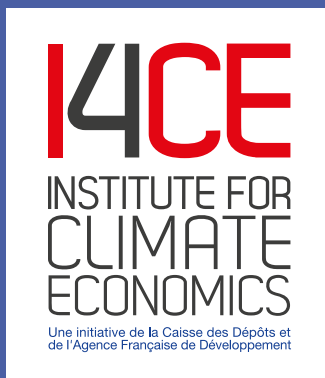


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FINANCIAL REGULATION



INDEXING CAPITAL REQUIREMENTS ON CLIMATE

WHAT IMPACTS CAN BE EXPECTED?

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The Institute for Climate Economics is a think tank with expertise in economics and finance whose mission is to support action against climate change. Through its applied research, the Institute contributes to the debate on climate-related policies. It also publicizes research to facilitate the analysis of financial institutions, businesses and territories and assists with the practical incorporation of climate issues into their activities.



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EXECUTIVE SUMMARY

As the main financier of the French and European economies, banks play a key role in financing the transition. Their current contribution in France is in the order of 8 billion euros per year, but this will need to more than double according to estimates by I4CE¹. To accelerate this shift for banking institutions and to prevent their increasing exposures to climate risks, the debate has tended to revolve around whether or not there is a need to reform prudential requirements. The purpose of these requirements is to safeguard financial stability and to protect banks in crisis situations, by obliging them to hold reserves against different risks.

There are two conflicting positions on climate issues, between those in favour of a Green Supporting Factor (GSF) and those who advocate a Penalising Factor (PF). The former, mainly from the banking sector, argue that “green” assets are less risky, which should justify a prudential relief measure. For example, for a loan to purchase

an electric car, a bank could hold less capital than in the case of a loan for a conventional car. The latter, in other words regulators and researchers, stress that the risk differential between green assets and normal assets has not been demonstrated, but that harmful assets – fossil fuels, aeronautics, combustion vehicles, etc. – are more exposed to transition risks. This argument is the theoretical basis for penalising harmful activities with a PF.

Beyond the debate on the existence of a risk differential, there is a more political issue of establishing whether these instruments would be an appropriate way to increase the contribution of banks to financing the transition. The I4CE report provides new findings on this point. It determines the impacts a GSF or a PF would have on project financing, on the internal profitability of banks, and on credit growth or contraction. Quantitative modelling has been used to outline the whole impact chain, from a change in prudential rules to the financing of a project.

THE GREEN SUPPORTING FACTOR (GSF), AN INAPPROPRIATE APPROACH TO STIMULATING NEW GREEN PROJECTS AND MEETING THE OBJECTIVES OF THE TRANSITION

The GSF has a very limited impact on the conditions for financing green projects

The Green Supporting Factor modelled in this study uses the value of existing prudential relief measures for SMEs and infrastructure: a 25% reduction in capital requirements. Two other GSF values have also been tested: -15% and -50%. The GSF is applied to new loans and not to the existing loan portfolio, assuming that the green share of these new projects is 2% – the average of the different existing estimates – and increases over time.

For green projects, the cost of credit is not the only factor determining the completion of a project: habits, rules, administrative delays, and local opposition are also involved. However, it is interesting to analyse the possible reduction in loan rates for such projects.

The quantitative analysis indicates that for all of the values tested, the impact of the GSF would be of the order of magnitude of one tenth of a percentage point, even in the best-case scenario in which a bank passes through to customers all gains linked to the reduction in capital requirements.

1. I4CE, Ledez, Maxime and Hadrien Hainaut. “Panorama des financements climat 2020”, 2021.

FIGURE 1: IMPACT OF THE GSF ON ANNUAL LOAN RATES IN PERCENTAGE POINTS

SCENARIO	Low GSF at 0.85 (15% reduction in prudential requirements)	Moderate GSF at 0.75 (25% reduction in prudential requirements)	High GSF at 0.5 (50% reduction in prudential requirements)
INITIAL ANNUAL LOAN RATE	4,41% ²	4,41%	4,41%
ANNUAL LOAN RATE WITH GSF	4,28%	4,19%	3,97%
PERCENTAGE POINT CHANGE IN ANNUAL RATE	0,13PTS	0,22PTS	0,44PTS

@I4CE_

This **impact on loan rates seems very low**, but is this really the case for specific transition projects? **For the mobility and energy retrofit sectors**, either the maturity of loans is too short or the share of bank financing is too small for bank interest to account for a significant share of the total cost of a project, and the impact of the GSF is therefore limited. For these sectors, **the financial incentive provided by the reduction in rates linked to the different GSF values tested is 15 to 25 times lower than the amount of existing public support.**

For **renewable energies**, due to the longer loan maturities, the prudential relief measures have a greater impact, at approximately one percentage point of the total cost of the project. A GSF would therefore be appropriate to support such projects, but they already benefit from **prudential relief through the Infrastructure Supporting Factor**. In view of the risks presented by these assets, it seems unlikely that the two support factors could be cumulated. It would be more interesting to limit the existing measures to green infrastructure only.

The GSF has a limited impact on credit growth

One of the effects expected of the GSF is that it should enable banks to free up capital. This capital could then be either distributed to shareholders or used to increase the overall volume of lending, including green loans. However, the quantitative study shows that this effect is uncertain: it depends on the capital strategies adopted by banks. Even in the best-case scenario, whereby banks reserve all capital, the additional growth in lending (green and retail) would be very low: approximately 0.08%/year. Additional green loans would be, at most, around 70 million euros per year, which is insufficient in relation to the contribution expected of banks, at around 18 billion euros³.

The effect of the GSF on bank profitability is small but significant, resulting in an increase of 0.1 to 0.4 billion euros/year across the whole French banking sector, compared to the 156 billion euros of annual net banking income.

2. The loan rate used may seem high in relation to the rates used for mortgage loans. This is the rate observed by ACPR for loans with a normal risk level. This rate takes the best-case assumption in order to maximise a potential impact and to be able to study it. The impact observed is even smaller for lower rates, applied to lower-risk loans (such as mortgage loans, for example).

3. Ibid

The effects of the GSF are too late to prompt banks to adopt ambitious climate strategies

Would a GSF prompt banks to adopt an ambitious climate strategy? One might think so, since proactive banks would thus reap greater rewards. Yet this is not

the case in the first years of application. In the short term, due to the progressive renewal of loans, the allocated gains are not proportional to climate strategies, and there is no additional reward for the most proactive banks. Some actors with a wait-and-see approach, simply following the gradual growth in green loans, would be remunerated in similar proportions.

THE PENALISING FACTOR (PF), A MEASURE THAT MUST HAVE A LIMITED SCOPE TO INCENTIVISE WITHDRAWAL FROM FOSSIL FUELS WITHOUT DESTABILISING THE REST OF THE ECONOMY

Only a strong calibration will ensure the PF significantly increases the cost of harmful projects

There are many questions about the scope of application and the possible value of a Penalising Factor. For the purposes of the modelling exercise, three application scenarios were chosen, with different calibrations and scopes: a very high PF (+250% capital requirements) applied to a scope similar to coal activities; a moderate PF (+25%) with a scope similar to fossil fuels activities; and a low PF (+10%) with a broader scope of activities, including not only fossil fuels, but also energy-intensive sectors such as aviation and automobiles. For each of these scenarios, the study modelled the application of the PF to the whole portfolio

of activities, not just to inflows, as was the case for the GSF. This choice seems the most plausible faced with the requirements imposed by regulators to protect banks from the transition risks of carbon-intensive assets.

The impacts of the PF on the increase in the cost of projects do not depend on the scope of application, but rather on the calibration. The modelling exercise shows that to have a significant impact on the cost of a project, the calibration must be high. With a 250% increase in capital requirements, the increase in the cost of some harmful projects would be approximately 10%, especially projects with a long maturity, as is the case for energy projects.

FIGURE 2: IMPACT OF THE PF ON ANNUAL LOAN RATES IN PERCENTAGE POINTS

SCENARIO	Scenario Low PF at 1.1	Moderate PF at 1.25	Very high PF at 3.5
INITIAL ANNUAL LOAN RATE	4.41%	4.41%	4.41%
ANNUAL LOAN RATE WITH PF	4.50%	4.63%	6.62%
PERCENTAGE POINT CHANGE IN ANNUAL RATE	+0.09PTS	+0.22PTS	+2.2PTS

@I4CE_

PF application has credit contraction effects that are temporary or more lasting depending on the scope of application

Whatever the calibration chosen, the PF is an instrument that should be used with caution. All of the scenarios highlight immediate and significant impacts for the banking sector, which may respond by increasing capital in order to maintain constant credit levels, or by reducing its balance sheet and thereby limiting the number of new loans.

From the first year of application, the volume of new loans, and especially green loans, could contract by several percentage points. This impact on the volume of loans varies according to the scope of application. The broader this scope, the more gradually banks will withdraw from the sectors concerned and the longer the impact on credit contraction will last.

It is easier for banks to rapidly withdraw from several target sectors (such as coal) than to implement actions across a large number of sectors, from which total withdrawal does not seem feasible for the time being (automobile industry, aeronautics, etc.). Applying a very high PF to a limited scope (such as coal) therefore creates a strong incentive for banks to rapidly withdraw from the activities concerned. This rapid withdrawal from harmful activities

limits penalisation to a few years and credit contraction effects are therefore temporary and limited.

However, applying a PF to a broader scope makes the incentive less effective. The individual cost of projects increases little and the number of sectors is too high for a rapid withdrawal to be feasible. The effects on loans in general, and therefore on green loans, are more lasting. The risk of penalising companies that are traditionally carbon-intensive, but are now in transition, is also higher.

In order to limit credit contraction effects, an application of PF on carbon-intensive inflows only might be possible. However, this hypothesis was not retained for the study, because the impact would be too low and too late to obtain a reorientation of credits up to the challenges of the transition.

Likewise, the hypothesis of the introduction of a very high PF only applicable to inflows has not been studied, due to uncontrolled side effects that this would involve for banks and businesses.

In view of these unwanted effects, **a high PF with a limited scope appears more appropriate in the context of a planned withdrawal from certain fossil fuel-based activities and to meet the objectives of the transition.**

CONCLUSION

Faced with the challenge of climate change, the mobilisation of the financial sector is crucial, but the conditions of this mobilisation remain to be defined. Minimum capital requirements are perhaps a response to the problem of risk, but with the exception of certain specific cases, their impact on the financing of the transition is limited.

The effects of a GSF (even high) are too limited to stimulate new projects across all transition sectors. A GSF improves the internal profitability of banks, but does not significantly increase the volume of green loans. As for a

PF, it would need to be both high and applied to a limited scope in order to accelerate the planned withdrawal from certain fossil fuel-based activities, while limiting contraction effects for all credit. A broader PF could have counter-productive impacts on the transition.

In view of these limitations, other prudential options are worth exploring and developing, yet receive far less attention, such as the obligation to implement transition plans in the context of supervision (Pillar 2), which would result in changes in the composition of bank balance sheets to finance the low-carbon transition.

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INTRODUCTION

■ CONTEXT

On 12 December 2015, at the conclusion of COP21, the 195 delegations present adopted the Paris Agreement and undertook to keep global warming below 2°C⁴. In October 2018, the IPCC published a special report entitled “Global Warming of 1.5°C”⁵, presenting the global greenhouse gas emission pathways compatible with the policy objective set. Informed by this scientific expertise, the governments are now positioning themselves, setting medium- and long-term national emissions reduction targets, and developing strategies to achieve these targets.

At the European level, the European Union aims to be carbon-neutral by 2050. Adopted in June 2021, the European Climate Law sets the target of reducing net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels.

At the French level, the National Low-Carbon Strategy⁶ (SNBC) sets out the conditions of the low-carbon transition by identifying the priority sectors and translating the French climate ambition into targets for these key sectors.

To enable these sectors to implement the transition, investments in favour of the transition need to be made, and adverse investments must be reduced. Research is underway to assess the investment amounts required⁷. Although European-level figures are still lacking, at the French level, the estimated needs for all of the sectors covered by the SNBC are around 50 billion euros/year for the period 2018-2023, rising to 70 billion euros/year for the period 2024-2028. In relation to current investments of approximately 40 billion euros/year, this means an increase of 10 billion euros/year for 2018-2023, and 30 billion euros/year for 2024-2028. It is expected that these investments will be mainly financed by an increase in the contribution of households and companies.

The financial and banking system largely finances investments by acting as an intermediary and deciding whether or not to provide financing for projects. This role is crucial, and financial actors are therefore vital to the transition. The European Commission has addressed this issue, and in March 2018 presented its Action Plan for sustainable finance⁸, then in July 2021 its Renewed Strategy, establishing a framework for financial and banking sector mobilisation for the transition.

In its proposals, the Commission refers to actions consisting in “incorporating sustainability in prudential requirements”, thereby activating the lever of financial and especially banking regulation. Progress for the banking sector means progress for the main financier of the economy, whether French (63%)⁹ or European (42%)¹⁰. Numerous studies are now attempting to develop the tools and measures^{11,12} needed to revise banking regulation with a view to more effectively directing investment flows towards the transition.

Historically, the goal of banking and financial regulation is to guarantee financial stability, by preventing individual (microprudential) risks and systemic (macroprudential) risks. This regulation is structured around **three Pillars**:

- **Pillar 1** concerns bank capital requirements. Every bank must hold a minimum level of capital commensurate with its exposures. This level of capital enables the institution to withstand internal or external financial shocks, without having to pass on its losses to its creditors or depositors.
- **Pillar 2** concerns supervisory requirements. Financial actors are highly regulated and the supervisory authorities (in France, the Autorité de Contrôle Prudentiel et de Résolution

4. United Nations Framework Convention on Climate Change, Paris Agreement. 2015

5. IPCC, “Special Report Global warming of 1.5°C”. 2018

6. French Ministry of Ecological Transition, “Stratégie Nationale bas-carbone” (March 2020 version).

7. I4CE, Ledez et Hainaut, “Panorama des financements climat 2020”.

8. European Commission, “Sustainable finance: Commission’s Action Plan for a greener and cleaner economy”. 2018

9. Banque de France, “Le financement des entreprises - ABC de l’économie”. 2020

10. European Central Bank, “Financial Integration and Structure in the Euro Area”. 2020

11. Philipponnat Thierry and Finance Watch, “Breaking the Climate Finance Doom Loop”. 2020

12. I4CE, Evain and Cardona, “Can financial regulation accelerate the low-carbon transition?”. 2021

– ACPR – for banks and insurance companies) can, under certain conditions, penalise institutions, especially by requiring higher levels of capital if they consider that the risk is insufficiently covered by existing capital.

- **Pillar 3** concerns disclosure requirements. This means guaranteeing reliable information for those concerned, whether creditors, depositors or investors.

The 2008 crisis and the massive last resort intervention by states highlighted the limitations of a financial system with low levels of capital and led to a radical reform of financial regulation. With the Basel Accords, known as “Basel III”, adopted in the light of the crisis, higher prudential requirements were introduced, and banks increased their capital. The CET1 ratio, which determines the level of CET1¹³ capital in relation to RWA¹⁴, thus increased for the six French banking groups from 5.8% in 2008 to 14.4% in 2019¹⁵.

At the European level, two specific prudential relief measures have nevertheless been established. In January 2014, a supporting factor was implemented for small and medium-sized enterprises (SMEs), reducing prudential requirements by 25% for this asset class. Statistically justified in terms of risk, this prudential relief measure also had a potential policy impact by facilitating access to credit for these companies¹⁶. On 28 April 2020, the European Commission announced the implementation of a second prudential measure known as the Infrastructure Supporting Factor (ISF), which reduces capital requirements by 25% for infrastructure project financing. Although the ISF was adopted before the pandemic, the policy goal of this measure is made clear in the title of the press release: Supporting businesses and households amid COVID-19¹⁷.

Where climate change is concerned, **two prudential factors** are currently under discussion:

1 The purpose of the **The Green Supporting Factor (GSF)**, mainly advocated by banks, is to introduce a specific weighting factor for green assets in order to reduce prudential requirements. These “green” assets could be those eligible under the EU taxonomy for sustainable activities published in April 2021¹⁸.

2 **The Penalising Factor (PF)**, advocated by some regulators¹⁹, introduces a specific weighting factor for carbon-intensive assets in order to increase prudential requirements. There is currently no harmonised harmful activities taxonomy, although the Platform on Sustainable Finance is working towards such a classification. The broad definition of “harmful” is “high-carbon” or “carbon-intensive”. A GSF assumes that green loans are less risky than other loans, whereas a PF assumes that carbon-intensive loans are more risky. This question of the risk differential has not yet been resolved, and ongoing research²⁰ by the NGFS addresses this issue. However, on a longer time horizon and in the context of a politically supported low-carbon transition, harmful assets may need to be amortised more rapidly than planned. Indeed, once alternatives and replacement solutions have been found, these assets are likely to become obsolete and will thus depreciate^{21,22}. **Prevention of this risk, known as transition risk, could call for the introduction of differentiated prudential treatment, in other words a GSF or a PF.**

13. Common Equity Tier 1: refers to the highest quality form of capital.

14. Risk Weighted Assets: total value of assets weighted according to risk.

15. ACPR, “La situation des grands groupes bancaires français fin 2019”. 2020

16. EBA, “Report on SMEs and SME supporting factor”. 2016

17. European Commission, “Commission Interpretative Communication on the application of the accounting and prudential frameworks to facilitate EU bank lending”.

18. European Commission, Annex to the Commission Delegated Regulation (EU) supplementing Regulation (EU) 2020/852.

19. Banque de France, “Discours introductif de François Villeroy de Galhau, Gouverneur de la Banque de France, à la Conférence internationale des superviseurs sur le risque climatique”. 2018

20. NGFS, “A status report on financial institutions’ experiences from working with green, non green and brown financial assets and a potential risk differential”. 2020

21. Caldecott et al., “Stranded Assets”.

22. Welsby and al. “Unextractable fossil fuels in a 1.5 °C world. Nature, 2021

■ OBJECTIVES AND APPROACH ADOPTED FOR THE STUDY

The goal of this study is not to decide in favour of one or other of the tools by discussing the risks of green or harmful assets. **Instead, it adopts an impact analysis approach, to ensure better ex ante assessment of the impact of incorporating these transition-related weighting factors into prudential requirements.** By moving away from a debate focusing on risk, the study aims to address the many unanswered questions: What is the real impact of each of these measures on the financing of the transition? What calibrations could be expected for these measures? What would the banking system gain from implementing a GSF? What impact would a PF have on the sector?

Prudential requirements, which are primarily aimed at safeguarding financial stability, represent a cost for banks.

By enabling a reduction in prudential requirements for green assets²³, the GSF is likely to lower the cost for banks of capital²⁴ used to finance these green assets. Assuming this reduction in banking costs translates into a reduction in loan rates, the GSF could thus have a positive impact on the financing of the transition and the stimulation of new green projects.

The first goal of the study is to determine whether there is a link between a reduction in prudential requirements and the potential stimulation of additional projects, by carefully examining the impact of the GSF on loan rates, according to its calibration. To illustrate the results, the study will focus on several transition sectors, in order to compare the impacts of the GSF with the other tools available to the public authorities.

In the remainder of this study, **the main sectors concerned** will be known as the transition sectors. The results modelled are valid for the European level, but the data used concentrate on the French example. Three sectors and certain specific issues have been selected:

- **The energy sector** and its key objective of deploying low-carbon alternatives to the fossil fuels used today.
- **The transport sector** and the development of soft mobility, with bicycles or electric vehicles.
- **The building sector** and the challenge of its transition through retrofitting, which aims to decarbonise and limit the energy used to heat buildings.

Although all economic sectors are clearly concerned by the transition, these three sectors emerged as the most relevant for conducting an impact assessment due to their emissions' importance and financing conditions.

In addition to boosting demand for transition projects, the GSF could potentially stimulate lending. With a view to analysing impact, the second goal of the study is to verify this assumption, by analysing the factors that lead to this increase in lending, and also to understand whether or not this additional lending exclusively concerns green loans.

Finally, to further inform public decision-making, it seems important to identify the benefit of a GSF for the main actors concerned: banks. **The final objective is therefore to understand how the French banking system is rewarded by the GSF if it adopts an ambitious climate strategy, but also to what extent it is rewarded if it adopts a wait-and-see approach.**

For symmetrical reasons, the PF is likely to reduce investments in carbon-intensive projects.

By using different calibrations and scopes to model the impacts of this measure on bank loan rates, the study highlights the scope/calibration combination that would have a sufficient impact, as well as the unwanted effects it could have on business financing.

Another goal of the study is to analyse the impact of different types of PF on the contraction of credit volumes and on the banking sector's capital needs.

23. Green in the sense of the EU taxonomy for sustainable activities.

24. Miles, D., Yang J. and Marcheggiano, G., Optimal bank capital. *Economic Journal*, 2012.

■ METHODOLOGY AND MAIN ASSUMPTIONS

To assess the impact of a measure, it is necessary to establish the conditions of its application, in particular its scope and calibration. The GSF modelled in this study uses the value of existing prudential relief measures for SMEs and infrastructure: a 25% reduction in capital requirements. Two other GSF values have also been tested: -15% and -50%. The GSF is applied to new loans rather than to the existing loan portfolio. To determine the scope, it seems natural to use the European taxonomy for sustainable activities. The assumption is that the green share of these new projects is 2% – the average of the different existing estimates – and increases over time. Different growth rates have been simulated according to the climate strategies adopted by banks.

To study the impact on project financing, the model used is based on the **best-case scenario, whereby banks would pass through the full reduction in prudential requirements to loan rates.**

In the case of carbon-intensive assets, however, there is currently no harmful activities taxonomy, and the framework for reflection is therefore much broader. **For the PF, both the scope of application and the calibration remain to be determined.**

This theoretical latitude means **that different measures can be considered, even for a given increase in prudential requirements.** Indeed, a very high PF, but with a very localised scope, can have the same impact on capital requirements as a low PF with a broader scope. Being able to restrict the field of application of the PF therefore means that much higher PF levels can be considered than in the study on the GSF. However, it is the PF level that determines the impact on bank loan rates, and on the cost of an activity or a project. **The impact models thus cover a wider range of PF values than for the GSF.**

For the purposes of the modelling exercise, three application scenarios were chosen, with

different calibrations and scopes: a very high PF (+250% capital requirements) applied to a scope similar to coal activities; a moderate PF (+25%) with a scope similar to fossil fuels; and a low PF (+10%) with a broader scope of activities, including not only fossil fuels, but also energy-intensive sectors such as aviation and automobiles.

For each of these scenarios, the study modelled the application of the PF to the whole portfolio of activities, not just to inflows, as was the case for the GSF. This choice seems the most plausible faced with the requirements imposed by regulators to protect banks from the transition risks of harmful assets. With a view to implementing a realistic penalty, each of the scenarios simulates a 1% overall increase in prudential requirements.

The different models used do not control the effects of GDP, and more generally macroeconomic effects on credit demand.

THE GREEN SUPPORTING FACTOR (GSF), AN INAPPROPRIATE APPROACH TO STIMULATING NEW GREEN PROJECTS AND MEETING THE OBJECTIVES OF THE TRANSITION

Presentation of the different approaches to GSF application: choice of calibration and scope

The Green Supporting Factor modelled in this study uses the value of existing prudential relief measures for SMEs and infrastructure: a 25% reduction in capital requirements. Two other GSF values have also been tested: -15% and -50%. The GSF is applied to new loans rather than to the existing loan portfolio, assuming that the green share of these new projects is 2% – the average of the different existing estimates – and increases over time.

For green projects, the cost of credit is not the only factor determining the completion of a project: habits, rules, administrative delays, and local opposition are also involved. However, it is interesting to analyse the possible reduction in loan rates for such projects.

The effect of the GSF on bank loan rates is insufficient to support demand for transition projects

> KEY MESSAGES:

The impact of the GSF on loan rates is very low (a reduction of approximately 0.1 percentage points), even in the best-case scenario in which a bank passes through to customers all gains linked to the reduction in capital requirements.

In the energy retrofit and mobility sectors, the financial incentive provided by the reduction in rates linked to the GSF is 15 to 25 times lower than the amount of existing public support.

For renewable energies, due to the long maturities involved, prudential relief measures have an impact of around one percentage point of the total cost of a project. However, financial issues are secondary, and a relief measure already exists, the Infrastructure Supporting Factor, which should be made conditional on eligibility under the green taxonomy.

PRESENTATION OF THE MODEL AND GENERAL RESULTS REGARDING THE IMPACT OF THE GSF ON BANK LOAN RATES

To understand the effects of the GSF on loan rates, a model has been developed, using the main parameters involved in loan rate setting, especially

- 1 the level of capital required against the amount of the banking operation (loan, investment, etc.), and
- 2 the expected return on this capital²⁵. Based on these two parameters, the model determines the change in the loan rate resulting from the introduction of the GSF²⁶.

Introducing a GSF enables a reduction in prudential requirements, and therefore by definition a reduction in the level of capital required relative to risk-weighted loans. In order to maximise the impact of the GSF on the loan rate, the assumption is that the return on capital expected by the bank does not change. This assumption is optimistic in terms of impact, since it assumes that the banking system transfers the whole reduction in its costs to the rates of loans provided. Under this assumption, it is therefore the end customer, and not the bank, that benefits from the gain provided by the GSF. It is quite likely that the banking system will decide to increase the profitability of its capital by maintaining constant loan rates, and thus profit, while reducing the level of its capital. However, for the purposes of the impact analysis, it was more interesting to adopt the assumption that produces a maximum impact on the project cost, in order to determine whether or not this reduction in costs

25. The ratio of profit to capital.

26. The details of the model are given in Annex 2.

would stimulate new projects. **The assumption of constant returns for the banking system thus means that an upper value can be given to the impact of the GSF on rates.**

Since the level of capital is lower, banks can maintain the same return on capital with a lower profit. However, this profit largely stems from the net interest margin, in other words the difference between the interest income paid by customers and the interest charges paid out by the bank. Accepting a

lower profit thus means accepting lower interest income. In other words, it means accepting lower returns on banking operations, i.e. providing loans with lower rates²⁷.

The model calculates according to the GSF values the new rates that would guarantee the banking sector the same return on capital. The post-GSF rates are naturally lower than the pre-GSF rates. These are presented in Figure 1 below, as well as the percentage point change for GSF values of 0.85, 0.75 and 0.5^{28,29}.

FIGURE 1: IMPACT OF THE GSF ON ANNUAL LOAN RATES³⁰ IN PERCENTAGE POINTS

SCENARIO	Low GSF at 0.85 (15% reduction in prudential requirements)	Moderate GSF at 0.75 (25% reduction in prudential requirements)	High GSF at 0.5 (50% reduction in prudential requirements)
INITIAL ANNUAL LOAN RATE	4.41 % ²	4.41 %	4.41 %
ANNUAL LOAN RATE WITH GSF	4.28%	4.19 %	3.97%
PERCENTAGE POINT CHANGE IN ANNUAL RATE	0.13PTS	0.22PTS	0.44PTS

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A first conclusion is that **the impact on the annual loan rate, at approximately one tenth of a percentage point, is relatively low. Moreover, the results of this model are consistent with other studies³¹.** In their paper “The Impact of Bank Regulation on the Cost of Credit: Evidence from a Discontinuity in Capital Requirements”, Di Patti, Moscatelli, and Pietrosanti (2020) observe a change in rates of 9.5 basis points, or 0.095 percentage points, per percentage point

drop in the capital requirement level. This capital requirement level is the ratio between capital and the risk-weighted loan amount. Figure 2 below presents the values taken from the model according to changes in the capital requirement level³².

In order to maximize the possible impact of the GSF, a high estimate of the average level of prudential requirements of a banking book was retained.

27. Annual rates are considered here. For long-term rates, it is better to consider the proportional change (see following paragraphs).

28. A “high” GSF at 0.5 means a 50% reduction in prudential requirements, a “moderate” GSF at 0.75 corresponds to a 25% reduction, and a “low” GSF at 0.85 to a 15% reduction.

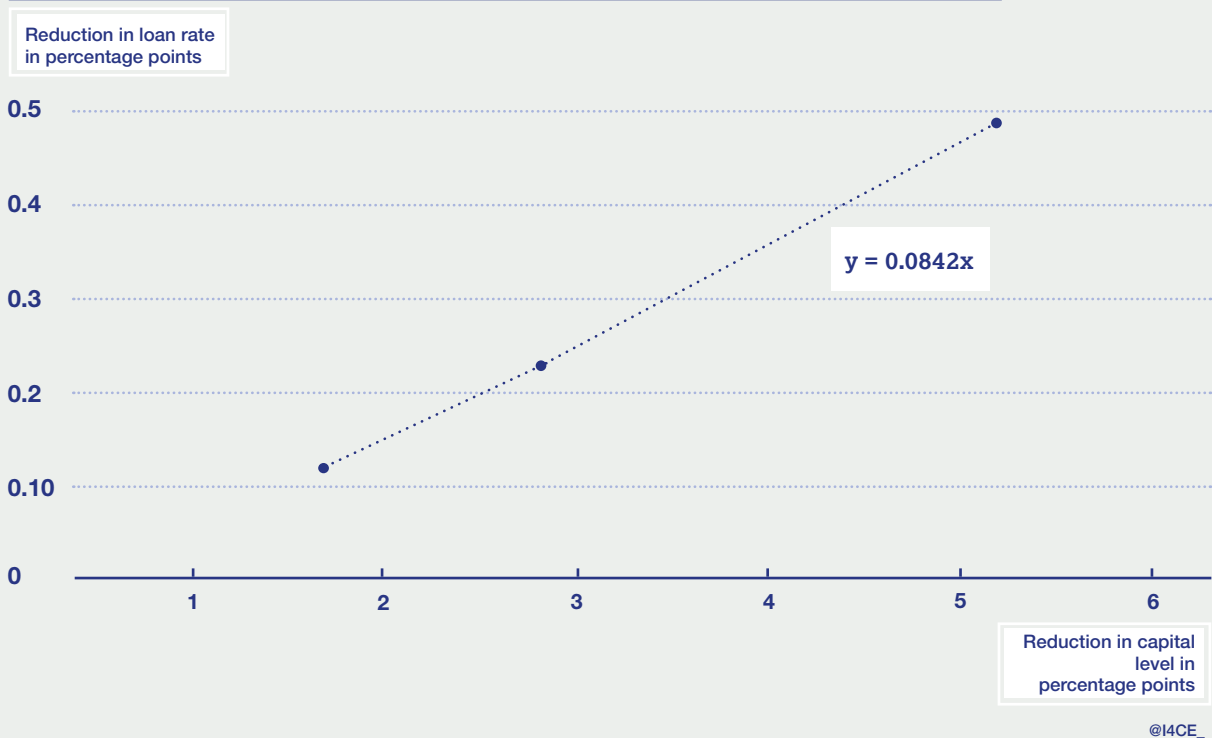
29. To see the impacts for other GSF calibrations, see Annex 2.

30. A risk-weighted factor $RW=1$ is applied to the loan considered here. The percentage point change in annual rates is relatively dependent on the RW used, since it is the RW that determines the initial level of capital and therefore the pre-GSF rate. See Annex 2 for further information on the impact on loans of RW values not equal to 1.

31. Di Patti, Moscatelli, and Pietrosanti, “The Impact of Bank Regulation on the Cost of Credit: Evidence from a Discontinuity in Capital Requirements”.

32. For example, a GSF at 0.75 results in a 25% reduction in requirements set at 8%. Thus, post-GSF, the capital requirement level is $0.75 \times 8\% = 6\%$. This is a reduction of two percentage points in the capital level. The other points are calculated according to the same method.

FIGURE 2: CHANGE IN LOAN RATES ACCORDING TO THE REDUCTION IN THE CAPITAL LEVEL



The model thus gives a change in rates of 8.4 basis points per percentage point drop in the capital requirement level, which is close to the 9.5 basis points obtained by Di Patti, Moscatelli and Pietrosanti (2020). The order of magnitude obtained is similar in both studies. Comparison with other studies confirms the results presented here, increases the relevance of the model, and legitimises the findings on the impact. Thus, **consistent with the results of other studies, the impact on the annual loan rate is of the order of magnitude of one tenth of a percentage point, a change that seems relatively small** (see Figure 1).

By way of example, a green car loan of 40 000 euros at 1.9% over 12 months will fall to 1.7% if a GSF at 0.75 is introduced, in the best-case scenario of banks passing through all gains. The customer requesting the loan will therefore gain 80 euros over the year, or 0.2% of the total cost of the project. **This example shows why the idea that a GSF would support demand for transition projects is implausible, given its very limited impact.**

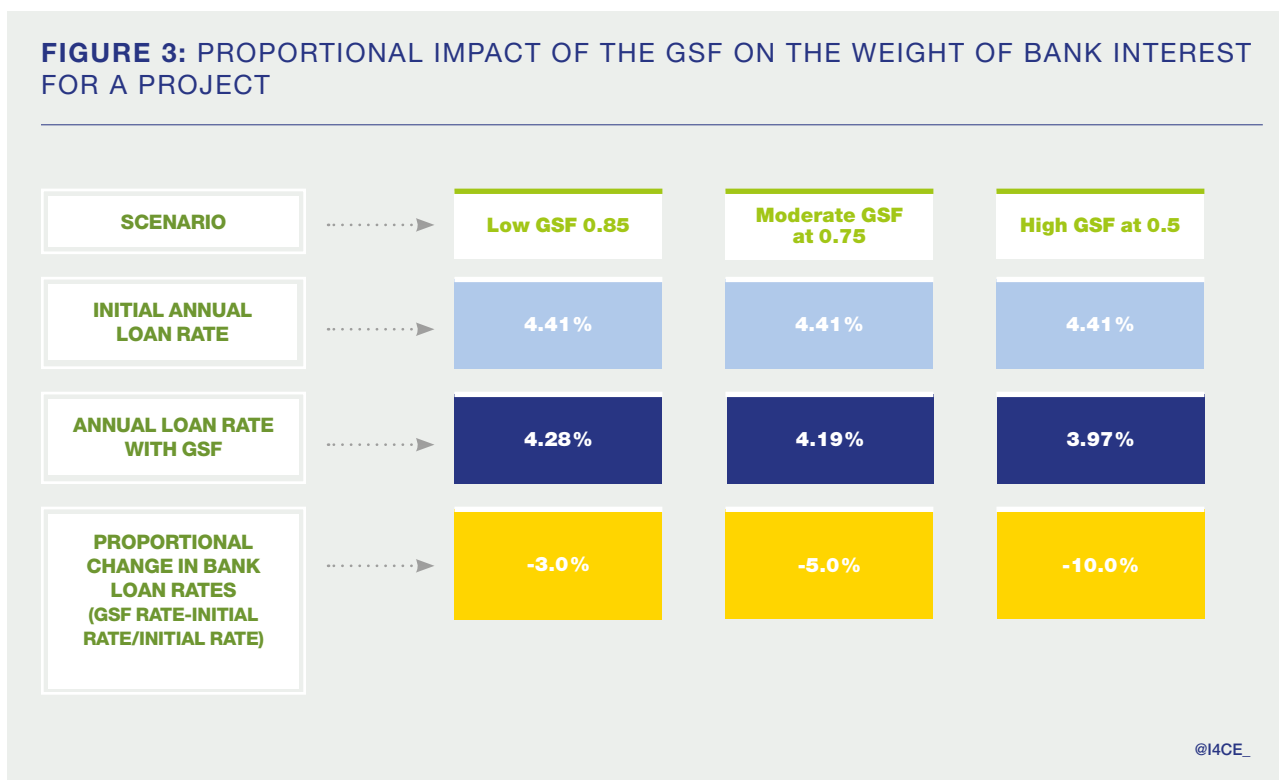
To be more specific, it should be recalled that these findings concern annual loan rates. In other words, **when the**

loan has a one-year maturity, the impact of the GSF, in relation to the amount borrowed for the project, would be approximately one tenth of a percentage point. But for loans with longer maturities (5, 10 or even 15 years), this assumption must be qualified. Indeed, for this type of loan, interest is paid every year in proportion to the outstanding amount. The GSF therefore contributes to reducing the weight of interest paid in the first year, but also in the following years.

To better understand the effects of the GSF on longer term loans, a proportional approach is needed. If the annual rate is reduced by x%, then all of the interest paid by the customer to the bank will be reduced by x%. Accessing information on relative changes in the annual loan rate therefore helps to understand changes in the cost of bank interest, for all maturities. Figure 3 explains the proportional effect of the GSF on the cost of bank financing for a loan³³ to a business or a household.

33. A risk-weighted factor RW=1 is also applied to the loan here. According to the proportional approach, the changes obtained for RW≠1 are similar to the results presented. See Annex 2 for further information.

FIGURE 3: PROPORTIONAL IMPACT OF THE GSF ON THE WEIGHT OF BANK INTEREST FOR A PROJECT



The GSF thus **reduces the weight of interest for a project by almost 10% for a GSF at 0.5, and by 5% for a GSF at 0.75**. To estimate the total change in the cost of the project, this proportion must be related to the share of bank interest in the project total.

For projects with a short maturity of one or two years, the weight of interest almost corresponds to the loan rate. Except for very risky projects, these rates rarely exceed 5%, and **the change in cost induced by the GSF is approximately 0.2-0.5%**. For projects with medium- or long-term maturities (10, 15, 20 years), interest can account for up to 20-30% of the total cost of the project. **For such projects, the GSF can thus induce a change in the cost of approximately 1-3%**.

For the purposes of the impact study, it is interesting to relate these orders of magnitude to sectoral realities and to existing public support policies. Moreover, financial leverage is only one of the obstacles to the financing the transition, and using this leverage does not necessarily produce an impact in terms of demand for transition projects.

MOBILITY: A MEASURE WITH A VERY LOW IMPACT COMPARED TO THE OTHER TOOLS AVAILABLE IN FRANCE

The transition of the transport sector is essential to achieving greenhouse gas emissions reduction targets. Indeed, in 2019 in France, almost 90% of final energy consumption for transport uses was attributed to petroleum products³⁴. The decarbonisation of the transport sector depends on the development of soft mobility and vehicle electrification. Political commitments have been made to this effect.

Faced with the planned phase-out of combustion vehicles, car manufacturers are adapting. Despite the price of green vehicles, which remains high compared to combustion vehicles, and the practical difficulties due to autonomy or recharging, the market for these vehicles has been very dynamic. In 2020, sales of plug-in hybrid electric vehicles tripled compared to 2019, reaching almost 75 000 vehicles, and sales of electric vehicles increased by 59% to reach 110 000 vehicles. In 2020, electric vehicles thus accounted for 6.7% of new vehicle sales³⁵.

34. DGEC, "Chiffres clés de l'énergie - Édition 2020".

35. ADEME, "Chiffres-clés Evolution du marché, caractéristiques environnementales et techniques, Véhicule particuliers neufs vendus en France".

In France, using a financial intermediary to purchase a vehicle is very common. In 2017, 64% of vehicle financing involved rental schemes (leasing, rent-to-own (RTO), long-term leasing). Traditional car loans account for more than a third (36%³⁶) of new vehicles purchased. Customers who finance their purchase through bank loans borrow on average 50-100% of the cost of their vehicle, with the rest being financed by own funds. The average length of a car loan is four years, or 48 months, and the average interest rates are 3%, which means that, in the best-case scenario, the weight of bank interest is at most 6% of the total amount borrowed³⁷.

Depending on whether 50% or 100% of the financing is provided by a bank loan, this interest therefore accounts for between 5% and 10% of the total cost of the operation. The high GSF at 0.5 results in a 10% reduction in these charges. **In the best-case scenario, the high GSF can therefore reduce the total cost of the operation by at most 0.6%.** This figure should be compared to the amount of existing public support, which is high in the mobility sector.

EXAMPLE :

A couple is unsure whether to purchase an electric vehicle with a value (excluding bonus) of 30 000 euros, or a combustion vehicle with a value (excluding malus) of 20 000 euros³⁸. In the case of financing through a car loan, the high GSF will provide a saving of **at most 0.6% of the total amount, or 200 euros.**

To steer consumer purchases towards low-emission vehicles, and in the context of the recovery plan, the French state has implemented a bonus-malus system. **In 2021, support for electric vehicles is between 5 000 and 7 000 euros³⁹**, and support for plug-in hybrid vehicles is up to 1 500 euros. Conversely, the malus applied to combustion vehicles increases linearly according to the level of emissions, and can be as much as 30 000 euros for emissions of more than 180gCO₂/km (NEDC standard). As an order of magnitude, for conventional combustion vehicles⁴⁰ with emissions between 100gCO₂/km and 140gCO₂/km, the malus for 2021⁴¹ is progressive up to 3 000 euros. Assuming an intermediate malus of 1 000 euros and a bonus of 6 000 euros, the bonus-malus reduces the price gap between electric vehicles and combustion vehicles by 7 000 euros. **The bonus-malus system thus provides financial incentives that are almost 25 times higher than the gains provided by the GSF.**

Another element of comparison stems from the downward trend in the cost of electric vehicles. With the growing mobilisation of car manufacturers, and the hope of returns to scale, **the price of electric vehicles is expected to fall by 7.2% per year over the period 2021-2025⁴²**. Thus, for the buyers concerned, **waiting two months has the same effect on the price (around 1%) as a high GSF would have. Consequently, in view of existing support and the downward trend in the cost of electric vehicles,** the introduction of a GSF would not be the trigger to convince the household to opt for an electric vehicle rather than a combustion vehicle.

The study shows that the financial incentives provided by the GSF are extremely low compared to the amount of existing state support and the rate of price reduction. The impact of state support on household mobility investment choices is still being studied, and questions the role financial incentives play in decisions compared to other non-financial parameters (trends, autonomy, access to parking in urban centres, cost of installing charging points at home). Without taking sides in this debate, it is important to note that although financial parameters can contribute to decisions, the fiscal efforts made by the state will have more impact than the incentives provided by the GSF.

For the automobile sector, the GSF does not appear to be the best tool available to the public authorities. Its effect is negligible, and uncertain since it is subject to the assumption that banks will pass through gains to customers.

ENERGY RETROFITTING: LIMITED IMPACTS THAT ARE NOT EQUAL TO THE CHALLENGE IN FRANCE

To achieve carbon neutrality by 2050, the French Multiannual Energy Plan (PPE)⁴³ for the periods 2019-2023 and 2024-2028 sets the objectives of decarbonising the energy used and also reducing final energy consumption. The expected reduction is 7.6% by 2023 relative to 2012, and 16.5% by 2028 relative to 2012. To reduce energy consumption in buildings, a key tool is energy retrofitting. This entails carrying out insulation work or rehabilitation in order to reduce energy consumption for a constant level of comfort.

36. CCFA, "Les financements automobiles en France". 2018

37. See Annex 3 for details of this calculation.

38. For information, the top-selling electric vehicle in France is the Renault Zoe, with new cars starting at 32 500 euros, and the top-selling combustion vehicle is the Peugeot 208, starting at 16 000 euros.

39. French Ministry of Ecological Transition, "Décret n°2020-656 du 30 mai 2020 relatif aux aides à l'acquisition ou à la location des véhicules peu polluants".

40. According to ADEME key figures, 97% of sales in 2020 concerned vehicles with emissions of less than 140gCO₂/km.

41. A progressive annual increase in the malus is planned. The malus value for 2021 is therefore less than the values that will be applied in the following years.

42. Mock, "Pathways to Decarbonization: The European Passenger Car Market, 2021-2035".

43. French Ministry of Ecological Transition, "Synthèse de la Programmation Pluriannuelle de l'Énergie 2019-2023 2024-2028".

The challenge in this sector is clearly on the demand side. Households and companies need to be encouraged to carry out this work. Numerous non-financial parameters must be taken into account in investment decisions. This study focuses on the quantitative effects of the GSF on financial parameters only, and proposes a comparison with the other main support and guidance schemes in place for the retrofitting sector.

One of the problems of the GSF is that it only affects the weight of bank interest. **In other words, if households or companies do not finance their project through bank loans, then the GSF will have no impact whatsoever.** Yet retrofitting needs concern all populations, and low-income households often have no access to bank credit, except in the framework of specific operations, even though they are among the most concerned⁴⁴.

According to the TREMI (2017) survey by ADEME⁴⁵, only 32% of households have used bank financing. Almost 70% of households carrying out a retrofit project are therefore not concerned by the introduction of a GSF. For the remaining third, the average share of bank financing is 52% of the amount of the project, and the average rate is 3.6% for a duration of 82 months⁴⁶. These figures result in a loan cost of 13% of the amount borrowed⁴⁷, or 7% of the total amount of the project.

The GSF would enable a proportional reduction of 3-10% of the cost of the bank loan depending on the calibration (see *Figure 3*), which means a reduction in the project cost of 0.2-0.7%. For an ambitious retrofit operation at 80 000 euros, the GSF would provide support of at most 600 euros. This is very inadequate to support demand and to encourage households to act.

This amount should be **compared to the direct support provided by the state** in the framework of MaPrimeRénov⁴⁸. This support, which is indexed to household income, is between 10 500 euros (MaPrimeRénov Rose) and 15 000 euros (Habiter Mieux Sérénité), not including any bonuses that could be added depending on the nature of the work. **The state is thus able to provide 20 times more support than a GSF could deliver, in the best-case scenario, by taking into account only the higher-income third of the households concerned.**

Similarly, the state has introduced an Eco-PTZ scheme that outsources to banks the provision of interest-free retrofit loans of up to 30 000 euros. The state thus pays the bank interest, which for 30 000 euros is around 5 000 to 6 000 euros. The limited success of the Eco-Ptz relativises the impact the GSF could have on demand for projects. Indeed, **it shows the low sensitivity of project developers to the weight of bank interest, and the probable existence of non-financial obstacles⁴⁹ that a GSF would not overcome.**

In conclusion, for the energy retrofit sector, the cost of the loan required is not the limiting factor in investment decisions. In comparison with the other tools available to the public authorities, the GSF does not seem capable of generating the additional demand needed to achieve the objectives of the SNBC.

With a view to conducting an impact analysis, and thus to achieving the objectives of the transition in particular in the energy transition sector, **this study shows that the GSF is not a suitable tool, and is not an appropriate mobilisation of financial regulation on climate issues.**

44. Sichel, "Rapport pour une réhabilitation énergétique massive, simple et inclusive des logements privés". 2021

45. ADEME, "Enquête TREMI, campagne 2017". 2017

46. These figures are obtained for all retrofit operations. The question is whether the green taxonomy will make all energy retrofit loans eligible, or only those linked to whole house retrofits (an energy performance certificate improvement of at least two categories). More specific data exists concerning whole house retrofits only, but since the order of magnitude is similar, the choice has been made to use total figures pending a regulatory clarification.

47. See Annex 3 for the calculation of the weight of interest based on data on rates and maturities.

48. French government, "MaPrimeRenov_DossierPresse_Janvier 2021.pdf".

49. These non-financial obstacles include the perception among households that profitability is too long-term and the work required is too demanding, the red tape involved in obtaining support, and the lack of structure in the current offering.

ENERGY: A POSSIBLE IMPACT BUT A PRUDENTIAL TOOL ALREADY EXISTS IN EUROPE

Energy issues are central to the transition. Indeed, the term “transition” is often used to mean “energy transition”. Although many different transitions are required to bring emissions in line with the Paris Agreement, the energy transition is the largest in terms of scale. The challenge is to shift from mainly fossil and high-carbon energy sources (63% of the final energy consumed in France in 2019 came from oil, gas and coal)⁵⁰ to low-carbon energy in just a few decades.

In May 2021, the International Energy Agency submitted a report setting out the pathway to carbon neutrality by 2050⁵¹. One of the priorities is to halt any new fossil fuel construction projects, whether coal-fired power stations, oil wells, or others. Another priority is to develop renewable energies. Most of these energy sources are very capital intensive, which makes their financing a critical issue.

EXEMPLE :

The CRE report⁵² provides an in-depth analysis of the conditions for setting up wind farms in France. An illustration of the impact of the GSF is given for a typical wind farm (10 MW with a total investment cost of 16 million euros, or 1.6 million euros/MW), taking the average values provided by the report. This investment is made by a dedicated project company, with 80% of the financing provided by a bank loan. This loan is to be repaid over 15 years, with an annual interest rate of 3.5% (the typical loan terms for a wind power project). In this case, interest will ultimately account for almost 30% of the amount borrowed, or $0.3 \times 0.8 = 25\%$ of the total amount of the project.

In these conditions, **the moderate GSF at 0.75 can reduce the weight of interest by 5% and thereby reduce the total cost of the project by around 1%**. For a higher GSF at 0.5, the weight of interest would be reduced by 10%, or a 2.5% reduction in the total cost of the project. For these long-term projects, depending on the calibration, the GSF can have a considerable impact on the cost of the project. **However, this does not necessarily mean that the GSF is the appropriate instrument.**

Wind and solar energy projects are already competitive, and easily obtain financing when they are low risk. However, for several years, renewable energy projects have been subject to a considerable regulatory risk: planning permission and land acquisition can pose problems in areas where local opposition is strong. As long as authorisation has not been granted,

financiers are unwilling to get on board and the project often faces difficulties. Conversely, once authorisation has been granted, financiers are more interested. **In other words, access to financing is problematic as long as the regulatory risk has not been managed.** It is thus a shortage of mature, low-risk projects that limits access to financing, rather than the insufficient involvement of financiers.

On the contrary, if it were introduced, the GSF would provide a stronger incentive for financiers to position themselves on projects once the regulatory risk has been managed. This would therefore further increase the availability of financing, without impacting demand for mature projects. Further destabilising a market segment that already has a supply and demand imbalance seems risky in view of the consequences for financial stability.

Moreover, a prudential relief measure already exists for infrastructure projects. This “Infrastructure Supporting Factor (ISF)” has exactly the same prudential effects as a GSF at 0.75. The eligible infrastructure must meet certain conditions, but carbon-intensive projects are not excluded⁵³ from the relief measure. Some energy projects therefore already benefit from this reduction, which reduces the interest and investment costs.

Applying a second supporting factor through the GSF, which in theory should be combined with the Infrastructure Supporting Factor (ISF) for certain projects in the energy sector, has little value in view of the regulatory obstacles already mentioned.

It would be far **more appropriate to transform the ISF into a “Green Infrastructure Supporting Factor (GISF)” to ensure it is applied only to infrastructure considered green under the taxonomy.** For the time being, article 501 of the Capital Requirements Regulation (CRR2) specifies that an environmental study must already be conducted for the asset financed to be eligible for the ISF. Including eligibility to the green taxonomy as a precondition for eligibility to the ISF would help to green the measure.

50. DGEC, “Chiffres clés de l’énergie - Édition 2020”.

51. IEA, “Net Zero by 2050 - A Roadmap for the Global Energy Sector”.

52. “Coûts et rentabilité des énergies renouvelables en France métropolitaine : Éolien terrestre, biomasse, solaire photovoltaïque”. 2014

53. Conversely, not all green projects are included, in particular if they do not meet the conditions imposed to reduce the risk of default.

CONCLUSION

The foregoing sectoral study has shown that, for each of the sectors mentioned, the financial impact of a Green Supporting Factor would be insufficient to generate a significant impact on the increase in green loans.

Even in the best-case scenario⁵⁴, the GSF has a secondary impact on the financial parameters relevant for each of the transition sectors. This limited impact is primarily the consequence of the reduced scope of application of the GSF. By only targeting bank financing, it only acts in proportion to the weight of bank interest. However, this weight, which depends on the characteristics of project financing, is lower for the transition sectors, especially mobility and energy retrofitting.

Moreover, at the French level, other tools are available for these sectors that are more suited to the context of the transition and capable of generating stronger financial incentives. In particular, the budget support for the transition sectors provided by the French state delivers incentives that are up to 20 times higher, especially for energy retrofit projects or electric vehicle purchases.

For the energy sector, however, due to the longer maturities, the cost of bank loans can be high. **The GSF thus enables a relative reduction in total costs of approximately 1%.** But renewable projects are subject to a regulatory risk that is difficult to manage for financial institutions. Consequently, as long as the project is not sufficiently mature, financing will be difficult to obtain. However, once a project is mature and is certain to go ahead, financing is more readily available. The GSF does not safeguard against the regulatory risk, and does not therefore resolve this problem of a shortage of sufficiently mature projects. Moreover, a prudential tool already exists for this segment: the Infrastructure Supporting Factor. **It seems more appropriate to maintain the ISF, but to include eligibility under the green taxonomy as a precondition for its application.**

Finally, to complete the impact analysis, it is important that financial parameters are not seen as the only elements that influence decisions to implement projects. **Other non-financial factors also limit demand.**

FIGURE 4: TABLE SUMMARISING THE FINANCIAL IMPACTS OF THE GSF ON THE TRANSITION SECTORS

	IMPACT OF GSF	AMOUNT AND ORIGIN OF SUPPORT	SUPPORT/GSF IMPACT RATIO
ENERGY RETROFIT: PROJECT AT 80K€	< 600€ (0.7% of total)	> 10 000€ (13% of total) MaPrimeRénov (state)	> 18.5
ELECTRIC MOBILITY: PURCHASE OF ELECTRIC VEHICLE AT 30K€	< 300€ (1% OF TOTAL)	> 4 500€ (15% of total) Bonus-Malus 2021 (State)	> 15
ENERGY SECTOR: WIND PROJECT AT 16M€	500K€ (3% OF TOTAL)	500K€ 3% of total) Infrastructure Supporting Factor	1

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The results presented are valid for a GSF at 0.5, under the best-case scenario in which banks pass through all gains to loan rates.

⁵⁴ These models assume that the return on capital expected by banks does not change. In other words, it is the customers who benefit from the GSF, through a reduction in the interest rate. The reduction in rates modelled is thus higher than it would be if banks reserved some of the gains

The effect of the GSF on credit supply is uncertain and primarily depends on the banking strategies adopted

> KEY MESSAGES:

The expected effect of the GSF on the volume of credit is uncertain, and even in the best-case scenario, the additional growth in loans (green and general) would be very low (approximately 0.08%/year).

Even under the assumption of a proactive scenario, additional green loans would represent 70 million euros annually, which is clearly inadequate to meet the needs estimated by the SNBC, at 18 billion euros per year for the period 2019-2023.

The very existence of additional loans depends on the capital management strategies adopted.

An increase in the credit supply is one of the other positive transition impacts expected of the GSF. The rationale is that with the reduction in prudential requirements, the level of capital required against banking sector exposures is lower. Banks can then provide new loans up to the amount of the unallocated capital. But this expected effect depends on the behaviour of banks: they could also choose to reduce their annual capital increases⁵⁵, so as to reserve a smaller share of their profits. The profit not reserved can then be redistributed to their shareholders, for them to invest freely. In their 2016 article, Aiyar, Calomiris and Wieladek⁵⁶ conclude that it is difficult to determine the linkages between prudential regulation and the credit supply. Care should therefore be taken to avoid jumping to conclusions about the potential stimulation of the credit supply.

The challenge is then to use a model to quantify the real level of potential additional credit, according to the different behaviours of banks, and to thereby assess the transition effects. The model built for the purposes of the study simulates the effect of the GSF on credit for the six main French banking groups (Groupe Cr dit Agricole, Soci t  G n rale, BNP Paribas, Banque Populaire Caisse d'Epargne, La Banque Postale, CM-CIC), representing more than 81% of assets⁵⁷. The choice of this scope is based on the quality of the aggregate data for the year 2019 contained in the ACPR report⁵⁸.

Its principle is to build a baseline scenario, presenting the evolution of the banking sector from 2022 to 2028, and of its main structural parameters. The next challenge is to simulate the application of a GSF, at the calibration levels used in the scenarios studied, then to observe the impact on the model parameters by making a comparison with the baseline scenario.

The analysis conducted thus focuses only on the differences relative to the baseline scenario. The assumptions and modelling choices of the baseline scenario therefore have little impact on the results obtained, as they are neutralised by the difference effect.

THE MECHANISMS UNDERLYING THE ADDITIONAL CREDIT

Faced with a reduction in their capital requirements, as is the case with the GSF, banks can pursue **two strategies**:

- 1 The lower capital increase strategy:** banks follow the trend rate of growth for their balance sheet modelled in the no-GSF scenario. Compared to this no-GSF scenario, prudential requirements are lower, and the need to provide new capital to support balance sheet growth is therefore lower. With this strategy, the bank uses the GSF to reduce its capital needs, maintaining a constant balance sheet with regard to the counterfactual baseline scenario.
- 2 The balance sheet growth strategy:** banks increase their balance sheet further than projected in the no-GSF scenario, using the reduction in prudential requirements. Indeed, the leverage effect is increased by the GSF and, for the same level of capital, banks are permitted to have a higher balance sheet. The principle is then to maintain a constant rate of capital increase with regard to the baseline. Relative to the no-GSF baseline, the additional leverage provided by the GSF enables a higher increase in the balance.

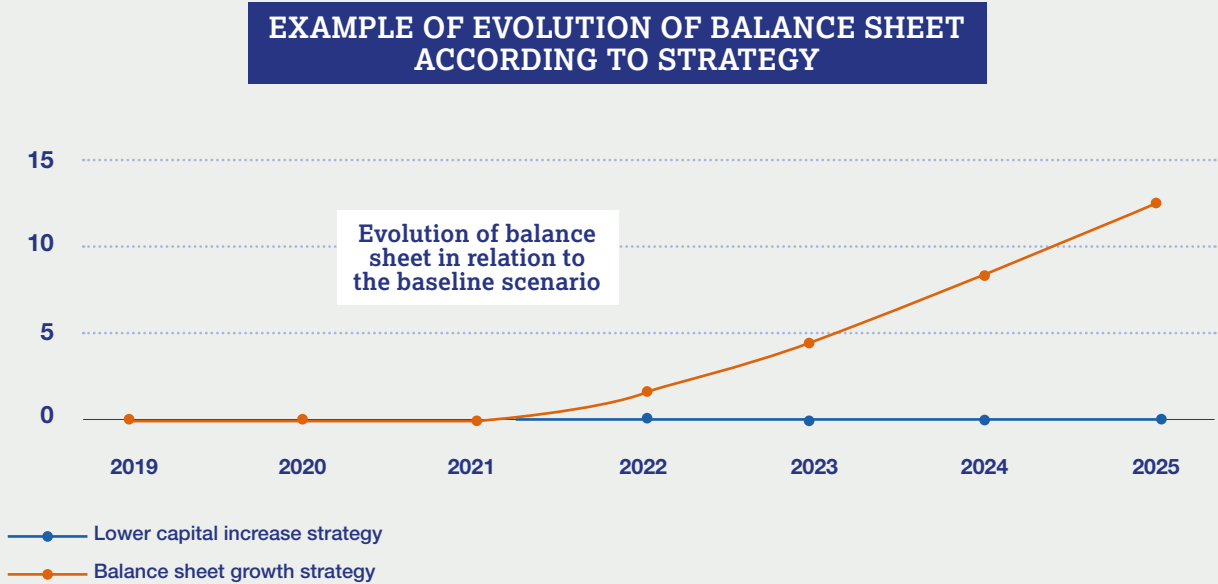
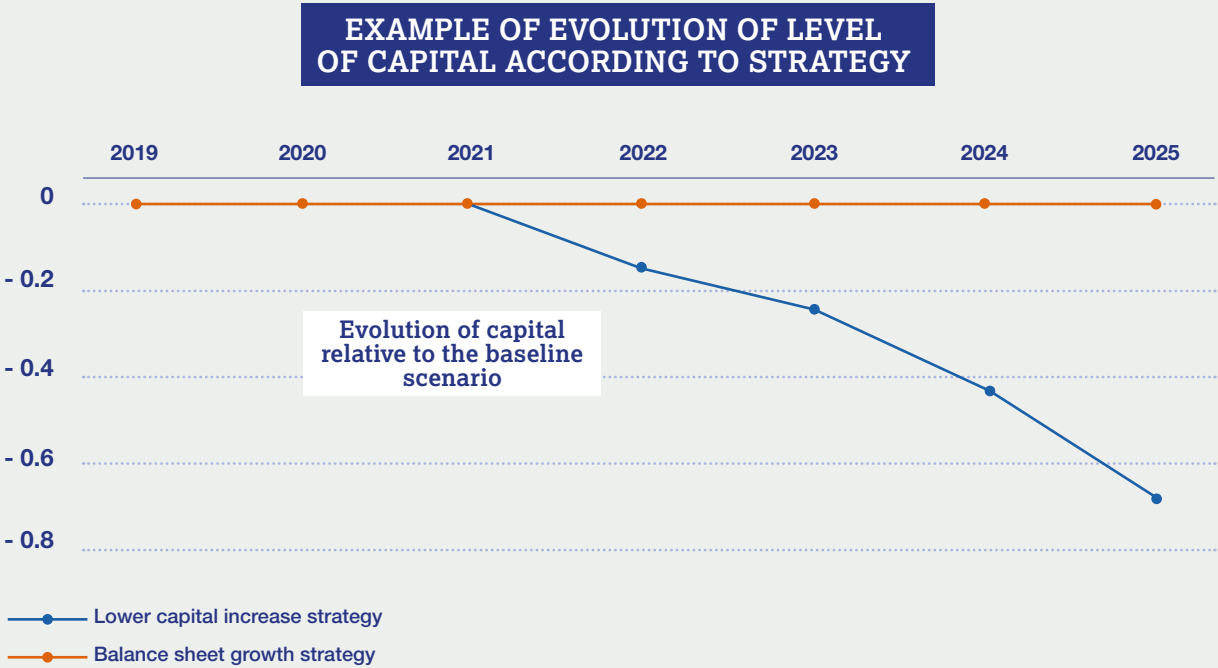
55. To support their balance sheet growth while complying with prudential requirements, banks must increase their level of capital every year. To do so, they reserve part of their annual net income, amounting to approximately 10 billion euros yearly for the French banking sector (Source: ACPR, (2020), La situation des grands groupes bancaires fran ais fin 2019).

56. Aiyar, Calomiris et Wieladek, "How does credit supply respond to monetary policy and bank minimum capital requirements?", European Economic Review, 2016

57. In 2019, the six French banking groups had a total aggregated balance sheet of 7 011 billion euros, compared to 8 671 billion euros for the whole banking sector (Les chiffres du march  fran ais de la banque et de l'assurance en 2019).

58. ACPR, "La situation des grands groupes bancaires fran ais fin 2019". 2020

FIGURE 5: TABLE SHOWING BANKING STRATEGIES FOR ADAPTATION TO THE GSF⁵⁹



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57. The scale of the graphs presented in Figure 5 is illustrative and has no economic significance.

It is interesting to note that **only one of the two strategies (the balance sheet growth strategy) increases the balance sheet, and thus generates additional credit compared to the trend.** This raises two questions: first, **what is the most plausible banking strategy**, and second, **is the additional credit generated invested in green assets?**

→ WHAT IS THE MOST PLAUSIBLE BANKING STRATEGY?

The choice of a strategy depends on the many characteristics of the bank, such as the profile of its customers, its situation, or its level of past commitment to climate issues. The models have nevertheless shown that in the short term (one to five years), the lower capital increase strategy enables banks to reserve a smaller proportion of profit, and therefore to increase distributable profit. If dividends must be paid to shareholders in the short term, it will be easier to adopt this strategy, as the net income to be reserved will be lower, and therefore the available and distributable gains will be higher.

On the contrary, in the long term (more than 10 years), the balance sheet growth strategy can pay off from the bank's point of view. Reinvesting additional capital results in a significant increase in net income, which can offset capital needs⁶⁰.

According to the vision of their shareholders and directors, banking institutions may choose one or other of these strategies. It is also possible that a bank may develop an intermediate strategy, in order to slightly reduce its capital needs, while reinvesting some of the additional capital to increase its balance sheet.

Whatever the case, these models have shown that the balance sheet growth strategy is not always the most appropriate in the short term, and that it is unlikely that the entire banking system will choose this strategy if the GSF is applied. However, to observe the potential impact of the GSF, it is interesting to study this maximum assumption, in which the six French banking groups all choose this strategy. **Assuming this best-case scenario means that in the following part, an upper value can be given to the impact of the GSF on credit, according to the calibration levels and the scenarios.** The most plausible assumption remains that a lower impact is expected.

→ WILL THE ADDITIONAL LOANS BE EXCLUSIVELY PROVIDED FOR ASSETS CLASSED AS GREEN UNDER THE TAXONOMY?

The answer to this question seems to be no. Banks certainly have an interest in financing more green assets in order to reduce their regulatory requirements. But the capital they free up by doing so can be reinvested, through the leverage effect, to finance assets of all types, and in all sectors. **It is therefore likely that the additional loans will be provided for "green assets" in the same proportion as the other inflows, in other words 2-3%**⁶¹. Thus, only 2-3% of additional loans will actually be allocated to the transition.

QUANTIFIED IMPACT OF THE GSF ON THE CREDIT SUPPLY ACCORDING TO BANKS' CLIMATE STRATEGIES

The impacts of the GSF on credit are modelled for a single calibration at 0.75, for an entry into force in 2022 on inflows, and for **three banking sector climate commitment scenarios**⁶²:

- 1 Proactive scenario:** bank climate investments increase by 20%/year, in line with the SNBC objectives. This growth figure of 20%/year corresponds to the rate of growth in French bank investments needed to achieve the objectives set by the SNBC⁶³, at 18 billion euros for 2019-2023 and 44 billion euros for 2024-2028.
- 2 Five-year delay scenario:** bank climate investments increase by 10%/year, which results in a five-year delay in achieving the objectives set by the SNBC, in other words a bank climate investment volume of 18 billion euros for the period 2024-2028⁶⁴.
- 3 Wait-and-see scenario:** climate investments increase at the trend balance sheet growth rate of 3%/year.

These models have been conducted until 2028, and the choice of this date is the result of two parameters.

First, the model is extremely dependent on the climate commitment scenarios. However, robust data on climate investment objectives are only available up to that date, since this data is directly attached to the SNBC periods. Building

60. See Annex 4 for details of the models, and the section on bank profitability for curves.

61. The green share of inflows is very difficult to find in the literature, and this choice of 2-3% is to some extent arbitrary. The broader range is 1-5%. See Annex 5 for more details.

62. Details of these scenarios are given in Annex 5, in particular with a curve presenting growth of the share of the portfolio eligible for the GSF according to the timescale and the scenario.

63. I4CE, Hainaut et al., "Relance: comment financer l'action climat". 2020

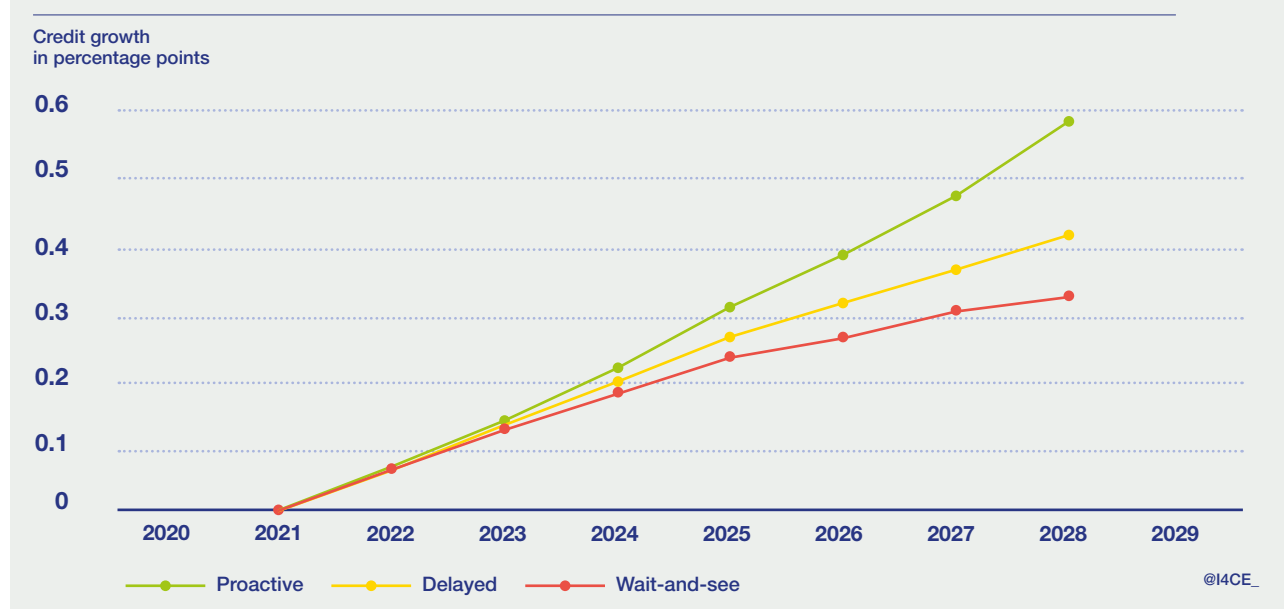
64. See Annex 5 for details of the calculations.

climate commitment scenarios that are coherent and relevant with regard to current rates has therefore only been possible up to 2028. Proposing a longer model would have required extrapolation of these results, and the sensitivity to assumptions could have undermined the credibility of conclusions.

Second, with regard to the objectives set by the SNBC, the challenges are for the next five years. An intense rate of growth in climate investments will need to be maintained, failing which these objectives may not be met. The goal of this study, and of its approach focusing on impact, is to determine whether the GSF can make an effective contribution in this short to medium term.

The additional credit relative to the baseline scenario is represented in Figure 6 below. It is assumed that the six main French banking groups (Crédit Agricole, Société Générale, BNP Paribas, BPCE, LBP and Crédit Mutuel-CIC) will pursue the balance sheet growth strategy. It is also assumed that the share of loans relative to the balance sheet remains constant. The change in loans and in the balance sheet is thus proportional. By representing the change in the balance sheet relative to the baseline scenario, the model therefore also describes the change in the credit supply.

FIGURE 6: ASSUMPTION OF BALANCE SHEET GROWTH STRATEGY: A LIMITED EFFECT ON CREDIT, AND WEAK CORRELATION WITH BANKING SECTOR CLIMATE COMMITMENT



The effects of the GSF on bank loans are very gradual (increased growth of 0.06%/year) until 2025. In the medium term, by 2028, bank loans increase in the proactive scenario by 0.58%, or an annual average growth of 0.08%. Relative to the aggregate loan amount of 4 150 billion euros for the six main French banking groups⁶⁵ in 2019, this 0.08% represents an additional loan portfolio of 3.5 billion euros/year. With a green share of these new assets standing at approximately 2%, **the order of magnitude of additional banking investment in the transition is approximately 70 million euros/year, which is negligible compared to the 18 billion euros/year expected by the SNBC for 2019-2023⁶⁶.**

Until 2025, the effects are independent of banking sector climate commitment. From 2025 onwards, the first differentiated effects on credit supply growth are observed, reaching almost 0.1%/year in the proactive scenario, compared to 0.02%/year for the wait-and-see scenario. **But even on this longer time horizon, the effect of the GSF remains very limited.** The optimistic value of 0.58% in 2028 should be compared to the annual trend rate of growth estimated at 3%⁶⁷. At a growth rate of 3% per year, the bank takes less than three months to grow by 0.58%. **Thus, under these assumptions, the balance sheet in January 2028 with a GSF at 0.75 will be identical to the balance sheet in April 2028. In the best**

65. Calculations based on ACPFR, "La situation des grands groupes bancaires français fin 2019". 2020

66. These additional transition efforts are estimated for the six main French banking groups, and can be made across their whole portfolio, including abroad. But even assuming these investments are made exclusively in France, the figure of 70 million euros/year obtained is negligible compared to the effort expected of French banks by the SNBC.

67. The trend rate of growth over the period 2013-2019 is 3%. See Annex 4 for details of the calculation, and the trend extrapolation for 2019-2028.

case, the GSF will mean the 2028 climate targets can be reached two and a half months earlier.

It is therefore difficult to see how the GSF could impact credit, and the transition, in view of this order of magnitude. It should also be remembered that this is an upper value of the effect on credit, and that **in reality, the effect will probably be much lower because of the banking strategies adopted. The quantitative results produced by the models confirm the qualitative arguments calling for caution regarding the impact of the GSF.**

In conclusion, the argument that the impact of the GSF on the transition is justified by its positive effect on credit seems to be incorrect.

The effect of the GSF on bank profitability is nevertheless certain, and even the worst performers are rewarded

> KEY MESSAGES:

Despite its limited impact on the transition, the GSF is moderately profitable for banks, with a gain of 0.1 to 0.4 billion euros/year for the whole of the French banking sector.

The GSF does not particularly encourage the banking sector to adopt a proactive climate strategy. Indeed, in the short term, there is no additional reward in relation to a wait-and-see attitude.

The rewards of the GSF are not conditional on achieving the climate investment objectives set by the SNBC. Even in the case of a wait-and-see attitude, the banking sector is still rewarded.

Over and above the impact for the transition sectors, to have a better global vision of the GSF, it is important to examine its impact on the main sector concerned: the banking sector. For this sector, distributable profit has been selected as the metric for measuring impact.

“Distributable profit” corresponds to the value obtained by deducting the amount of annual capital increase from the net income.

Distributable profit = net income – capital increase.

This value is relevant since it expresses **the value actually distributable to shareholders**, after the bank has increased its capital by reserving a proportion of its income. Of course, the reserve is a type of reinvestment in the company by shareholders, but it is an obligatory reinvestment. Assuming other sectors offer better returns on capital than the banking sector, it could be interesting for shareholders to reinvest their profits in these sectors. In the context of a capital increase, shareholders cannot freely reinvest all income, but only **the share of income known for the purposes of this study as “distributable profit”**.

The impact of the GSF on distributable profit for the French banking system⁶⁸ is modelled until 2028, as with the effects on credit, and for the three bank climate commitment scenarios (proactive, delayed, wait-and-see) described above. The results obtained depend on the strategy followed, and the two extreme situations, in which the whole of the banking system chooses i) the lower capital increase strategy, or ii) the balance sheet growth strategy, have been modelled.

THE GSF INCREASES BANK PROFITS, BUT CLIMATE EFFORTS ARE RECOGNISED BELATEDLY, AND WAIT-AND-SEE STRATEGIES ARE OVER-REWARDED

In the design of a potential GSF, the most plausible assumption is that the taxonomy will be used to determine which loans would be eligible for the measure. For the time being, and in view of the difficulties of banking IT systems, it is expected that the GSF will be applied to inflows, rather than to existing loans. Despite numerous studies^{69,70}, it is very difficult to find in the literature harmonised and stabilised figures concerning the green share of inflows for 2022.

In this study, **the green share of inflows is specifically defined as the green taxonomy-eligible percentage of banking assets (loans, investments, cash flow, etc.) weighted according to their risk and contractualised within the year⁷¹**. The broad range is between 1 and 5%, and the figure of 2%⁷² was chosen for this study.

One of the problems caused by **the application to inflows is that climate commitment efforts are only recognised in the medium to long term (post-2028)**. The incentive to implement ambitious strategies is therefore low. In a proactive scenario, the banking system invests in the climate and attempts to go higher than the 2% of green

68. More specifically for the aggregation of the six main French banking groups.

69. Principles for Responsible Investment, “Testing the taxonomy”. 2020

70. Novethic, “Les fonds verts européens au défi de la taxonomie”. 2020

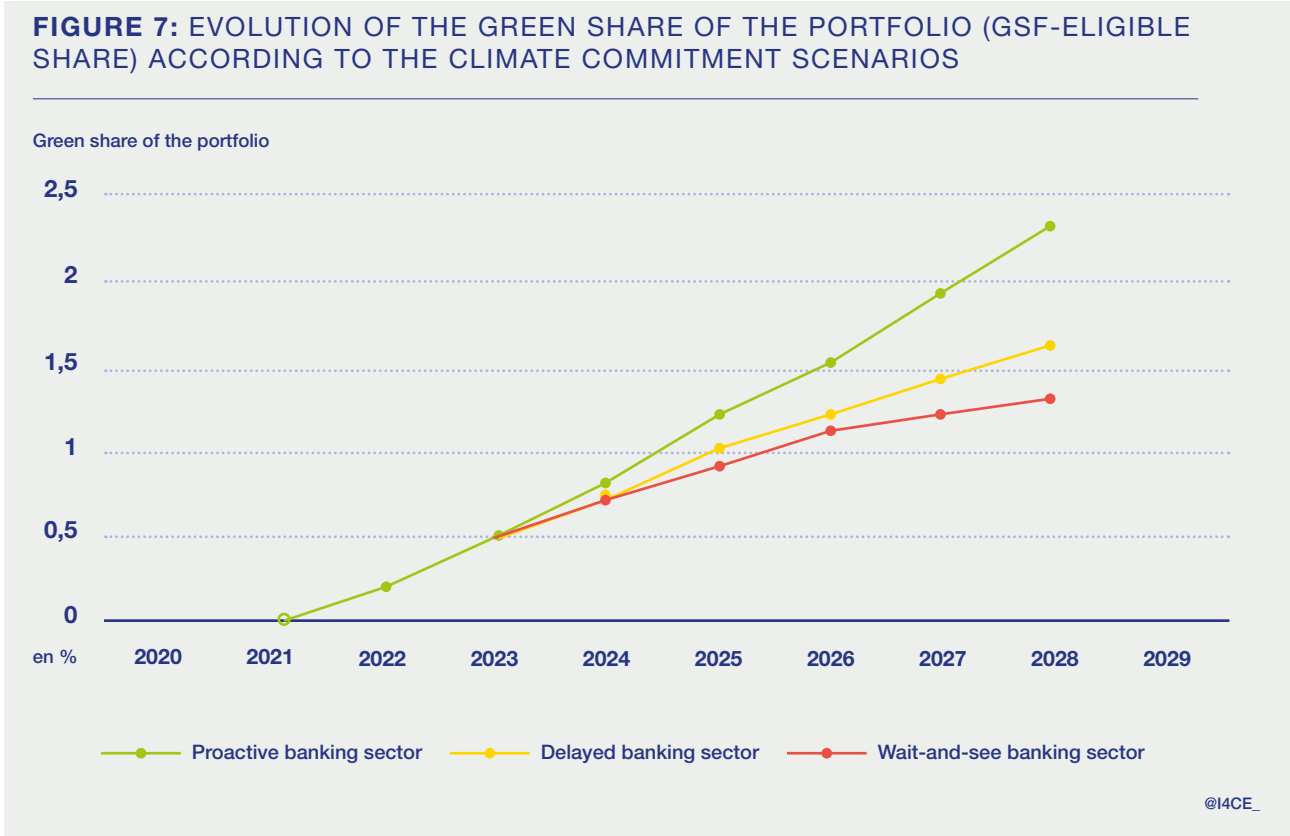
71. In other words, it is the green taxonomy-eligible share of RWAs contractualised within the year.

72. See Annex 5 for further details.

assets, but it will be several years before its efforts on inflows materialise across the balance sheet as a whole. In a more passive scenario, the banking sector merely labels the 2%

of green assets that already exist in inflows. Without any effort, the banking sector will thus increase the green share of its portfolio every year to reach 2%.

FIGURE 7: EVOLUTION OF THE GREEN SHARE OF THE PORTFOLIO (GSF-ELIGIBLE SHARE) ACCORDING TO THE CLIMATE COMMITMENT SCENARIOS



Thus, in the first years following the application of the GSF, whether the banking sector as a whole is proactive, delayed or passive, it should benefit from prudential relief measures of the same magnitude. Yet the magnitude of prudential relief is what conditions the amount banks gain relative to the baseline scenario. If the banking sector receives the same prudential relief whatever its behaviour, then it will be rewarded in an identical manner. It is difficult to believe that the banking sector will be very proactive if it is rewarded even in a scenario that represents it as being passive.

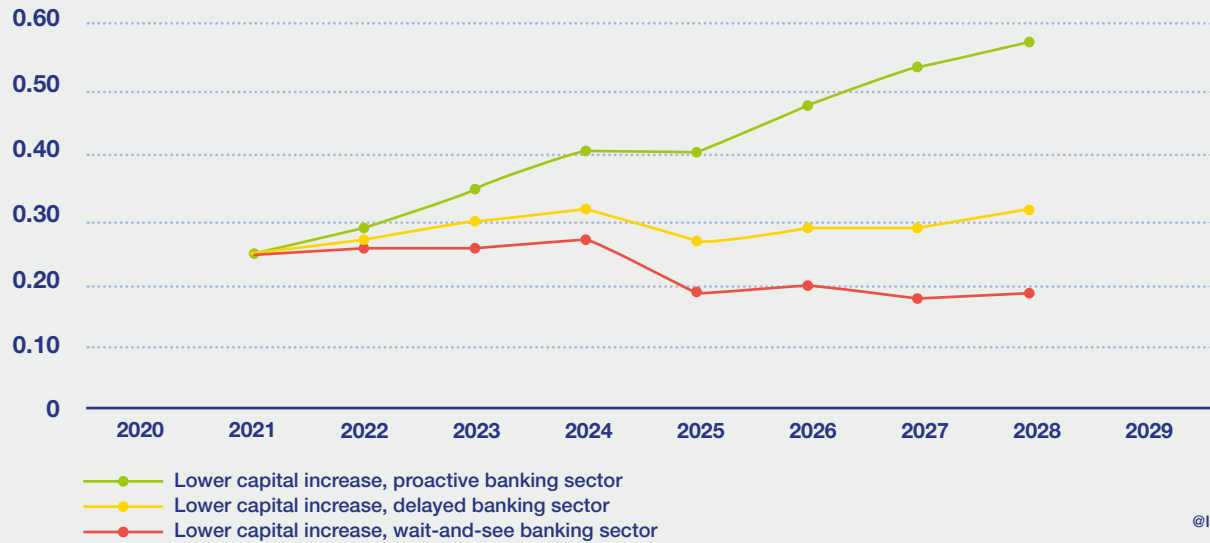
In the proactive scenario, banking sector climate investments grow at a rate of 20%/year. In the wait-and-see scenario, they grow at the far lower rate of 3%/year. But since the starting point is the same, set at 2% of inflows for all banks, it will take time before the cumulative gaps between the two scenarios become significant. The decision to set the same starting point is due to the fact that it represents the current share of green assets in inflows at the aggregate level for the whole banking sector.

It is only from 2025 onwards that the gaps in the green share of portfolios widen, and **it is therefore only on the basis of gains recorded after 2025 that the banking sector will benefit from committing to the climate.**

Figure 8 below confirms that the impact of the strategy on distributable profit is observed in 2024-2025.

FIGURE 8: ASSUMPTION OF LOWER CAPITAL INCREASE STRATEGY: A STRONG IMPACT IN THE SHORT TERM ON DISTRIBUTABLE PROFIT

Change in profit not reserved
(in billion euros)

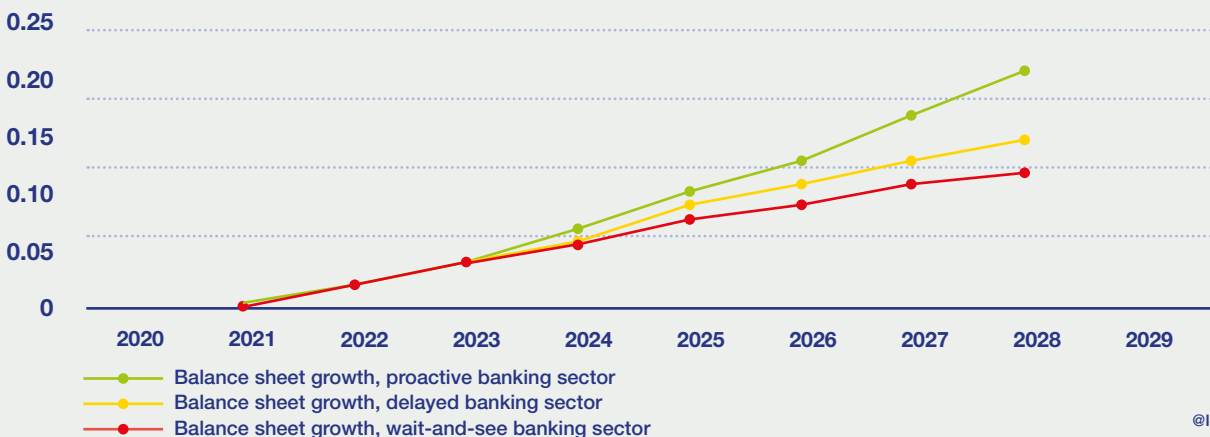


The interest of this graph is that it shows **the order of magnitude of the reduction in capital needs, at 0.2 billion euros/year for a passive banking sector, and 0.4 billion euros/year for a proactive banking sector.** Compared to the net income of 25 billion euros/year, and to the current rate of aggregate capital increases of approximately 5 million euros/year, a GSF at 0.75 generates **a 4-8% reduction in capital needs** relative to the counterfactual. **This means that over the period 2022-2028, 1 to 2 billion euros of profit will potentially not need to be reserved, and could therefore be redistributed to shareholders.**

According to the strategy chosen, the GSF impacts different financial magnitudes. In the context of a balance sheet growth strategy, the effect concerns the aggregate balance and therefore the aggregate net income. In simpler terms, the additional share of income reserved (0.2-0.4 billion euros/year) is reinvested in the bank and only remunerated at the ROE ratio set at 6.3%. The order of magnitude of the gain is therefore far lower in the short term, but since a larger share of income is reinvested every year (in 2028, the cumulative amount is 1-2 billion euros), the long-term gains are ultimately substantial (a 1% increase in net income in 2028 in the proactive scenario).

FIGURE 9: ASSUMPTION OF BALANCE SHEET GROWTH STRATEGY: A MODERATE GAIN IN THE SHORT TERM, BUT A STRATEGY THAT PAYS OFF IN THE LONG TERM

Increase in net income (in billion euros)



CONCLUSION

It seems the GSF has only a very limited impact on the conditions for financing transition projects and, in the best-case scenarios, would only reduce total project costs by several tenths of a percentage point. Other tools appear far more suitable to address sectoral issues, whether these are financial, proposing support of a higher order of magnitude, or non-financial, providing guidance and expertise.

By reducing prudential requirements, a GSF at 0.75 could enable an increase in the supply of bank loans, at 0.6% of loans in 2028. But these would not all be transition loans, since banks would be entirely free to choose the sectors in which to reinvest additional capital. Consequently, at best, a GSF at 0.75 would result in an additional climate investment of 70 million euros per year, an amount that is negligible compared to the 18 billion euros/year expected for the period 2019-2023. Moreover, this figure should be viewed with caution, as it is based on best-case assumptions. It seems more likely that banks, as companies, will adopt strategies that are advantageous to their shareholders, and will in particu-

lar pursue lower capital increase strategies. The effect on the credit supply will therefore be far more limited.

However, **the GSF is a tool whose interest is clear to the banking sector and its shareholders.** Capital needs would, for example, be reduced by 4-8% in a lower capital increase strategy, and net income could increase by 1% in the medium term in a balance sheet growth strategy. In terms of impact, this raises questions since the rewards are not conditional on achieving climate investment objectives. Even in the case of proactive commitment by the banking sector, efforts will only be better rewarded in the medium term. **The incentive for the banking sector to implement the transition provided by the GSF appears to be too weak to truly contribute to achieving the climate investment objectives required in the context of the SNBC.**

THE PENALISING FACTOR (PF), A MEASURE THAT MUST HAVE A LIMITED SCOPE TO INCENTIVISE WITHDRAWAL FROM FOSSIL FUELS WITHOUT DESTABILISING THE REST OF THE ECONOMY

Presentation of the different approaches to PF application: choice of calibration and scope

> KEY MESSAGES:

- In the absence of a harmful activities taxonomy, three application scenarios have been chosen, with different calibrations and scopes: an extreme PF applied to a scope similar to coal activities ; a high PF with a scope similar to fossil fuels activities; and a low PF with a broader scope of activities linked directly and indirectly to fossil fuels.
- Contrary to the GSF, the models simulate the application of the PF to the whole portfolio of activities, not just to inflows.
- A high or extreme PF (an increase in requirements of 100-250%) can increase the cost of certain carbon-intensive projects by approximately 10%, especially those with a long maturity.

DETERMINING THE CALIBRATION:

A HIGH PF CAN SIGNIFICANTLY INCREASE THE COST OF BANK FINANCING FOR A PROJECT

The rate model⁷³ used in the first section on the GSF is symmetrical in certain aspects, and can also be used to simulate the impact of the PF on bank loan rates. In order to maximise the observable impact in the context of a PF, the model assumes that banks pass through to loans all costs associated with the increase in prudential requirements⁷⁴.

The greater theoretical latitude given to the calibration of the PF means that models with broader PF values are appropriate. **The results are presented for values ranging from 1.1 to 3.5, or an increase in prudential requirements for the assets concerned of 10-250%. Figure 10 presents the model results:**

73. See Annex 2 for operational details.

74. Bridges, and al, The impact of capital requirements on bank lending, Bank of England Working Paper, 2014

FIGURE 10: IMPACT OF THE PF ON ANNUAL LOAN RATES⁷⁵ IN PERCENTAGE POINTS

SCENARIO	LOW PF at 1.1	MODERATE PF at 1.25	VERY HIGH PF at 2	EXTREME PF at 3.5
INITIAL ANNUAL LOAN RATE	4.41%	4.41%	4.41%	4.41%
ANNUAL LOAN RATE WITH PF	4.50%	4.63%	5.30%	6.62%
PERCENTAGE POINT CHANGE IN ANNUAL RATE	+ 0.09PTS	+ 0.22PTS	+ 0.88PTS	+ 2.2PTS
PROPORTIONAL CHANGE IN INTEREST RATE (PF RATE- INITIAL RATE)/INITIAL RATE	+ 2%	+ 5%	+ 20%	+ 2.2 PTS

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For a low to moderate PF, the impacts on loan rates are relatively low, at approximately one tenth of a percentage point. For a very high to extreme PF, the impact is more significant, at approximately one percentage point, and can mean a 50% increase in the weight of bank interest for a project.

For infrastructure projects such as coal-fired power stations, loan maturities can be more than 10 years, and bank interest rates are relatively high, at almost 10%, because of the level of risks these projects often face. In lower risk countries such as China, bank interest rates are around 4-5%⁷⁶. Taking the example of financing for a coal-fired power station, 80% of which is covered by a bank loan with a 10 year maturity and an interest rate of 10% per year, the weight of interest can account for more than 40% of the cost of the project. Under the same assumptions, but with an interest rate of 5%, corresponding to a project in a country such as China, the weight of bank interest accounts for 20% of the project. **Applying an extreme PF to raise the weight of interest for coal-fired projects by 20-50% could increase the cost of these projects by 8-20% in the highest risk countries, and by 4-10% in the lowest risk countries.**

For projects that do not involve energy infrastructure, the maturities are often shorter and the weight of interest in relation to the total investment is therefore lower. For example, assuming that the purchase of combustion vehicles is concerned by a PF, the impact would be smaller. Indeed, the 50% increase in bank interest would mean that the rate of a 12-month car loan at 2% would only increase to 3%. The impact for these shorter loans is lower, and would be at most approximately one percentage point in the case of an extreme PF.

This impact on the total cost, with an extreme PF, is thus of the order of magnitude of one tenth of a percentage point for energy infrastructure projects with a long maturity. This would significantly impair the conditions for financing these carbon-intensive projects, and therefore their implementation, unless other non-bank financing sources are found. For projects with shorter maturities, such as car loans, the impact on the total cost is closer to one percentage point. Applied to a broad scope, an extreme PF would have a significant impact on numerous sectors, but its impact would remain limited on certain loans with a short maturity.

⁷⁵. A risk-weighted factor RW=1 is applied to the loan considered here. The percentage point change in annual rates is relatively dependent on the RW used, since it is the RW that determines the initial level of capital and therefore the pre-PF rate. See Annex 2 for further information on the impact on loans of RW values not equal to 1.

⁷⁶. Jones, Stevenson, et Purvis, « The World Bank and Coal Aid ».

DETERMINING THE SCOPE OF APPLICATION: IN THE ABSENCE OF CONSENSUS, SOME VERY DIFFERENT OPTIONS ARE ON THE TABLE

Like the calibration, the scope of a potential PF remains to be defined. From a risk perspective, the principle of the PF is to impose additional prudential requirements for a “harmful” asset category that is subject to high transition risks. This increase in the capital mobilised is aimed at limiting the impacts on the financial sector should these risks materialise.

By announcing carbon neutrality by 2050 at the European level, and a 55% net emissions reduction target by 2030⁷⁷, the European Commission has set objectives towards the low-carbon transition. This transition calls for alternative low-carbon solutions to the most carbon-intensive traditional activities. In other words, it means replacing all carbon-intensive assets in the medium to long term⁷⁸. These assets, for which the clock is running, could gradually depreciate or even become stranded assets⁷⁹. This loss of value, which depends on the pace of the transition, is the cause of transition risks.

For the purposes of modelling, this study seeks to anticipate the plausible scopes of application for the PF. As a proposal, the PF is not yet fully mature in the public debate, and it is very difficult to decide on the most appropriate scope. The sectors for which medium-term withdrawal and exit strategies already exist are directly concerned by the transition risk and are likely to be concerned by a PF.

With a view to producing scenarios, scopes that include economic sectors deemed to be at transition risk have been developed. The assessment of the transition risk is an assumption, which is not entailed based on any specific research. Assumptions regarding the level of exposure to these scopes have been selected. **It has been difficult to establish the assumptions associated with scenarios and the model input parameters due to a lack of robust public data.** These orders of magnitude regarding exposure are based on certain sources provided by the public authorities and NGOs, but they are not the result of any in-depth quantification process. **The scenarios should not therefore be seen as recommendations for PF application, but rather as attempts to understand the different types of identifiable impacts of the PF.**

DEVELOPMENT OF THREE PF APPLICATION SCENARIOS

In total, three scenarios have been developed, with different scopes of application, but with a calibration adapted so as to always correspond to a relative increase in prudential requirements of 1%. This choice of 1% was made to mirror the order of magnitude of the impact the SME SF has on prudential requirements. The SME SF has in fact resulted in an increase of 0.16 percentage points in the CET1 ratio⁸⁰, in other words a relative change in capital of almost 1%. Setting such a parameter thus enables the construction of these **three scenarios with coherent scopes of application as well as plausible calibrations.** Of course, other calibrations or scopes could have been chosen. The study does not suggest that application decisions should be made by referring specifically to the scenarios modelled; it simply models orders of magnitude of the impact a PF could have on the transition under different assumptions.

The three scenarios simulate an application of the PF in 2022, to the whole portfolio of activities and not just to inflows. The three scenarios are:

- “Extreme PF, localised scope”. **The calibration is set at 3.5**, or a 250% increase in prudential requirements for the assets concerned. **Scope set at 0.4% of RWAs⁸¹.** This level corresponds to the high range of French banking sector exposure to coal⁸².
- “Moderate PF, limited scope”. **The calibration is set at 1.25**, or a 25% increase in prudential requirements for the assets concerned. **Scope set at 4% of RWAs.** This level corresponds to an estimated order of magnitude of French banking sector direct exposure to fossil fuel activities. As explained above, in view of the lack of data, this estimate should be considered with caution, as it is derived from a single source, and based on a methodology specific to the authors of that source⁸³.
- “Low PF, broad scope”. **The calibration is set at 1.1**, or a 10% increase in prudential requirements for the assets concerned. **Scope set at 10% of RWAs.** Such an exposure requires aggregation of at least 10 sectors linked directly to fossil fuels (coal, oil, gas), or more indirectly (cement, aeronautics, etc.)⁸⁴.

77. Relative to 1990 levels.

78. According to the report by IEA (2021), Net Zero by 2050, the production of energy from fossil fuels declines sharply, but is not zero in 2050 due to the existence of carbon capture and storage technologies. The decrease between 2020 and 2050 is -90% for coal, -75% for oil and -55% for natural gas. Fossil fuel assets will therefore not lose all of their value by 2050, and the expected depreciation is gradual. Caldecott et al., “Stranded Assets”.

79. Caldecott et al., “Stranded Assets”.

80. EBA, “Report on SMEs and SME supporting factor”. 2016

81. Risk-weighted assets: prudential requirements are not calculated relative to assets (loans, cash flows, etc.), but relative to risk-weighted assets.

82. ACPR and AMF, “Les engagements climatiques des institutions financières françaises”.

83. Institut Rousseau, Les Amis de la Terre France, and Reclaim Finance, “Actifs fossiles, les nouveaux subprimes”. 2021

84. See Annex 6 for justification of values.

FIGURE 11: TABLE SUMMARISING THE THREE SCENARIOS CHOSEN FOR PF APPLICATION

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SCENARIO	Extreme PF, localised scope	Moderate PF, limited scope	Low PF, broad scope
CALIBRATION	3.5	1.25	1.1
SHARE OF RWAS (CONCERNED BY PF)	0.4%	4%	10%
PLAUSIBLE SCOPE OF SECTORS CONCERNED	Coal	Coal, oil, gas	Coal, oil, gas, cement, petrochemicals, aeronautics, combustion vehicles
INCREASE IN PRUDENTIAL REQUIREMENTS	1%	1%	1%

For each of these scenarios, the following are simulated:

- 1 **the penalty generated for the banking sector** in general (in terms of capital needs, or directly in terms of net income),
- 2 **the contraction of credit**, a side effect on the overall distribution of loans. The results of these simulations are strongly dependent on the rate of banking system withdrawal, in other words on the capacity of actors to exit the activities concerned in order to no longer be penalised by an increase in requirements.

Proactive withdrawal from carbon-intensive assets enables a rapid return to the usual level of requirements. The effects, both on credit and on financial parameters, are limited in time. On the contrary, a slower withdrawal prolongs the negative effects of the PF on all credit and on the banking system.

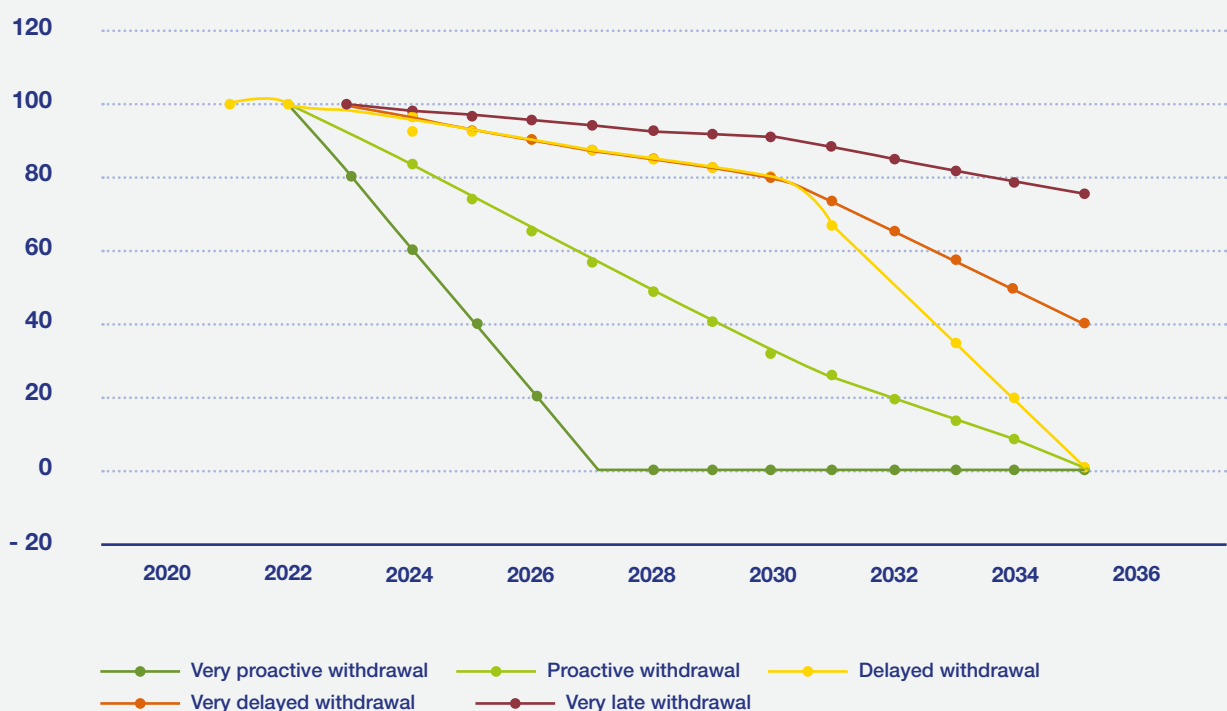
This model does not provide the optimal rate of withdrawal for banks, but rather a visualisation of the impact, with a given PF application scenario and withdrawal scenario. Thus, for each PF application scenario, it was necessary to asso-

ciate assumptions on the rate of withdrawal. Naturally, it is more difficult to achieve a rapid rate of withdrawal when the scope of PF application is broad. Several withdrawal scenarios have been modelled, but are more or less plausible depending on the PF application scenario with which each one is associated.

These **five withdrawal scenarios** are:

- 1 **Very proactive withdrawal:** final withdrawal in 2027
- 2 **Proactive withdrawal:** final withdrawal in 2035, with a 70% reduction target for 2030
- 3 **Delayed withdrawal:** final withdrawal in 2035, with a 20% reduction target for 2030
- 4 **Very delayed withdrawal:** final withdrawal in 2040, with a 20% reduction target for 2030
- 5 **Very late withdrawal:** final withdrawal in 2060, with a 10% reduction target for 2030

FIGURE 12: EVOLUTION OF HARMFUL ACTIVITIES SHARE OF RWAS REBASED TO 100 ACCORDING TO ASSUMPTIONS ON HARMFUL SECTOR WITHDRAWAL



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The scenarios presented are not intended to be prospective; they are used to establish assumptions and to observe model outputs. The establishment of assumptions is com-

plicated by a lack of ex ante data, but is necessary to observe the initial results.

Modelling of three PF scenarios: immediate impacts on the targeted sectors and on the economy as a whole, which are temporary or more lasting depending on the scope of application

> KEY MESSAGES:

- The application of a PF has an immediate and significant effect on the banking sector, which can either increase capital, or reduce its balance sheet. Inflows, and especially green flows, could be reduced by several percentage points during the first year of application.
- Applying an extreme PF to a localised scope creates a strong incentive for banks to mobilise in order to rapidly withdraw from the activities concerned, making the effects on credit temporary and limited.
- Applying a PF to a broader scope has more lasting effects on credit, and therefore on green loans. The incentive to withdraw from the sectors concerned is weaker due to the high number of sectors concerned and the lower calibration of the PF. Finally, the risk of penalising traditionally carbon-intensive companies that are currently in transition is also higher.

**“EXTREME PF, LOCALISED SCOPE”:
SIGNIFICANT BUT TEMPORARY EFFECTS
ON THE BANKING SECTOR AND CREDIT**

According to the scope concerned, withdrawal strategies differ in terms of ambition. For this extreme PF, but applied in a very localised manner to 0.4% of the portfolio⁸⁵, very proactive and proactive scenarios are plausible. The main French banks have already undertaken to withdraw from coal by 2030 in the European zone, and by 2040 in the rest of the world.

The effects on credit and on financial parameters (capital needs, as well as the impact on net income) are modelled for the **three most plausible scenarios, in other words**

- 1 **very proactive**
- 2 **proactive**
- 3 **delayed.**

FIGURE 13: ASSUMPTION OF CONSTANT BALANCE SHEET STRATEGY: A STRONG NEED FOR INITIAL CAPITAL INCREASE, RECOVERED IN THE CONTEXT OF A VERY PROACTIVE WITHDRAWAL

Profit not reserved relative to baseline scenario (in billion euros)



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85. ACPR and AMF, “Les engagements climatiques des institutions financières françaises”.

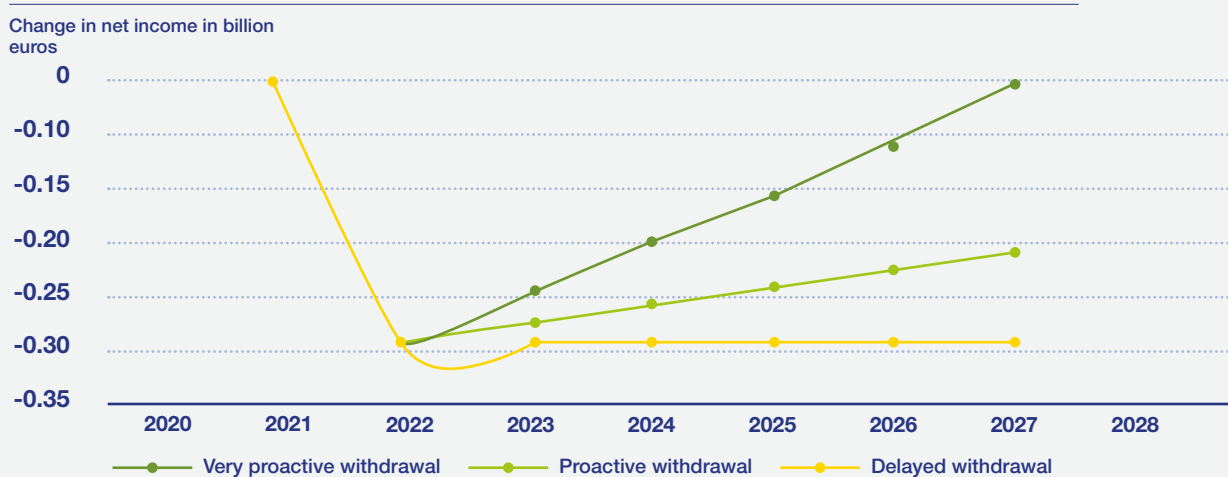
If the banking system wishes to maintain a constant balance sheet in the first year, and to absorb the increase in requirements through an increase in capital, 3.7 billion euros of additional CET1 capital⁸⁶ will need to be provided from the first year of application⁸⁷. **This need for capital, for a 1% increase in requirements, corresponds to 13.2% of their annual net income and a 1% relative increase in total capital⁸⁸.**

However, these efforts can be rapidly recouped in the very proactive scenario. In this scenario, the banking sector gradually withdraws from the assets concerned by the PF, which results in a reduction in requirements relative to the first year. Capital needs are therefore reduced relative to the baseline scenario for these years of lower prudential requirements. In

other words, **it is as if the banking system were ahead of schedule on its trend growth in capital.** This penalty reduces profit only in the first year, but once capital needs are adapted to the new level, only changes in the balance sheet come into play. Conversely, a delayed withdrawal would mean more lasting effects on capital needs and, in 2027, nothing is yet recouped.

If the banking sector fails to secure the funds needed to increase capital, it will be unable to support the growth of its balance sheet, and therefore of its net income. **The decline in income, in a balance sheet reduction strategy, is in the order of 0.3 billion euros/year** and will persist unless proactive or very proactive action is taken. **This gap with projected net income is approximately 1%⁸⁹.**

FIGURE 14: ASSUMPTION OF BALANCE SHEET REDUCTION STRATEGY: AN IMMEDIATE REDUCTION IN NET INCOME, RECOVERED IN THE CONTEXT OF A VERY PROACTIVE WITHDRAWAL



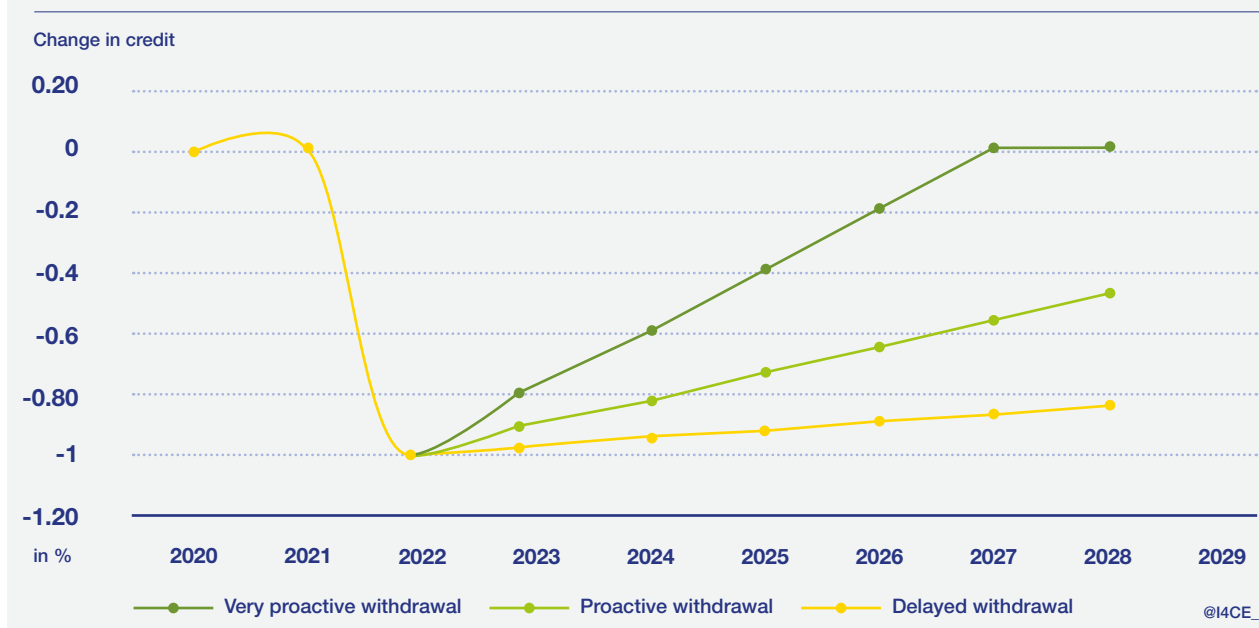
In addition to **this reduction in net income, balance sheet contraction can result in a reduction in bank loan volumes.** It should be noted that balance sheet contraction is the result of the simulation assumption consisting in maintaining the same rate of capital increase as in the baseline scenario. The conclusion of the model is not that an increase in prudential requirements necessarily leads to balance sheet contraction, but that if banks do not succeed in increasing capital, then it is possible that there will be a contraction of the balance sheet.

Figure 15 below describes the effects on the balance sheet, under this assumption of a constant capital increase

relative to the baseline scenario. If the balance sheet contracts as described below, there is also a risk of credit contraction. Assuming that the share of loans in relation to total assets remains constant, then the change in bank loan volumes is proportional to that of the balance sheet. Thus, if the banking system does not succeed in increasing capital after the introduction of a PF, and if the balance sheet contracts by 1%, then the effect on credit will be 1% in the first year. This effect is offset if banks rapidly withdraw from their balance sheet assets linked to the sectors concerned, but persists in the other cases (see Figure 15).

86. Common Equity Tier One (CET1) capital refers to the highest quality form of bank capital.
87. In this case, 2021, since banks anticipate the additional capital they will need the following year, here 2022, the year of simulated PF application.
88. This figure of 1% is in fact entirely dictated by the calibration of scenarios, which imposes a 1% increase in prudential requirements. For regulators, and with a view to future decisions, it is important to note that this increase in requirements, whether it represents 0.5%, 1% or 2% depending on the calibration considered, will have an immediate impact, from the first year.
89. For scenarios with different scopes and calibrations, the impact on net income would be proportional to the increase in prudential requirements. In other words, a PF at 1.5 applied to 4% of the portfolio would result in a 2% reduction in net income.

FIGURE 15: ASSUMPTION OF BALANCE SHEET REDUCTION STRATEGY: CONTRACTION EFFECTS POSSIBLE FOR ALL CREDIT, WHICH MAY BE TEMPORARY DEPENDING ON THE HARMFUL SECTOR WITHDRAWAL STRATEGY ADOPTED



The study thus highlights a possible risk of credit contraction, but this risk must be viewed with caution in light of the assumptions used and the scientific research on the subject.

“MODERATE PF, LIMITED SCOPE” AND “LOW PF, BROAD SCOPE”: LONG-LASTING EFFECTS AND UNCERTAIN CONSEQUENCES FOR THE TRANSITION SECTORS

►► **In case of broad application, the PF could penalise carbon-intensive sectors that are in transition**

The PF adopts a very static reading of companies and their role in the transition, without analysing the dynamics of change. In fact, many companies, and in particular the major energy companies, are adapting their business models, which were historically reliant on fossil fuels, towards low-carbon activities. Because they are still very carbon-intensive, these companies could be penalised by a PF with a broad scope, even though they are making efforts and working towards their own transition.

In the energy sector, which is organised into independent subsidiaries, it is unlikely that the PF would have side effects for investment in low-carbon activities. Indeed, these large companies are often organised

into highly specialised subsidiaries, with their own access to financing. Activities linked to the energy transition are therefore relatively protected in relation to fossil fuel activities. Consequently, it is not the whole company that is penalised by the introduction of a PF, but more specifically its most exposed subsidiaries. The PF will therefore not have any negative side effects on the energy transition. This nevertheless raises the question of how to track unallocated loans contracted by the holding company at the head of the subsidiaries, which then redistributes these loans without the bank knowing whether they are used for fossil or renewable subsidiaries. This issue is particularly acute in the context of non-conventional energy sources, which are not necessarily financed through specific projects, but rather through the oil companies’ general-purpose financing.

However, in other sectors, the PF could reduce access to financing for the whole company, even if it is on the path to transition. Indeed, in the broader “harmful” sector, including heavy industries and vehicle and aircraft manufacturers, there is no such clear division into subsidiaries. The company would thus be penalised at a more aggregate level, thereby limiting its latitude to ensure its transition. This is particularly the case of the cement sector in France, which is still a very high-emitting sector, but for which a transition plan⁹⁰ has been developed. This transition requires substantial investments as well as a gradual decrease in production. As things stand, in a “Low PF, broad scope” scenario, the cement sector would be

90. Ademe and Finance ClimAct, “Présentation plan sectoriel ciment”. 2020

concerned by an increase in prudential requirements. The company's whole investment capacity would therefore be penalised, and its capacity to implement the transition would then be reduced. The aeronautics sector and the automobile sector both have this same profile, with a high need for investment and an identical legal organisation, whatever the nature of the activities.

Caution must therefore be exercised when considering the scope. In the "Moderate PF, limited scope" scenario, the measure would only concern fossil energy producers. The negative effects would then be limited due to the very specific organisation of the energy sector into subsidiaries. To ensure these effects remain limited, only carbon-intensive subsidiaries should be targeted, at the risk of not covering non-conventional projects. However, integrating parent companies would also run the risk of penalising green energies.

In a "Low PF, broad scope" scenario, however, some companies could encounter financing difficulties, despite

their transition efforts. **In this scenario, the PF could thus produce the exact opposite of the intended effect, in other words it could penalise the transition.**

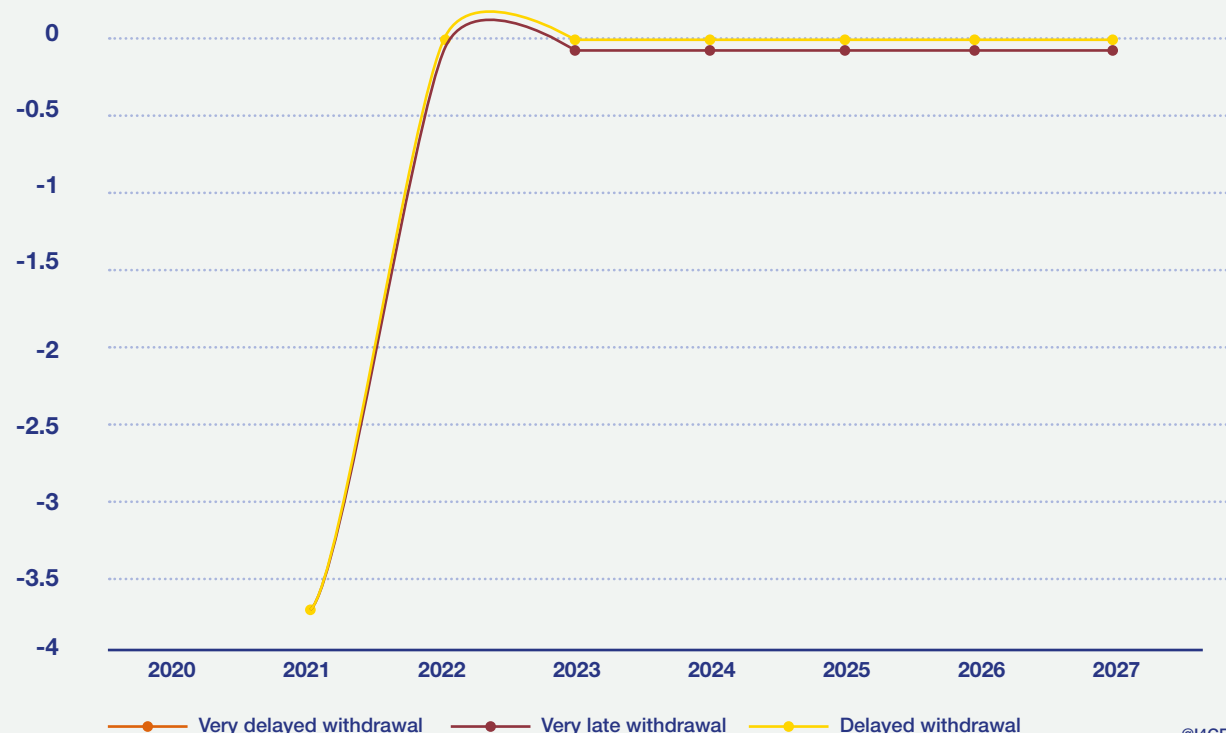
►► **Proactive behaviour seems implausible for a broad scope, and the effects of the PF on the banking sector are more lasting**

For these broad PF scopes, the very proactive and proactive scenarios seem less plausible. It is in fact very difficult to estimate the economic, social and even financial consequences of a hasty and sudden withdrawal from these sectors. The impact of the PF is therefore used here for the "delayed", "very delayed" and "very late" withdrawal scenarios.

Since the calibration of the PF has been determined according to the scope of application, to guarantee a 1% increase in prudential requirements in the first year, the results of the model are common to the "High PF, limited scope" and "Low PF, broad scope" scenarios.

FIGURE 16: ASSUMPTION OF CONSTANT BALANCE SHEET STRATEGY: A STRONG NEED FOR INITIAL CAPITAL INCREASE, WHICH IS NOT RECOVERED DUE TO HARMFUL SECTOR WITHDRAWAL BEING TOO LATE

Profit not reserved relative to the baseline scenario (in billion euros)



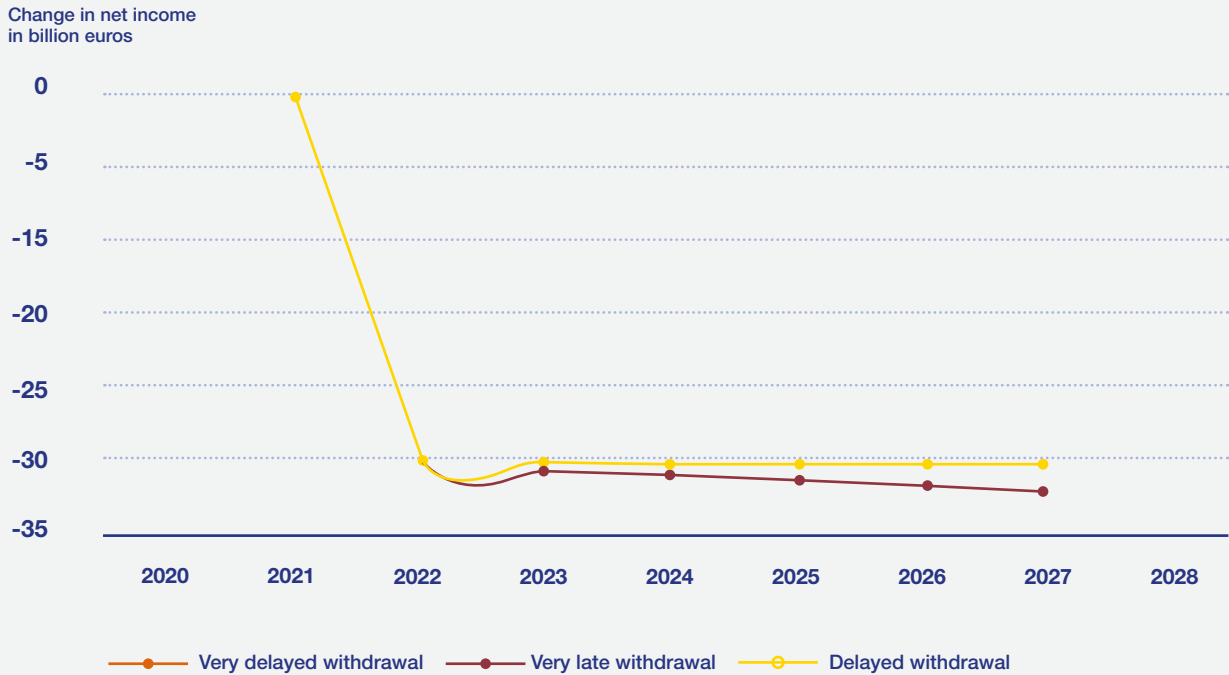
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This time, the three withdrawal scenarios that appear appropriate in view of the scope concerned lead to a marked deferral of gains. In the case of a constant balance sheet, the banking system still needs to increase capital in 2021 by 3.7 billion euros (13.7% of its net income in 2021), but it no longer recovers its investment through reductions in capital reserves required over the period 2020-2030. In other words, if it mobilises its shareholders, the banking sector can reserve almost 15% of its income in 2021, but will not be able to redistribute it by 2027. If it mobilises external

capital, it can remunerate it, but will not be able to “return” it by 2027.

As can be expected in view of the assumptions used, the model⁹¹ shows that it is only from the moment the banking system truly begins its withdrawal from the assets concerned that its capital needs diminish relative to the trend. In other words, in the context of delayed or very delayed withdrawal, the banking sector is financially constrained by the PF from its entry into force until withdrawal from the sectors concerned is complete.

FIGURE 17: ASSUMPTION OF BALANCE SHEET REDUCTION STRATEGY: AN IMMEDIATE REDUCTION IN NET INCOME, WHICH IS NOT RECOVERED DUE TO HARMFUL SECTOR WITHDRAWAL BEING TOO LATE



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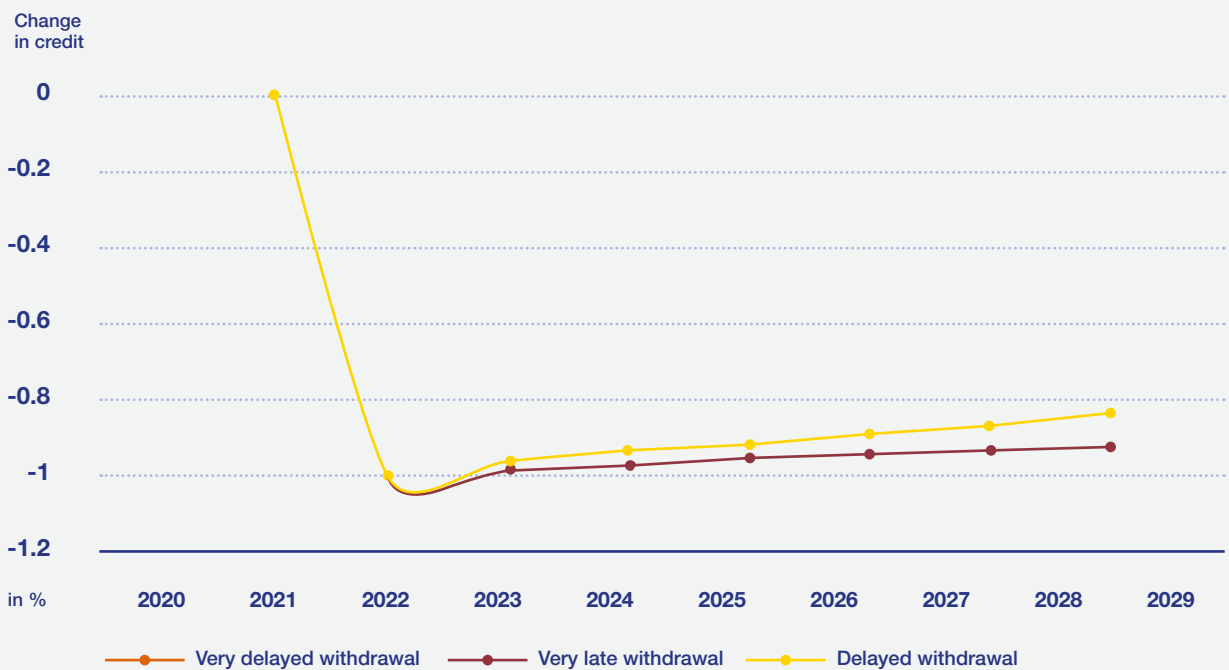
91. See Annex 7.

If the decision is made to not increase capital, then the banking system must reduce its balance sheet and accept a decline in net income. **This effect appears to be much more lasting than in the context of proactive withdrawal strategies.** Since balance sheet contraction is by assumption proportional to credit contraction, the effect on bank lending is more lasting (see Figure 18). Credit contraction is 1% from the first year and, in 2028, the loan volume remains 0.8% lower than in the baseline scenario. **This credit contraction impacts all sectors, including the transition sectors.** Indeed, it is not just loans for assets concerned by the PF that are reduced, but all loans, weighted according to their share in the current bank balance sheet. Currently, the share of loans

to non-financial customers residing in France corresponds to almost 28%^{92,93} of the consolidated balance sheet for the French banking sector. Thus, the introduction of a PF could lead to a reduction in bank loans of almost 20 billion euros in the first year, under the assumption of a balance sheet reduction strategy across the whole banking sector. Assuming that 2% of its loans are allocated to the transition, then almost 400 million euros of green assets will not be financed by commercial banks in the first year of application of the PF. **Under the assumption of bank climate investment volumes of between 10 and 20 billion euros for 2022 (see Annex 5), the PF could thus reduce bank climate financing flows by 2-4% in the first year⁹⁴.**

These conclusions regarding credit are subject to numerous assumptions. They are aimed at giving a maximum order of magnitude for the potential credit contractions affecting bank financing for the transition, an order of magnitude that should be viewed with caution.

FIGURE 18: ASSUMPTION OF BALANCE SHEET REDUCTION STRATEGY: CONTRACTION EFFECTS POSSIBLE FOR ALL CREDIT, WHICH ARE LASTING DUE TO HARMFUL SECTOR WITHDRAWAL STRATEGIES BEING TOO LATE



92. The ACPR report gives 2 412 billion euros in late December 2019, for a total consolidated balance sheet of 8 671 billion euros, or a proportion of 27.8%.

93. ACPR, "Les chiffres du marché français de la banque et de l'assurance". 2019

94. While credit contracts by 1%, inflows are reduced by 2-4%. This gap is due to the fact that inflows represent a smaller amount of assets than loans. However, when credit varies, it is inflows that serve as an adjustment variable. Thus, the change is equal in absolute terms, but proportionally higher for inflows.

CONCLUSION ON THE MOST APPROPRIATE SCOPE OF APPLICATION FOR THE PF

In conclusion, applied to stocks, the PF has an immediate effect, both on loans targeted by the PF and on other loans. From the first year, this effect implies **either a massive effort** by the banking sector in terms of capital increase (13.2% of net income in 2021), **or a balance sheet contraction and therefore a credit contraction of approximately 1%**, as well as a reduction in net income.

This immediate effect is temporary if the banking sector succeeds in rapidly withdrawing the assets concerned from its balance sheet, but is more lasting if this withdrawal is delayed. **For a very localised PF, ambitious withdrawal scenarios can be envisaged**, without too great an impact on the rest of the economy. With a broader scope, **the PF does not enable banks to achieve these withdrawals in all scenarios, but is a strong incentive for them to do so where these withdrawals are possible.** With a view to achieving impact, the regulator must implement a high PF for the sectors from which it considers short- to medium-term withdrawal to be appropriate and feasible.

Applying a PF to a broader scope, beyond fossil energy activities alone, seems counter-productive. Indeed, financing for certain companies that are traditionally carbon-intensive but currently in transition would become more difficult and costly. The PF would thus penalise transition projects, thereby producing the exact opposite of the intended effect. Moreover, the banking system would not have a stronger incentive to adopt proactive behaviour. Faced with an increase in requirements across numerous sectors, it would be more difficult to prioritise the actors with which to proceed. In addition, the increase in prudential requirements would potentially have a negative impact on other credit, reducing inflows, and especially green flows, by several percentage points during the first year of application.

With a view to analysing the impact on financing for the transition, it seems more appropriate to prioritise the sectors to which the PF should be applied, beginning with a high calibration to incentivise withdrawal, while only concerning a small part of the portfolio from which withdrawal is possible. Subsequent regulatory reviews in the medium-term could set a new objective once the withdrawal objective has been achieved. If a prudential penalisation tool were to be implemented, this seems to be how the impact on the transition would be the most beneficial, while limiting the unwanted effects on the rest of the economy.

In order to limit credit contraction effects, an application of PF on carbon-intensive inflows only might be possible. How-

ever, this hypothesis was not retained for the study, because the impact would be too low and too late to obtain a reorientation of credits up to the challenges of the transition.

Likewise, the hypothesis of the introduction of a very high PF only applicable to inflows has not been studied, due to uncontrolled side effects that this would involve for banks and businesses.

How should alternative financing solutions be viewed?

The models conclude that depending on the calibration, the PF can significantly increase the cost of bank loans for a carbon-intensive project. Access to bank financing is thus complicated by a price effect or by the refusal of banking institutions to finance certain projects in order to avoid facing an additional capital requirement. Project developers would then have no choice but to turn to non-bank financing.

One of the concerns is that these new types of financing would be obtained from less regulated or unregulated financial actors. This would result in a lack of transparency on these harmful activities. The management of climate risks and especially of transition risks would then be less effectively verified, if at all, and these financial actors could then suffer heavy losses depending on the rate of transition. **The other concern is that these new types of financing could be obtained from foreign banking actors with lower climate requirements than the European standard.**

The effect of the PF could then be reduced, since harmful activities would continue, but under more adverse financing conditions. Moreover, the risk to financial stability might not be managed, in case of a shift towards unregulated sources of financing. Finally, the European banks could lose market share to their international competitors, whose climate standards are often less ambitious.

However, several points allow us to qualify these fears of alternative financing solutions. Regarding short-term carbon-intensive financing, those which are now in general purpose could hardly find other financiers than bank financing. For the financing of longer-term projects, part of it is already commonly financed by specific vehicles transformed into bonds which are then bought by institutional investors (insurance companies, pension funds, etc.) or asset managers. These actors are themselves gradually committing to climate strategies. The remaining financial players are nevertheless less regulated, such as hedge funds, but these focus on

short-term operations and are not intended to carry long-term financing. Finally, there are small private funds, on which the pressure to make decarbonisation commitments is significantly less important than on more highly regulated entities.

The points discussed are to be viewed with caution. Some authors criticise these arguments, associating them with banking lobby rhetoric⁹⁵. This study has not attempted to further explore all of the arguments, and presents different positions here by way of information.

95. Couppey Souberan Jezabel, Blablanque: Le discours de l'inaction, Michalon, 2015

FINAL CONCLUSION

By developing an impact analysis approach to the prudential measures traditionally designed for risk management purposes, this study addresses a specific problem. It does not adopt a position on the expert debate, consisting in determining whether these tools should be implemented for reasons of risk. However, the study does answer the question of whether these measures would have a significant positive impact on the transition, and the answer seems to be no.

The impact of the Green Supporting Factor on the key transition sectors is negligible. Even under the assumption of the pass through of all banking gains to a reduction in rates, the impact on the cost of bank loans remains limited. In the key sectors, energy retrofits and mobility, the financial incentive provided by the GSF is negligible, and almost 15 to 25 times lower than the amounts of support provided by the state. In the energy sector, the financial incentive is higher, but the weight of financial factors in investment decisions should be put into perspective. Moreover, a prudential relief measure already exists for infrastructure, and it would therefore be more logical to “green” this tool instead.

The Green Supporting Factor rewards the banking sector, but the incentive to take proactive climate action is very limited in the short term. Indeed, the gaps between strategies only emerge clearly after 2028. Banks that do not increase their green investments are rewarded almost as much until 2028 as proactive banks. These gains, achieved with no obligation of results, would provide little incentive for banks to be proactive. Moreover, the expected impacts on credit are limited, since they are dependent on the banking strategies adopted.

Depending on the calibration, the Penalising factor can have a strong impact on the cost of financing for the sectors concerned. It can thus signifi-

cantly penalise certain activities and sectors. The cost for the banking sector of the increase in prudential requirements is a strong incentive to rapidly withdraw from the sectors concerned. But without a harmful activities taxonomy, the definition of those sectors varies. Moreover, depending on the share of the portfolio concerned, it is more difficult for banks to divest themselves of these assets, and for the economy to relinquish its activities and jobs.

Applied at a low level and to a broad scope such as a harmful activities taxonomy, the PF could be counter-productive. The adverse effects on the banking sector would then be more lasting, and access to financing could become more difficult for companies that are traditionally carbon-intensive, but currently in transition. Applied in a localised manner, with a high calibration, the PF would provide a stronger incentive for the banking sector to withdraw from harmful activities financing. Indeed, if the scope of the PF is reduced, then the rate of banking sector withdrawal can be more rapid. The more rapid this withdrawal, the more temporary the contraction effects linked to the PF will be. But the measure will then need to be designed so as to avoid counter-productive effects (for example, obstacles to investments that are essential to improve the energy efficiency of fossil fuels). To sum up, the PF is a tool with an imperfect impact on the transition. In the best case, it simply excludes the most carbon-intensive activities, or accelerates their exclusion. But it does not provide an incentive for the other sectors to implement the transition, and may even penalise them if its application is too broad.

Faced with the challenge of climate change, financial and banking sector mobilisation is crucial, but the conditions of this mobilisation remain to be defined. Prudential tools are perhaps a solution to the problem of risk, but they do not sufficiently address the issues of the transition. **Aside from the planned withdrawal from fossil fuels, for**

which a high and localised penalisation could be appropriate, the other impacts of these measures on the transition are negligible, or even counter-productive.

Other prudential options should therefore be explored and developed, from the perspective of the transition plans required in the context of supervision (Pillar 2), which would result in changes in the composition of bank balance sheets to finance the low-carbon transition.

The notion of transition plans has only just emerged in the public debate⁹⁶⁹⁷ and the exact details of this proposal remain to be defined. How-

ever, the advantage of this proposal is that it would more effectively address the problems identified in this case study, namely:

- ensuring better support for companies in transition,
- creating an obligation for banks to implement a truly ambitious and global strategy.

The penalties for non-compliance would need to be defined, but it seems that it is possible to find a system that would avoid the risk of credit contraction, especially because it would involve a transition plan rather than a penalty implemented immediately.

96. Caldecott Ben, "Climate risk management (CRM) and how it relates to achieving alignment with climate outcomes (ACO)", Journal of Sustainable Finance & Investment, 2020

97. Evain and Cardona, "La réglementation financière peut-elle accélérer la transition bas-carbone ?", 2021

ANNEX 1: LIST OF INTERVIEWS

BANKING SECTOR:

- **Crédit Agricole**, Éric COCHARD, Aurelia SMOTRIEZ, Corinne RISSE
- **La Banque Postale**, Guillaume BIRON, Zineb TAZI
- **Société Générale**, Erwan DEVILLERS, Paul GRIMAL, Arnaud DOLEANS
- **BPCE**, Delphine BARTRE
- **Natixis**, Karen DEGOUVE
- **Association Française des Sociétés Financières (ASF)**, Yves-Marie LEGRAND, Françoise PALLE-GUILLABERT

SUPERVISORS AND REGULATORS:

- **French banking and insurance supervisor, ACPR**, Laurent CLERC
- **French banking and insurance supervisor, ACPR**, Gabrielle SIRY, Hyacinthe BUISSON, Pierre MEIGNANT, Kevin GUIBERT
- **Directorate General of the Treasury**, Charlotte GARDES

EXPERTS:

- **ADEME**, Mathieu GARNERO
- **Foundation for European Progressive Studies**, Andreas DIMMELMEIER
- **Council on Economic Policies (CEP)**, Pierre MONNIN

ANNEX 2: FUNCTIONING OF THE RATE MODEL

The rate model is a model used to calculate, for a given GSF and a given expected return on capital, the absolute and proportional change in loan rates offered to customers according to their level of risk.

It is built on **two successive steps**:

- 1 Proposing a model to set the bank loan rate according to the tied-up capital
- 2 Using the model to determine the impact of a GSF or a PF on the rate level

RATE SETTING MODEL

The principle of this model is to determine the rate level the bank must set for the remuneration of capital tied-up due to prudential regulation, after deduction of taxes and

financing costs (cost of borrowing for the rest of the capital advanced), as well as general costs (salaries, cost of infrastructure, etc.), according to the level of risk.

> Calculation of capital mobilised

The dependence on the level of risk stems from the methods used to calculate prudential requirements. Indeed, banks do not mobilise their capital according to a fixed proportion of the amount of the asset loaned, but according to a fixed proportion of the risk-weighted asset. The principle is that these capital reserves act as a buffer against the risk of losses, and that these losses will be lower for less risky assets.

after authorization from the supervisor. The amount of the loan (A) is then multiplied by the risk-weighted factor (RW) to obtain the risk-weighted asset (RWA).

$$RWA = RW \times A$$

Thus, every asset is associated with a risk-weighted factor (RW⁹⁸), which is determined by the regulation according to the characteristics of the asset (risk of the issuer, nature of the asset, etc.), or calculated by the bank's internal model

The prudential requirement is then that **capital must represent at least 10.5% of these RWAs**, since a conservation buffer of 2.5% of RWAs⁹⁹ is added to the minimum regulatory requirement of 8%.

CAPITAL = 10,5% x RW x A			
Example for an asset A=100k€, and RW=0.75:			
AMOUNT OF LOAN CONCERNED	RISK-WEIGHTED FACTOR	PRUDENTIAL RATIO	CAPITAL MOBILISED
100	0,75	0,105	7,875

98. The RW level is in the order of 1. In very specific cases, it can be 0, and in extreme cases it can be around 2. In most cases, it varies between 0.25 and 1.5.

99. In certain cases, supervisors may exempt banks from the additional conservation buffer requirement of 2.5%. The choice was made to include it because the goal of this study is to model the potential maximum impacts of prudential tools when fully operational.

Annexes

> Calculation of expected net banking income

When providing loans, a bank expects returns on the capital employed. The return value determined as a model input is 6.3%, a value given by the ACPR for the banking sector in 2019¹⁰⁰.

Applying this profitability to the capital mobilised gives the expected profit. To understand the charges assigned to this loan (tax and internal management cost), the profits/NBI ratio has been calculated from the aggregate balance of the six

main French banking groups in 2019 (Table 1 of the document), NBI is the **net banking income**, and is the banking equivalent to turnover. **The ratio calculated at 0.19 means that for a turnover of 100, after deduction of taxes and charges, remaining profit is only 19.**

Assuming that the distribution of charges is proportional to the loan amount borrowed, it is possible to calculate the expected NBI from the expected profit.

EXAMPLE FOR THE SAME ASSET A=100K€, AND RW=0.75:

ROE LEVEL EXPECTED 6.3%	PROFIT EXPECTED 0.496	EARNINGS/NBI RATIO 0.19	NBI EXPECTED 2.61
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> Calculation of interest rate offered to customer

Based on the NBI obtained, the challenge is now to determine the rate level to be set. **Financing costs still need to be included.** Financing charges are not included in net banking income. NBI is net, in other words it aggregates the different net incomes, namely the net interest margin (NIM) and net commissions. The net interest margin (NIM) exactly represents the differential between income (in other words revenues generated by money loaned) and interest charges (in other words charges due to money borrowed).

To find the financing cost, it was necessary to extract the detail of income and interest charges for each of the six banking groups (Crédit Agricole, Société Générale, La Banque Postale, BPCE, CM-CIC, BNP Paribas). The data obtained are those for the year 2019, and are from the banks' Universal Registration Documents¹⁰¹¹⁰²¹⁰³¹⁰⁴¹⁰⁵¹⁰⁶. This gives the following table:

BANKING GROUP	CASA	SG	BPCE	BNP	LBP	CM-CIC	TOTAL
INCOME INTEREST (M€)	25 107	23 712	24 145	22 446	4 257	5 543	105 210
INTEREST CHARGES (M€)	13 663	12 527	15 485	18 506	1 919	3 101	65 201
NET INTEREST MARGIN (M€)	11 444	11 185	8 660	3 940	2 338	2 442	40 009

Source : Universal registration document 2019 for the aforementioned banks

100. ACPR, "La situation des grands groupes bancaires français fin 2019". 2020

101. Crédit Agricole SA, "DEU CASA 2020". 2021

102. BPCE, "Document d'enregistrement universel 2020 BPCE". 2021

103. "Rapport financier BNP Paribas 2020".

104. La banque postale, "Document d'enregistrement universel 2019 LBP".

105. "Société Générale_Rapport financier_2021.pdf".

106. Crédit Mutuel - CIC, "CIC_rapport-annuel_2019.pdf".

The financing costs could also have been modelled based on a cost of financing per loan. In this case, the total charges would have been related to the total loans, or 4 150 billion euros in 2019 for the six main banking groups, to arrive at a **value of $65.2/4150=0.016\text{€}/\text{€loaned}$** . But this modelling choice means that bank lending activity bears all of the financing charges. However, to finance financial assets that are not loans, banks also borrow, and remunerate this borrowed capital. **Since it is difficult to make a distinction between the share of interest charges attributed to retail activity and the share attributed to investment activity, the choice was made to determine the cost of financing relative to total assets.**

To obtain the **financing cost by asset, interest charges are related to the total amount of aggregate assets of the six banking groups, or 7 011 billion euros in 2019.** The cost of financing is thus $65.2/7\ 011=0.0093\text{€}/\text{€invested}$. Since the financing costs obtained are lower, the loan rates given by the model are also lower, which results in overestimating the proportional impact of the GSF on rates. Opting to model financing costs through a cost of charges relative to total assets results in representing the highest potential impacts of the GSF on rates. **This assumption regarding financing costs thus**

gives an upper value to the potential impact of the GSF.

It should nevertheless be noted that the decision to model financing costs based on a cost of financing by asset implies ignoring scale effects. A curve specifying the different bank borrowing rates according to the volumes of assets financed would have ensured greater precision, but in the absence of this information, the model indeed ignores scale effects.

In conclusion, different representations of financing costs were possible. Due to a differential calculation, the choice of the assumption does not lead to different results with regard to the changes in absolute value obtained. However, where the proportional impact is concerned, the choice of the assumption is decisive. **The decision was made to choose among the plausible assumptions the one with the most impact. The study thus models an upper value of the impact of the GSF,** and shows that even under these best-case assumptions, the impact remains insufficient. **The value determined is therefore a financing cost of $0.0093\text{€}/\text{€invested}$.** For example, for 100k€ loaned, the financing cost is $0.0093*100\text{k€}=0.93\text{k€}$.

EXAMPLE FOR THE SAME ASSET $A=100\text{k€}$, AND $RW=0.75$:

NBI EXPECTED
2.61

FINANCING COST
0.93

TOTAL BANK COST
3.54

BANK RATE EXPECTED
3.54%

> The model therefore indicates that for an asset $A=100\text{k€}$, and $RW=0.75$, the bank rate expected is 3.54%.

STRONG ASSUMPTIONS MADE IN THE CONTEXT OF THIS MODEL:

This model of the impacts of the GSF/PF is based on three strong assumptions:

- 1 Charges are constant in absolute value between the pre-GSF and post-GSF situations
- 2 The financing costs (cost of borrowing capital) are constant in absolute value between the pre-GSF and post-GSF situations
- 3 Banks pass through the full reduction in their costs in the case of a GSF, and the full increase in the case of a PF, to the bank loan rates offered to customers.

Assumption 1 arises from the consideration that the **internal structure of bank costs must not change with the application of a PF or a GSF.** It is possible that the introduction of a GSF will oblige banking institutions to classify their assets, and to assess the green taxonomy eligibility of new loans, at a cost. This effect has been considered negligible, and for the sake of simplicity, **the choice was made to assume constant internal charges.**

Assumption 2 corresponds to the **best-case scenario maximising the impact of the GSF or the PF on the loan rate.** Indeed, some studies specify that bank financing costs could decrease with a PF, since lending to banks with higher capital becomes less risky, and should

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therefore be remunerated less. Conversely, with a GSF, banks would have proportionally less capital, and therefore the returns expected on loans made to banks would be higher, since the loan would be more risky. The bank would thus borrow at higher rates. **This effect on the cost of financing has the opposite of the intended effect on bank rates to customers.** Indeed, with a GSF, the increase in the cost of capital borrowed by banks would be passed through to end customers by an increase in rates. The

reverse is true of a PF. **Assuming that financing costs are constant thus produces a higher estimate of the impact of the measures on rates.**

Assumption 3 is also an assumption determined in order to maximise the impact of the measures on rates. It is likely that banking institutions will reserve some of their gains (with a GSF), or pass through some of their losses (with a PF) to customers. The effects on rates would then be reduced.

FINAL IMPACT OF THE GSF OR THE PF ON RATES

The GSF is a supporting factor (and the PF a penalising factor) which applies in the calculation of RWAs, and therefore in the calculation of bank capital requirements. It is multiplied by the risk-weighted factor RW and by the amount of asset A to give the post-GSF RWA:

$$RWA = \text{GSF (ou PF)} \times RW \times A$$

The prudential requirement is then that capital should represent at least 10.5% of these RWAs.

$$\text{CAPITAL} = 0,105 \times \text{GSF (OU PF)} \times RW \times A$$

The GSF is called a supporting factor because its goal is to reduce prudential requirements. **The GSF must therefore**

be lower than 1. Conversely, the PF is a penalising factor, which aims to increase prudential requirements. **The PF must therefore be higher than 1.**

To calculate the new post-GSF (or post-PF) rate, the quantity of capital mobilised is updated. The new expected profits are calculated, and therefore the new expected pre-tax profits. It is assumed that charges remain constant in absolute value (in other words, the GSF or the PF has no impact on the bank's internal cost structure). **The internal charges calculated pre-GSF** (or pre-PF) are therefore added. This is the expected NBI multiplied by the charges/NBI ratio set by calculation based on ACPR data at 0.746. Financing costs are then added, in other words the cost of borrowing capital (assumed to be constant) multiplied by the capital loaned $0.0093\text{€}/\text{€loaned} \times 100\text{k€loaned} = 0.93\text{k€}$ to obtain the new rate.

EXAMPLE FOR THE SAME ASSET A=100K€, AND RW=0.75, PF = 1.25:

AMOUNT OF LOAN CONCERNED 100	RISK-WEIGHTED FACTOR 0.75	PRUDENTIAL RATIO 0.105	LEVEL OF PF 1.25	CAPITAL MOBILISED WITHOUT SF 9.84
LEVEL OF ROE EXPECTED 6.3%	VALUE OF PROFIT EXPECTED (FROM PRE-TAX EARNINGS EXPECTED) 0.62 (0,83)	PRE-PF INTERNAL CHARGES (0.746*NBI EXPECTED) 1.95	NBI EXPECTED 2.78	
FINANCING COST 0.93	TOTAL BANK COST 3.71	BANK RATE EXPECTED 3.71%	DIFFERENCE IN PRE-PF AND POST-PF RATE +0.17%	

This example shows that for this type of asset, the **rate differential expected is 0.17 percentage points. In other words, the PF increases rates by 0.17pts.**

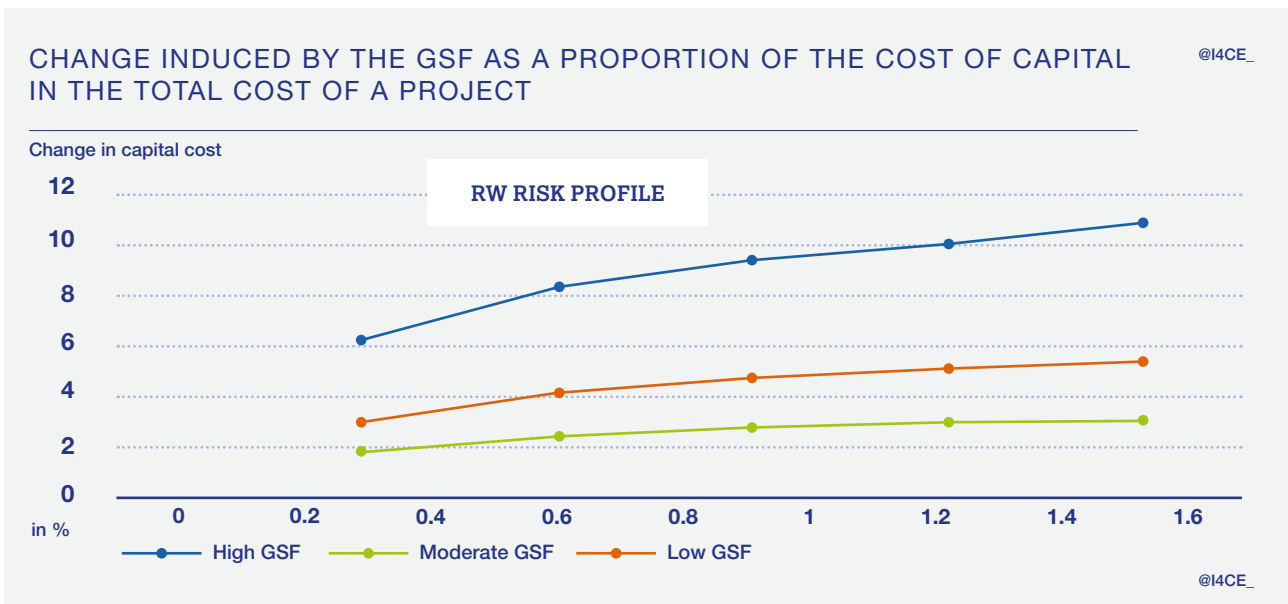
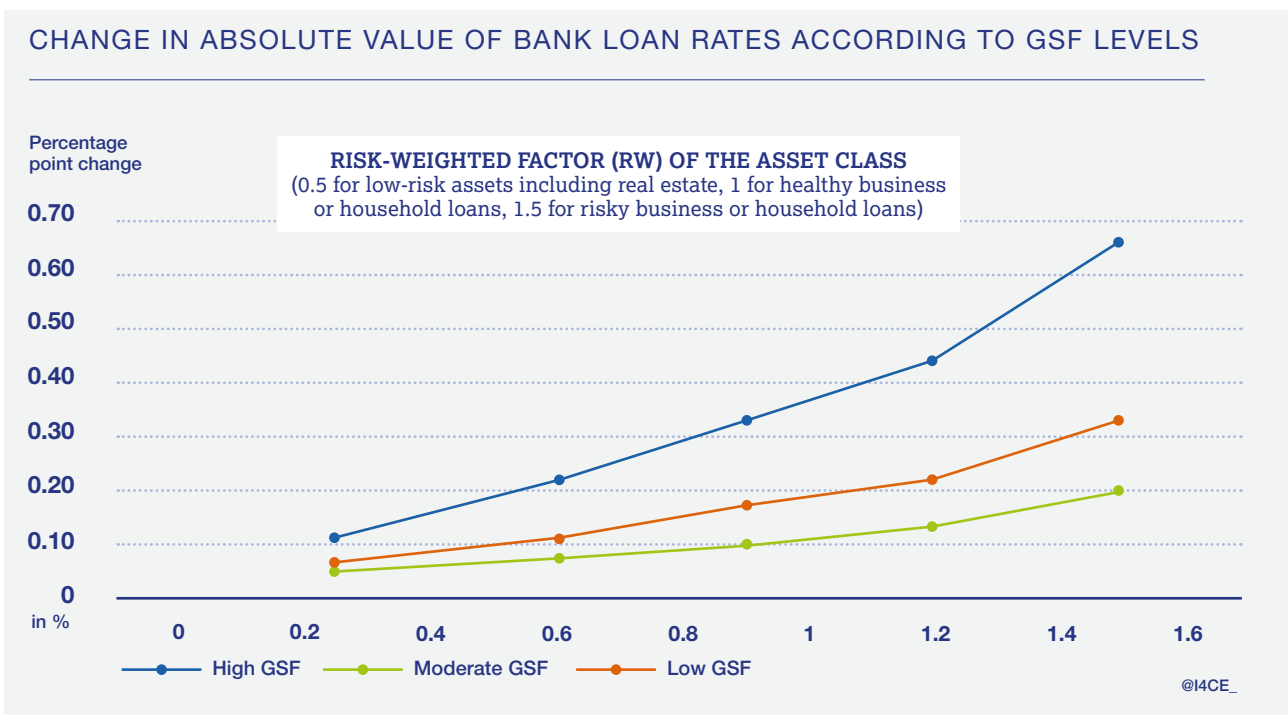
CURVE OF CHANGE IN RATES ACCORDING TO RISK PROFILE (RW):

Details on the functioning of the model help to understand the dependence of the result on the risk factor RW. For a given amount, the riskier the loan, the higher the prudential requirements, the higher the capital held against the loan, and therefore the higher the impact of the GSF or PF in absolute value.

The change in absolute value evolves linearly with the risk-weighted factor RW. Conversely, for a given GSF, the proportional change no longer evolves linearly with the RW. This non-linear evolution is due to the decision to model the financing costs relative to the capital borrowed, which is thus independent of the level of risk.

In the development of the study, for the sake of readability the choice was made to use only the case RW=1. The annex presents here more detailed results according to the risk levels.

For the sake of readability, it is therefore logical to summarise the proportional change by its value for RW=1.



ANNEX 3 : CALCULATION OF THE WEIGHT OF INTEREST RELATIVE TO THE TOTAL COST OF THE PROJECT

Calculating the weight of interest relative to the total cost of the project is an essential parameter to understand the potential impact of the GSF or PF on the sectors of activity concerned.

To estimate this value, the following data are needed:

- The investment expenditure **K** of the project
- The share **S_b** of this expenditure financed by bank loan (comprised between 0 and 1)
- The annual rate **r** of the loan
- The maturity **m** (in years, or in months)

gives the total amount paid for the loan. The amount borrowed is then subtracted to obtain the loan cost.

The arguments of the PMT function are:

- The interest rate **r** of the loan between each payment (converted into monthly rate if the maturity is expressed in months)
- The number of payments corresponding to the maturity **m**
- The loan principal (which corresponds to the value **K** multiplied by **S_b**)

The Excel PMT function is then used, which returns the amount of each payment. Multiplied by the number of payments, this

CALCULATION OF THE WEIGHT OF INTEREST RELATIVE TO TRANSITION PROJECTS

	ENERGY RETROFIT	ELECTRIC VEHICLE PURCHASE	WIND POWER PROJECT
INVESTMENT EXPENDITURE K IN K€	80	40	16 000
SHARE OF BANK FINANCING S_b	0.52	1	0.8
ANNUAL LOAN RATE R	3.6 %	3 %	3.5 %
MATURITY M	82 months	48 months	15 years
LOAN COST IN K€	5.3	2.5	3 600
WEIGHT OF INTEREST RELATIVE TO EXPENDITURE	7 %	6 %	23 %

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ANNEX 4: FUNCTIONING OF THE BANKING SECTOR IMPACT MODEL

MODEL PRINCIPLES AND SCOPE

The goal of the model is to represent the impacts of prudential measures on the French banking sector. More specifically, the study focuses on the six main French banking groups (CASA, SG, BNP Paribas, BPCE, LBP, CM-CIC), and is informed by baseline data for the year 2019 extracted from an ACPR report¹⁰⁷.

The principle is to build a baseline scenario presenting the evolution of this banking sector from 2022 to 2028 and of its main structural parameters. The challenge is then to

simulate the application of a GSF, or a PF, at the calibration levels used in the scenarios studied, then to observe the impact on the model parameters by making a comparison with the baseline scenario.

The analysis therefore focuses solely on the differences in relation to the baseline scenario. The model assumptions and choices for the baseline scenario thus have little impact on the results obtained, as they are smoothed by the difference effect.

CONSTRUCTION OF THE BASELINE SCENARIO

The following values, aggregated for the six main French banking groups, are modelled from 2022 to 2028:

- BANK BALANCE SHEET
- NET BANKING INCOME (NBI)
- NET PROFIT
- RISK-WEIGHTED ASSETS (RWAS)
- LEVEL OF COMMON EQUITY TIER 1 (CET1) CAPITAL¹⁰⁸

These values characterise the banking sector, and their evolution in the baseline scenario is given by the following assumptions:

- 1 **Trend growth in the bank balance sheet of 3%/year.** Graph 13 of the report gives a growth of $151/128=1.18=18\%$ between 2013 and 2019, or an **annual growth of 2.8%**. Between 2018 and 2019, the

aggregate balance sheet grew from 6 624 billion euros to 7 011 billion euros, or a growth of 5.8%. Faced with these evolving figures, the choice was made to assume a growth of 3%/year, a realistic value. This is a model input value, which can therefore be modified as necessary. But the results described in this study were produced for a baseline scenario, and **a trend growth assumption of 3%/year.**

¹⁰⁷. ACPR, "La situation des grands groupes bancaires français fin 2019". 2020

¹⁰⁸. The decision to represent the capital level by the CET1 value rather than the total amount of capital is influenced by the input data. The ACPR report explicitly describes the level of CET1 capital. Rather than estimating total capital with a ratio, the choice was made to consider CET1 capital in the model rather than total capital.

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- 2 The ratios **NBI/balance sheet** (2.15%), **Profit/NBI** (0.19), **RWA/balance sheet** (0.34), and **CET1/RWA** (14.4%) **are held constant over the period 2022-2028** and equal to their 2019 value.

Based on assumption 1 regarding balance sheet growth, and on the different values given for the ratios in assumption 2, it is possible to calculate for each year over the period 2022-2028 the balance sheet, NBI, profit, RWA, and CET1 values.

APPLICATION IN THE MODEL OF THE GSF OR THE PF

Different application scenarios correspond to each of the prudential measures. For the GSF, the measure is applied in 2022 to inflows, and the eligible portfolio values are given in the annexes on climate scenario construction. For the PF, application is also in 2022, but to the whole portfolio. The scopes of application according to the scenarios are given in the annex on the calculation of harmful activities banking sector exposures.

To adapt to these measures, banks can react in **two ways**:

- 1 **Banks maintain a constant balance sheet relative to the baseline scenario.** With the GSF, the RWA/balance sheet ratio decreases, and thus for a constant balance sheet, the banking sector reduces its capitalisation ratio: this is the **lower capital increase strategy for adaptation to the GSF**. With the PF, the RWA/balance sheet ratio increases, and so for a constant balance sheet, the banking sector increases its capitalisation ratio: this is the **constant balance sheet strategy for adaptation to the PF**.

For the model, this means that the balance sheet level is held constant relative to the baseline scenario. The NBI/balance sheet and net profit/balance sheet ratios are unchanged, and consequently **there is no impact on net profit**. However, the RWA/balance sheet ratio is changed, and therefore the constancy of the CET1/RWA ratio means that the levels of RWAs and CET1 capital evolve.

Relative to the baseline scenario, for the GSF this means **gains through a reduction in capital reserve requirements**, and for the PF, **charges through an increase in these same requirements**.

- 2 **Banks maintain their rate of capital increase, in other words they maintain their rate of trend growth in CET1 capital.** With the GSF, the RWA/balance sheet ratio decreases, and thus for a constant CET1, and therefore a constant RWA, the banking sector increases its balance sheet: this is the balance sheet growth strategy for adaptation to the GSF. With the PF, the RWA/balance sheet ratio increases, and thus for a

constant CET1, and therefore a constant RWA, the sector reduces its balance sheet: this is the balance sheet contraction strategy for adaptation to the PF.

For the model, this means that the capital level is held constant relative to the baseline scenario. The CET1/RWA ratio is unchanged, and consequently **there is no impact on RWAs**. However, the RWA/balance sheet ratio is changed, and therefore the balance sheet, but also the NBI, and net profit evolve.

Relative to the baseline scenario, for the GSF this means **gains through an increase in net profit**, and for the PF, **losses through a reduction in net profit**.

For the GSF, these strategies result in balance sheet growth and, for the PF, in balance sheet contraction. **These strategies therefore have an impact on lending, which the model measures as the change in the balance sheet relative to the baseline scenario.**

ANNEX 5: JUSTIFICATION OF CLIMATE SCENARIO CHOICES AND CALCULATION OF GREEN SHARE OF RWAS

The annex of the report “Relance: comment financer l’action climat”¹⁰⁹ by the researchers Hainaut and Ledez (2020) details the conditions for financing the transition, for each

transition sector, then at the aggregate level. These tables are used in two ways:

1 AGGREGATE EXTRACTION OF BANKING INVESTMENTS FOR THE TRANSITION UNDER THE OPTIMISTIC ASSUMPTION OF ACHIEVING THE SNBC OBJECTIVES.

COMMERCIAL BANKS	CURRENT	2020-2023	2024-2028
EXPENDITURE (IN BILLION €)	8.2	18.4	43.9

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2 SECTORAL EXTRACTION OF BANKING INVESTMENTS TO UNDERSTAND THE DETAIL OF THE BANK CLIMATE INVESTMENT PORTFOLIO FOR EACH PERIOD (2019-2023 OR 2024-2028).

COMMERCIAL BANKS	CURRENT	2020-2023	2024-2028
BUILDING EXPENDITURE (IN BILLION €)	5.3 (65%)	7.3 (40%)	15.5 (35%)
TRANSPORT EXPENDITURE (IN BILLION €)	1.6 (20%)	7 (38%)	21.3 (49%)
ENERGY EXPENDITURE (IN BILLION €)	1.3 (16%)	4.1 (22%)	7 (16%)
TOTAL	8.2 (100%)	18.4 (100%)	43.9 (100%)

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¹⁰⁹. This growth value of 20%/year corresponds to the rate of growth needed in French banking investments to achieve the objectives set by the SNBC, at 18 billion euros for the period 2019-2023 and 44 billion euros for 2024-2028 (see technical annex for details on calculations).

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JUSTIFICATION OF ASSUMPTIONS FOR THE CLIMATE SCENARIOS

The proactive climate scenario is the one in which bank climate investments grow at a rate sufficient to achieve the values mentioned. The model that appeared the closest to these objectives is that of growth of 20% from the year 2019. The table below details the average values obtained

for the different periods, 18.6 billion euros/year compared to 18.4 billion euros/year for 2019-2023, 46.3 billion euros/year compared to 43.9 billion euros/year for 2024-2028. **A growth rate of 20%/year was therefore determined for the proactive scenario.**

SIMULATION OF BANK CLIMATE INVESTMENTS
(GROWTH OF 25% OVER 2018-2019, 20% OVER 2020-2028)

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YEAR	2016 / 2017 / 2018	2019 / 2020 / 2021 / 2022 / 2023	2024 / 2025 / 2026 / 2027 / 2028
TARGET AVERAGE IN BILLION €/YEAR	8.2	18.4	43.9
AVERAGE OBTAINED IN BILLION €/YEAR	8.17	18.04	46.3
INV BILLION €/YEAR	6.5 / 8 / 10	12.5 / 15 / 18 / 21.6 / 25.9	31.1 / 37.3 / 44.8 / 53.7 / 64.5

For the five-year delay scenario, the goal was to reach a climate investment volume for the period 2024-2028 of 18.4 billion euros, i.e. its value in the previous period (2019-2023) in the SNBC scenario. The model that appeared the closest is that of growth of 10%/year. The table below details the average

values obtained over the period 2024-2028, in other words 19.5 billion euros/year per compared to 18.4 billion euros/year. **A growth rate of 10%/year was therefore determined for the five-year delay scenario.**

SIMULATION OF BANK CLIMATE INVESTMENTS
(GROWTH RATE OF 10% PER YEAR)

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YEAR	2016 / 2017 / 2018	2019 / 2020 / 2021 / 2022 / 2023	2024 / 2025 / 2026 / 2027 / 2028
TARGET AVERAGE	8.2	INTERMEDIATE	18.4
AVERAGE IN BILLION €/YEAR	8.2	12.1	19.5
INV BILLION €/YEAR	7.5 / 8.2 / 9	9.9 / 10.9 / 12 / 13.2 / 14.5	16 / 17.6 / 19.3 / 21.3 / 23.4

For the business-as-usual scenario, the modelled balance sheet trend growth rate was used. Since the value of 3% was determined for the trend growth, **this value was**

therefore set as the growth rate for bank climate investments in the business-as-usual scenario.

CALCULATION OF THE SHARE OF GSF-ELIGIBLE RWAS

In the models concerning the banking sector, the GSF is assumed to enter into force in 2022, and to apply only to inflows. One of the first challenges is to determine the green share of these inflows. The next challenge is to determine

the green evolution of all loans, after assumptions on the rate of renewal of loans, and the maturity of green investment flows.

> Choice of the value of the green share of inflows in 2022

Despite numerous studies on the taxonomy^{110,111}, it is very difficult to find in the literature harmonised and stabilised figures concerning the green share of inflows for 2022. The broad range is between 1% and 5%.

For the purposes of the model, it was necessary to determine a value for inflows for the banking sector. In the article "The EU sustainable finance taxonomy from the perspective of the insurance and reinsurance sector"¹¹², Scholer and Barbera (2020) estimate the share of taxonomy-eligible assets in the portfolio of European insurers. Considering only assets invested in the European Economic Area, this share is estimated at 4%. It should be specified that eligibility under the taxonomy **requires verification of five steps¹¹³, and that in this study, only compliance with the first step has been verified.** It is therefore likely that the value obtained is overestimated. It is very difficult to compare this partial value on the insurance sector with the real value for the banking sector.

Another approximate model can give an order of magnitude. Indeed, comparing the 8.2 billion euros of climate investments made annually in 2019 to the renewal of bank loans in 2019 gives an approximate value. In the absence of precise data, the rate of loan renewal was estimated at 12%, which compared to the existing loans of 4 150 billion euros in 2019, gives an inflow of 500 billion euros. **According to this method, the green share of inflows is therefore $8.2/500=1.6\%$.**

Considering that the broad range is between 1% and 5%, the choice was made to use the intermediate value of 2% for the green share of inflows for 2022.

This value is half the one given in the article by Scholer and Barbera, but it is possible to consider that this is due to screening in the four other steps. In the subsequent models, the green share of inflows is thus set at 2% for 2022, and its evolution depends on the different climate investment growth assumptions given by the scenarios.

> Evolution of the green share of inflows according to the scenarios

To model the evolution of this green share over time, the growth assumptions of the climate scenarios have been used. The inflows grow at the trend rate (3%), and the amount of bank climate investment grows by 20%, 10% or 3% depending on the climate scenario. Then the additional

growth is calculated by finding the quotient of indices. Finally, multiplying the additional growth obtained by the green share estimated initially in 2022, in other words 2%, makes it possible to directly calculate the green share of inflows.

110. Principles for Responsible Investment, "Testing the taxonomy". 2020

111. Novethic, "Les fonds verts européens au défi de la taxonomie". 2020

112. Scholer and Barbera, "The EU sustainable finance taxonomy from the perspective of the insurance and reinsurance sector". 2020

113. The five steps are: i) identification of a taxonomy-eligible sector of activity, ii) proof of a substantial contribution to one of the six objectives of the taxonomy, iii) proof of no harm to the five other objectives, iv) compliance with the minimum social safeguards, v) calculation of the percentage of taxonomy-eligible assets.

Annexes

EVOLUTION OF THE GREEN SHARE OF INFLOWS ACCORDING TO THE SCENARIOS

YEAR	2022	2023	2024	2025	2026	2027	2028
INFLOWS AT TREND GROWTH OF 3% (Base 100 in 2022)	100.0	103	106.1	109.3	112.6	115.9	119.4
GREEN INVESTMENT VOLUME (Base 100 in 2022)	100	120	144	172.8	207.4	248.8	298.6
ADDITIONAL GROWTH AS PROPORTION OF INFLOWS	1	1.17	1,36	1.58	1.84	2.15	2.50
GREEN SHARE OF INFLOWS	2%	2.3%	2.7%	3.2%	3.7%	4.3%	5%

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The values are presented in the table above in the context of the proactive scenario.

> Green share of bank loans

Once the green share of inflows is determined, it is possible to return to the green share of the portfolio.

To do so, assumptions must be made concerning the rate of renewal of loans, in other words the ratio between the annual volume of inflows and the volume of existing loans. Considering an average maturity of eight years for loans, the assumption used was **a renewal rate of 12%**. This variable has an impact on the model, since it conditions the volume of green assets financed after 2022 (and therefore those to which the GSF applies) relative to the whole portfolio.

Next, **it is necessary to estimate the average maturity of the green portfolio** in order to estimate from when the post-2022 inflows will exit the portfolio. To calculate this maturity, the choice was made to return to the sectoral distribution of bank climate investments, represented for each period at the beginning of the annex.

Taking the sectoral maturity values of 4 years for transport, 9 years for energy retrofitting and 15 years for energy, then taking the proportion of each sector in the banking effort for the periods 2019-2023 and 2024-2028, it is possible to **estimate the annual green post-2022 outflow**.

For the sake of simplicity, it is considered in the model that **all loans issued in the year N are repaid in the year N+M, with M being the average maturity**. For example, in the proactive scenario, expenditure in the transport sector in 2022 accounts for 38% of the banking effort. It is therefore considered that 38% of inflows in 2022 are outflows in 2026. The share of expenditure in building (40%) will not be repaid until 2031, or 9 years later.

TABLE PRESENTING THE DIFFERENT STAGES INVOLVED IN CALCULATING THE GREEN SHARE OF THE PORTFOLIO IN THE PROACTIVE SCENARIO

YEAR	2022	2023	2024	2025	2026	2027	2028
BALANCE SHEET (Base 100 in 2022)	100.0	103	106.09	109.27	112.55	115.93	119.41
INFLOWS RELATIVE TO BALANCE SHEET IN 2022	12	12.36	12.73	13.11	13.51	13.91	14.33
GREEN SHARE OF INFLOWS	2%	2.3%	2.7%	3.2%	3.7%	4.3%	5%
GREEN INFLOWS RELATIVE TO BALANCE SHEET IN 2022	0.24	0.29	0.35	0.41	0.50	0.60	0.72
GREEN OUTFLOWS RELATIVE TO BALANCE SHEET IN 2022	0	0	0	0	0.09	0,11	0.17
GREEN SHARE OF PORTFOLIO	0.2%	0.5%	0.8%	1.2%	1.5%	1.9%	2.3%

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To obtain the green share of the portfolio in year N, the difference is calculated between the sum of inflows between 2022 and the year N, and the sum of outflows between 2022 and the year N, which is related to the balance sheet in the year N (expressed with a base 100 in 2022).

Share of GSF-eligible RWAs

The values expressed in the paragraph above are relative to loans. But the model takes as an input the share of PF-el-

igible RWAs (and not loans). Assuming that the risks are uniform at the aggregate level studied here, in other words that 0.8% of loans represents 0.8% of RWAs, and that 2.3% of loans represents 2.3% of RWAs, equivalence is maintained between the two values. In other words, the values indicated above in the line "Green share of portfolio" are used as input values for the model, as regards the GSF-eligible share of RWAs.

ANNEX 6: DETAILS OF THE CALCULATION OF HARMFUL ACTIVITIES BANKING SECTOR EXPOSURES

> Banking sector exposure to the different harmful sectors

• PORTFOLIO SHARE OF COAL SECTOR:

The exposure of French banks to the coal sector is comprised between 0.14% and 0.42%¹¹⁴. A scenario in which the PF applies to 0.4% of commitments therefore

corresponds in order of magnitude to the introduction of a penalising factor for the coal sector.

• PORTFOLIO SHARE OF COAL, OIL, GAS SECTORS COMBINED:

The aggregate share of fossil fuels in the four main French banking groups (BPCE, Société Générale, Crédit Agricole, BNP Paribas) relative to the total aggregate balance sheet is 4% (see calculations below based on the report "Actifs fossiles, les nouveaux subprimes" (2021, Institut Rousseau,

Les Amis de la Terre France, and Reclaim Finance). In view of the lack of data, this estimate should be considered with caution, as it is derived from a single source, with a methodology that is currently being questioned.

> A scenario in which the PF applies to 4% of commitments corresponds in order of magnitude to the introduction of a penalising factor for the whole energy sector linked to fossil fuels.

TABLE PRESENTING THE FOSSIL SHARE OF THE FOUR MAIN FRENCH BANKING GROUPS IN 2019¹¹⁵

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	BNP	CA	SOGÉ	BPCE	TOTAL
TOTAL INVESTMENT ASSETS	835	380	592	369	2 176
FOSSIL SUBTOTAL	39	18	27	17	101
	4.7 %	4.7 %	4.6 %	4.6 %	4.6 %
TOTAL LOAN ASSETS	936	834	507	812	3089
FOSSIL SUBTOTAL	41	53	27	38	159
	4.4 %	6.4 %	5.3 %	4.7 %	5.1 %
TOTAL PORTFOLIO	2165	1596	1356	1338	6455
FOSSIL PORTFOLIO	80	71	54	55	260
	3.7%	4.4%	4%	4.1%	4%

Source : Institut Rousseau, Les Amis de la Terre France, et Reclaim Finance, « Actifs fossiles, les nouveaux subprimes », juin 2021

114. ACPR and AMF, "Les engagements climatiques des institutions financières françaises".

115. Institut Rousseau, Les Amis de la Terre France, and Reclaim Finance, "Actifs fossiles, les nouveaux subprimes". 2021

• PORTFOLIO SHARE OF SECTORS LINKED DIRECTLY TO FOSSIL FUELS, OR MORE INDIRECTLY:

The sum of the 20 most carbon-intensive sectors in France accounted for 12.2% of net loans exposed to credit risk in 2017¹¹⁶.

penalising factor for different high-emitting sectors, beyond the energy scope alone. Sectors such as aeronautics, cement, steel and others are therefore included.

A scenario in which the PF applies to 10% of commitments corresponds in order of magnitude to the introduction of a

VALUES OF EXPOSURES RELATIVE TO TOTAL BANK RWAS

The values expressed in the paragraph above are relative to loans. But the model takes as an input the share of PF eligible RWAs (and not loans). Assuming that the risks are uniform at the aggregate level studied here, in other words

that 4% of loans represents 4% of RWAs, and that 10% of loans represents 10% of RWAs, equivalence is maintained between the two values.

¹¹⁶. ACPR, “Le changement climatique: quels risques pour les banques et les assurances ?”, 2019

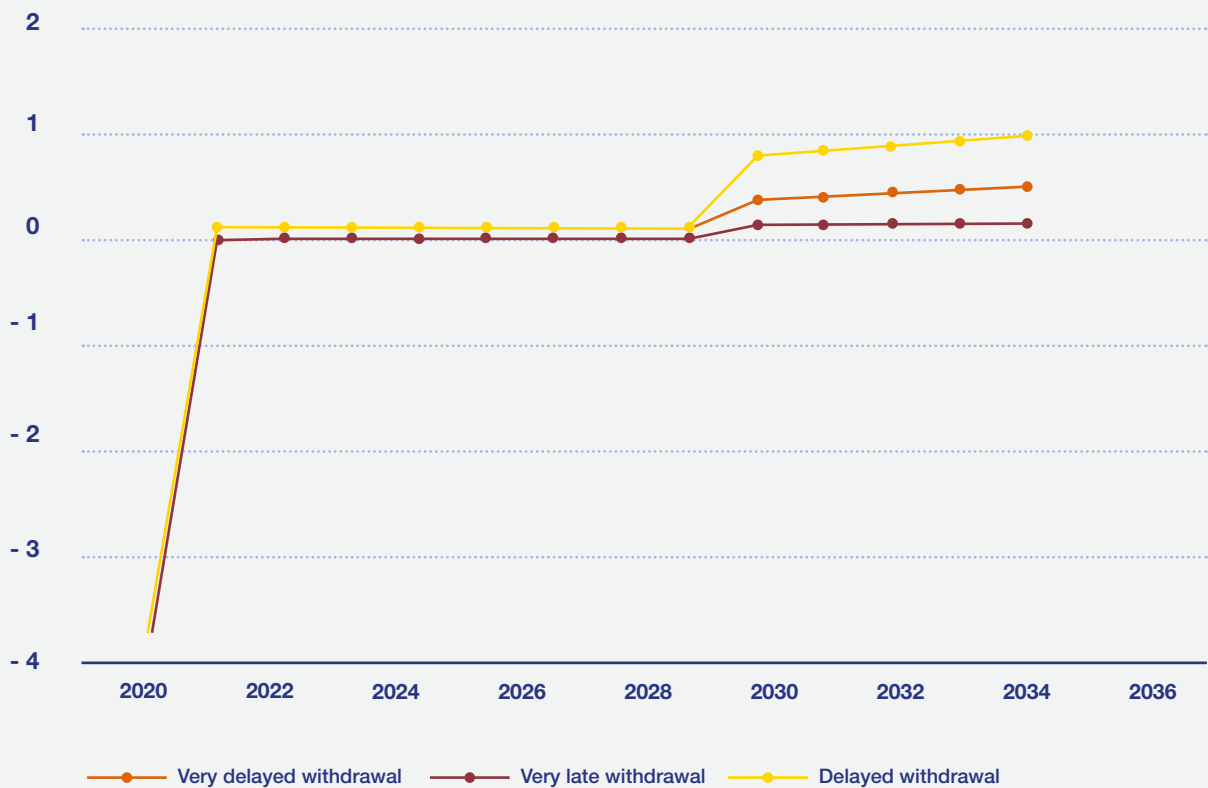
ANNEX 7: MODEL OF 2028-2035 IMPACTS OF THE PF IN THE CONTEXT OF DELAYED OR VERY LATE WITHDRAWAL

The table below shows that reductions in capital reserve needs occur from 2030 when the banking sector begins to withdraw from the assets concerned. The initial additional reserves will therefore only be gradually recouped from 2030.

Moreover, they will only be fully recouped upon final withdrawal by the banking institutions, in other words in 2040 or even 2060 according to the scenarios studied here.

MASSIVE CAPITAL INCREASE IN THE FIRST YEAR, RECOUPED FROM 2030 UPON WITHDRAWAL FROM THE ASSETS CONCERNED

Change in annual capital reserve needs relative to baseline scenario (in billion euros)



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