we estimate what adjustment of the capital requirement would have to take place to achieve the equivalent effect of the adjustment of the risk-weight. This adjustment then allows for an application of the impact factors – in terms of cost and availability of capital – identified in the academic literature described above. These empirical factors are then applied to the implied adjustments for the GSF and the Brown Penalty to estimate potential effects for this policy intervention.

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