

Sustainability and Finance - Why and How?

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1. Introduction

That environmental sustainability should gradually become strictly interrelated to financial activities is a widespread and entirely accepted principle, pursued through financial regulation, supervision, and banks' and financial institutions' voluntary actions.

But it is not so obvious why this is the case. If markets were able to internalize environmental costs and risks fully, these should be adequately priced by financial institutions and banks. The allocation of credit and other financial resources would then reflect such costs and risks. And if there were, as there are market failures, these should be addressed by policy instruments targeted explicitly to reducing emissions, like carbon pricing or other fiscal tools, so that financial institutions could then face and respond to adequate pricing signals.

Moreover, by affecting the allocation of assets in terms of their environmental intensity, financial regulations also influence their risk mix. Polluting activities or activities potentially exposed to climate change face physical (environmental damage) and transitional (change in regulation) risks. But green assets are frequently based on new and untested technologies. Hence they are also risky. The ideal mix between these two types of risk

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should in principle be identified by the objective function of policy makers or social planners, not necessarily by financial regulators.

So, why is there a need for an environmentally-focused action in financial and banking markets? This is one of the two questions addressed in this issue of European Economy. The other one, is how this should and is being done, especially through regulatory and supervisory frameworks, voluntary actions and standards for measuring and disclosing climate and environmental risks.

As for the why, a simple argument is that climate-related risks could impair the ability of central banks to achieve their mandated objectives, for example because climate change and mitigation policies may affect inflation dynamics and also financial stability, as discussed by Campiglio and Lamperti in this issue. Consequently, central banks could directly target green financial instruments in their asset purchase actions.

At the same time, central banks, along with other mandated authorities, could affect the market behaviour of banks and financial institutions through regulatory and supervisory tools. Four other arguments support this type of action.

The first one is that environmentally stringent regulation for financial institutions is less politically costly to be put in place than fiscal instruments affecting the generality of businesses and consumers. Paradoxically, even though nowadays no political party could be elected without a platform explicitly addressing climate change, fiscal tools raising the prices of fossil fuels can give rise to massive political resistance and turmoil, see for example the uprising of the Gilets Jaunes movement in France following a fiscally induced slight increase in fuel prices. At the same time, an effective carbon taxation should be global and fully harmonized through border adjustments. In this respect, a coherent global policy alignment is difficult to implement and faces a lot of resistance, as shown by the recent, pretty generic commitments reached during the United Nation Conference on Climate Change, Cop 26 conference. These policies are necessary of course, but they are not there yet.

Financial institutions are easier to regulate. There is consensus on the need to reduce the riskiness of financial markets in itself, and on the fact that climate change raises high physical risks (e.g. environmental disasters) and transitional risks (e.g. changes in regulation and consequent stranded assets).

In that respect, especially banks, have an issue of legacy stranded assets that regulators are bound to face, for example in fossil fuels. Investors are also increasingly sensitive to the pursuance of ESG objectives and are in favour of stringent environmental targets. The risks of investing in green technologies are certainly sizeable and frequently uncertain, but the pressure toward the environmental transition partly reduces the perception of such risks.

A second reason for targeting financial markets is that since fiscal tools are not yet (or are just partially) in place, or in the end they cannot be fully enforced, and consequently market prices do not adequately internalize environmental costs and risks, there is a need for a rapid action, which can more easily be taken by directly targeting financial markets. The mitigation of both physical and transitional risks in asset allocation can more effectively be achieved through financial regulation in the short/medium term. The following section of this editorial discusses this issue at length.

A third one, is that the financial effort required to achieve environmental targets and mitigate climate change is enormous and all resources must be mobilised towards this goal as soon as possible, pressing financial markets in this direction even beyond what would be achievable with mere fiscal incentives.

Fourth and finally, as discussed below, there are failures that cannot be targeted by fiscal instruments and directly pertain to financial markets and interact with pure environmentally induced market failures. For example, credit constraints induced by asymmetric information. Also, De Haas and Beyene et al. in this issue discuss at length how banks generally price environmental risks less than capital markets and how this is also related to the limited perception that depositors, in contrast to direct investors, have on the allocation of banks' assets. The last part of this editorial will discuss the role of banks vs. capital markets in financing the environmental transition.

As for the how, several contributions in this issue discuss the regulatory and supervisory frameworks adopted or planned (Beyene et al., Mikkelsen et al. and Marullo Reedtz). These, in general, pertain to several domains. First the definition of shared criteria for the measurement and disclosure of the environmental risk, both concerning assets with implicit physical riskiness and those involving transitional costs. Second, the evaluation and inclusion of such risks by financial institutions in their risk appetite frameworks and in supervisory actions and stress tests and the provision by supervisors of clear guidelines. Third, a balanced

use of regulatory tools like capital requirements, on the one hand to favour asset allocation towards sustainable investments and, on the other hand, to reduce the risk of rapid divestment from established fuel intensive assets.

The issue focuses especially on the actions of EU institutions, initially triggered by the EU Commission Action Plan on Financing Sustainable Growth in March 2018 and which involves the European Central Bank (ECB), the European Banking Authority (EBA).

Also important are frameworks which imply a voluntary action by financial institutions. In particular, the Task Force on Climate-related Financial Disclosures (TCFD) was established by the Financial Stability Board (FSB) for climate related disclosures and the Net-Zero Banking alliance, which now involves all major financial players. There is an open issue of how far these voluntary arrangements should become compulsory in the longer term.

In what follows, we develop the arguments for why financial regulation should address environmental issues and discuss the different position of banks and capital markets as recipients of such regulatory frameworks.

2. Why financial regulation?

Problems of sustainability of economic decisions are inherent problems of adverse external effects: “the negative effect of production, consumption, or other economic decisions on another person or party, which is not specified as a liability in a contract” (Core, 2017) and therefore is not taken into consideration by a selfish profit or utility maximizing economic agent.

Consider the most debated one: emissions of greenhouse gases causing global warming (Stern and Stern, 2007). Like any other type of pollution, it is a negative externality. Negative externalities have been thoroughly analysed in the economic literature. Two leading solutions have been proposed: limits to production and taxation. Indeed, the most obvious solution in front of a polluter is to force him to stop. But this is an oversimplification because the social costs of completely halting the activities of a polluter can often be higher than the benefits (if Pfizer were marginally polluting to produce vaccines, we would probably be unwilling to force its closure). Welfare maximization requires comparing costs and benefits and set any quantitative

limit to production at the level that equates the marginal social costs of production with the marginal benefits. However, this is more easily said than done, especially when producers are in large numbers – coordination on quantity limitations is complex among countries, let aside among single firms – and when the adverse external effects are not instantaneous but delayed in time, as in the case of global warming.

Fixing precise limitations to any activity that generates external effects and imposing them on each economic agent is clearly infeasible. A first option to circumvent this problem is cap and trade policies, i.e. to define a measure of the negative external effect (e.g., tonne of carbon emissions) and price them (see Campiglio and Lamperti in this issue). Once this is done, these policies can go a long way in solving the coordination problems of quantity limitations by allowing firms to trade the right to emit among themselves. Although the decision on how to initially allocate these rights is not obvious, the outcome is efficient, because those firms who incur the lower costs to reduce emissions have the higher incentive to do so. At the same time, the total amount of rights to emit that are granted allows to control the aggregate level of emissions.

Taxation is the alternative to impose quantitative limits, directly or through cap-and-trade policies. Set a Pigouvian tax equal to the marginal external cost – the difference between the (possibly delayed) marginal social cost and the private social cost – and profit maximizing firms will automatically choose the socially optimal production level. Taxation allows to force economic agents to internalize the external effect of their actions, leading to an optimal aggregate level of carbon emissions. According to this view, the optimal strategy to limit greenhouse gas emissions – or any other external effect in production or consumption – is to levy a Pigouvian tax. As such, there is no need to adopt indirect strategies, such as regulations in the financial markets making the cost of funding dependent on how “green” an investment is, so as to “reorient capital flows towards sustainable investment in order to achieve sustainable and inclusive growth” (EU Commission, 2018).

However, there are at least two main problems with this prescription. One is the interaction of the external effects with other features of the economic system, such as imperfections in financial markets. The other is the evaluation of the joint riskiness of both the impact of the negative external effect (e.g., global warming) and the actions addressing it.

The case of imperfections in the financial markets is relatively straightforward. Consider two firms that must decide whether to invest in adopting a greener production technology. To simplify the analysis, assume for the moment that such technology is readily available, and its cost and benefits are known. One incurs lower costs to adapt to the new technology, but due to credit constraints, it faces high borrowing costs and prefers to renounce investing. The other firm has low borrowing costs, but it is also unwilling to invest since it faces high adaptation costs. Taxing carbon emissions would increase the costs for both firms if they did not invest in acquiring the new technology. The firm facing high adaptation costs may be forced to make the investment, despite the higher adaptation costs, while the credit constrained one may still find unprofitable to invest. An alternative policy, introducing incentives to finance green investments, would instead reduce the borrowing costs for the credit constrained firm, making it more likely to invest in green technology. For reasonable ranges of the differences between the costs of adopting the new technology and the borrowing costs for the two firms, it is possible that financial market regulation allows to achieve a lower level of emissions with the same impact on production. Regulations favoring investments in greener productions or technologies may thus be more effective than directly taxing emissions.

The issue of riskiness is two-faceted (on this theme, see also Campiglio and Lamperti in this issue). On the one side, there is a legacy problem: economic activities started when the global warming problem was underestimated (and therefore Pigouvian taxes were not introduced) can suffer significant losses, causing a surge in the riskiness of the existing portfolio of investments. On the other side, there is a perspective problem because the development and adoption of environmentally sustainable technologies require large investments, typically involving a high riskiness of both private and social returns.

The consequences of the permanent increase in average world temperature caused by greenhouse gas emissions are the object of an intense debate among scientists. Their economic effects are also the focus of a growing body of research (Cruz Álvarez and Rossi-Hansberg, 2021). It seems unquestionable that exceptional risks loom ahead.

From a portfolio management perspective, the problem is whether these risks are priced correctly by investors, particularly by financial intermediaries.

If global warming led to extreme events causing radical changes in the economic system – from severe weather conditions to substantial relocations of economic activities – the value of assets held by financial intermediaries would collapse. If provisioning to face these risks was insufficient, a financial crisis would likely unfold. As already seen with the global financial crisis of 2007-2008, this may cause monetary policy problems, calling for radical interventions by central banks.

Provisions may be inadequate for two main reasons. First, investors may be unable to collect and process the vast amount of information required for a sound assessment of the risks caused by global warming. A possible solution would then be to elaborate and provide information on the risks caused by global warming to economic activities, to help investors accounting for their effects in their decisions. As argued by Degryse et al. in this issue, this is already happening, at least in part.

Second, the investors and especially financial intermediaries may not have the right incentives to set aside adequate provisions if they believe that the effects of global warming will be so pervasive to require in any case an intervention by public authorities. We can dub this as a “too-pervasive-to-face” problem. The obvious response to such a scenario is to introduce specific regulations of financial markets forcing intermediaries to cover the risks caused by global warming adequately.

In principles, the rationale for such interventions is not to sustain the funding of investments in greener technologies but to cover the risks caused by greenhouse gas emissions. In fact, such risks may even be unrelated to the production of negative external effects, depending only on how much the existing economic activities are exposed to the consequences of such effects. In practice, requiring higher provisions to cover the risks of the activities more severely affected by global warming will also impact on the allocation of portfolios towards greener investments. First, corporations such as airlines both produce negative external effects and are affected by events extreme weather events caused by global warming. Second, the likely introduction of a Pigouvian tax on polluting corporations is itself a risk that regulations will ask to cover, making it less profitable to conduct these economic activities.

The second type of risk is related to developing and adopting “green” technologies, which is an effective alternative to reducing the level of

production in industries that negatively impact the environment. The question is how much shall we invest in this endeavour? Welfare maximization requires comparing the cost of developing and adopting these technologies with the benefit that they guarantee in reducing the external costs. However, both costs and the benefits entail significant risks, which are difficult to evaluate, making it difficult to find the funding required for such investments (as in the well-known cases of R&D financing) especially by financiers like banks and traditional investment funds. In complete and perfectly working financial markets, a Pigouvian tax increases the costs of production, providing an incentive to reduce its levels and, therefore, those of greenhouse gas emissions.

However, Pigouvain taxation may be more challenging to organise, and it can create an additional layer of uncertainty, related to its application through time, relative to a financial regulation that favours financing the development and adoption of greener technologies. As discussed in more detail in the next session, differences in risk aversion across financiers can also impact the adoption and development of green technologies.

Banks vs. markets

Finance and investments are necessary ingredients for a swift green transition. This observation naturally begs the question about the most effective ways to finance the investments that the green transition requires. This question has no unique answer, as it depends on the characteristics of the investing firms and the type of investments. The heterogeneity of firms and investments relevant to the green transition explains some of the mixed results identified in the academic literature and discussed in the articles in this issue of *European Economy*. We identify three critical factors for financing investments in general and the green transition in particular.

First, to understand the role of finance in the green transition, one needs to move away from the ideal world of the Modigliani and Miller theorem, where the source of finance does not matter for firms (value). In a realistic realm, the “pecking order theory” for finance (Myers and Majluf, 1984, for its adverse selection incarnation and Jensen and Meckling, 1976, for the cost-of-agency one) provides a first helpful step in understanding how firms finance

different investments. Ample empirical evidence shows that to address issues of asymmetric information and reduce the cost of financing, firms first rely on retained earnings as the cheapest source of funds and then on external finance, first debt and then equity, with increasing financing costs that reflect the higher associated risk for the external parties.

A second relevant element is that the mentioned hierarchy of financing sources adapts to the “financial growth cycle” of the investing firm and its characteristics, such as size and actual and prospective growth. For example, small start-ups with high growth potential and high risk very often rely on venture capital and private equity.

A third key point is the nature of the investments needed for the green transition. Simplifying and relying on the articles on the present issues of the European Economy, we can identify two types of investment: one aiming at drastic innovations and another helping polluting firms start coping with and reducing their emissions using existing technologies. These types of investments are different. The former is much riskier as it aims at delivering new technologies with a long investment span. The latter is less so and could be seen as “retrofitting” or adapting existing production activities with abatement technologies. Also, the output of the former type of investment is typically intangible, such as with intellectual property rights and trade secrets. Instead, that of the latter is incorporated in production assets, such as renewable energy generation. As we further explore below, these critical differences in risk, investment span, and intangibility have material implications for funding different parts of the green transition.

Combining all these factors, the hierarchy in cost of finance, the characteristics of the investing firms, and the types of investments offers a rich picture to understand how and to what extent sustainable finance can contribute to the green transition. In particular, we are interested in understanding which type of finance is better suited to provide funds for the green transition. Given our three key elements, it is clear that the answer to this question depends on the possible matches between the alternatives, in particular (i) the source of funding, e.g., banks or financial markets, (ii) the characteristics of the investing firm, e.g., established firms or high-growth potential start-ups, and (iii) the type of green investment, e.g., new technologies or existing abatement technologies. The possible matches of the factors (i)-(iii)

provide 2x2x2 combinations, some of which are more apt to finance the green transition than others.

In particular, in light of these observations, banks may face relevant issues in financing green investments when associated with certain matches combining points (i)-(iii) discussed above. A first specific problem often mentioned is that the green transition operates in a pre-existing environment where banks provide funds to firms, typically relying on debt contracts and associated collaterals. The green transition is intended to shift activities from pre-existing ones to more environmentally friendly ones. This transition tends to reduce the value of pre-existing technologies and associated assets that banks hold in their accounts. Banks may thus prefer not to contribute with their actions that may accelerate this devaluation of assets and collateral related to dirtier technologies. This observation, also discussed in Degryse et al. and De Haas in this Issue of the European Economy is reminiscent of what we have observed with the Non-Performing-Loans(NPL) crisis a few years ago, where banks avoided for quite some time the write-down of bad debts (see the European Economy 2017 issue n. 1). Although unilaterally, the fear of the risk of an adverse market reaction was understandable, collectively, keeping NPL in banks' balances contributed to a general instability of the whole sector and required prompt policy interventions.

The problem of pre-existing lending to non-clean investments shares some similarities with NPL and some significant differences. In particular, although NPL banks had clear individual incentives to keep inflated asset values, with the green transition, it is difficult to imagine that each bank individually anticipates and fears the devaluation effects in legacy portfolios and hence perceives the risk of the transition of its lending to innovative green technologies. For example, Beyene et al. (2021) show that banks continue to underprice the risk of asset devaluation for traditional investment due to the green transition, which seems odd with a bank' strategy of limiting entry green innovative firms with credit rationing. Relatedly, other banks' characteristics contribute to their attitude towards green investment. Since banks tend to have a shorter investment time horizon than equity markets, they consequently tend to care less for possible future devaluation of assets associated with a high-carbon footprint. In this respect, capital markets seem more apt for prompt corrective action incorporating the increasing environmental risks.

Traditional banks also perceive less pressure to adapt to changing needs and preferences of ultimate funders, in their case depositors, as compared with investment funds. Although attention toward cleaner activities and investments is increasing, traditional banks offer a bundle of many different services to depositors, which may dilute the perception by depositors of the greenness of banks' asset allocation. Relatedly, the actual exposure of banks towards polluting activities and or the fossil fuel sector is not readily available to banks depositors, as emphasized in Beyene, Delis, and Ongena in this Issue of European Economy. On the contrary, when investors patronize investment funds, the link between the funded projects and the investors' preferences is more direct and visible. Relatedly, the universal-service characteristic of traditional banks makes it more difficult for banks' management to keep track of the specific technologies adopted by the firms they lend to. This limited knowledge may ultimately weaken banks' ability to invest in environmental-friendly innovations.

The different technologies relevant to the green transition can more or less fit what banks can effectively offer and handle. Banks can play a significant role in funding transition investments that allow firms to "retrofit" and adapt their production process towards cleaner approaches. In these cases, borrowers' traditional assets can offer collaterals that banks can rely on for lending. Instead, financing the developments of drastic innovations for new green technologies may be problematic for banks because these types of innovations typically produce intangible outputs such as patents and trade secrets. As with any type of R&D intense investments, when the outcomes of the investments are intangible and thus non-pledgeable, banks can provide limited funding sources, and capital markets are more apt to address these environments. This is also convincingly emphasized by the papers of De Haas and Degryse et al. on this Issue of European Economy, which illustrate that green patented innovations expand faster in countries where equity finance is more prominent compared with bank lending. This observation is particularly relevant for bank-centric Europe that should channel as much as possible equity funding towards environmental innovations, possibly also rebalancing tax biases in favour of equity rather than debt.

How effective are banks dealing with polluting firms? There is some evidence that banks can price loans incorporating environmental impact. Chen

et al. (2021) show that firms that emit more pay higher interest rates than banks, primarily when emissions are associated with more risky borrowers and weak governance. However, the question is whether banks are better able than capital markets to price environmental risks correctly. As discussed by De Haas in this Issue of *European Economy*, access to credit per-se favours investment in cleaner technologies, although the most relevant factor seems instead the quality and attitude of firms' management towards environmental issues. Moreover, since banks continue to underprice the risk of asset devaluation for traditional investment, firms relying on carbon-heavy technologies are currently moving away from bonds to bank credit, as documented by Beyene et al. (2021b).

Interestingly, both De Haas and Degryse et al. in this Issue of *European Economy* have shown that the best outcomes from the credit markets obtain when "green-meets-green," when banks explicitly commit to green lending match with environmental conscious borrowers that effectively disclose their attitude. In these cases, mutual commitment and disclosure on the two sides of the credit market allow for a cheaper lending cost. An immediate policy implication seems thus that of facilitating credible disclosure of the environmental attitude of both sides of the credit market.

Overall, banks' difficulty in correctly pricing environmental risks combines several elements, as argued above. The articles in this issue of *European Economy* provide several policy actions that could redress this problem. Essential in this direction will be improving transparency and disclosure requirements about actual exposure to polluting industries and environmental risks. Moving from a voluntary approach (prone to manipulation and cherry-picking, as shown in Bingler et al. 2021) towards mandatory requirements, such as recently announced by New Zealand, the United Kingdom, and Switzerland seems a fundamental step.

3. Conclusions

In principle, Pigouvian taxation could fully internalize environmental costs and risks, making it useless to introduce ad hoc financial regulations (see Cochrane, 2021, for a view along these lines). But to attain a more sustainable

equilibrium in the presence of other market failures, policy interventions in the financial markets can be an effective complementary tool to Pigouvian taxation.

Two main types of interventions have been proposed and are being put in place (see, in particular, Marullo Reedtz and Mikklesen et al. in this issue for a comprehensive analysis). First, the provision of rigorous and standardized information to investors, through the definition of criteria for the measurement and disclosure of environmental risks (e.g., the Taxonomy Regulation of the EU, the Sustainable Finance Disclosure Regulation, the Regulation on European green bonds), and the requirement that large public-interest entities publicly report on sustainability issues (e.g., Directive 2014/95/EU). Second, the explicit inclusion of environmental risks in the bank supervisory framework, including capital requirements and stress tests (e.g., EBA's Implementing Technical Standards on Pillar 3 disclosures on ESG risks), and in central bank's analyses (e.g., ECB's Guide on climate-related and environmental risks).

The ample set of policies proposed in the financial sector will be paralleled by more traditional interventions addressing the effect of negative externalities through taxation and quantitative limitations. These will also impact investment returns (see also the discussion in Giovannini and Tamburrini, in this issue). Overall, the impact on the entire financial industry will be pervasive, affecting the choices and performance of banks, investment funds, insurance companies, and retail investors.

A natural set of questions thus arises. What objective function is driving this process? Who has chosen this objective function? Who is controlling that, when enacted simultaneously, the selected policies point in the right direction to achieve the desired goals?

The answer to the first question is apparently easy: the objective of all proposed policies is to internalize the adverse external effects that make individual choices unsustainable. But this goal requires a precise quantification of the social surplus to be maximized, a daunting task in any welfare analysis. In the absence of a unique solution, the objective function to be maximized should be chosen by citizens, following a democratic process. This observation leads to the answer to the second question that elected governments should determine the objective function to be maximized. While

it may be largely agreed that the mandate of financial regulatory authorities reflects the government's will for financial stability and the general working of financial markets, that such a mandate also reflects government choices on environmental issues is not so obvious. This may call for stricter directives from governments to financial authorities on environmental issues so as to enhance their accountability.

The last question has apparently no answer. Different bodies define different sets of rules, often with a large degree of autonomy. But a body or a framework coordinating the different policies and controlling that their decisions are not contrasting is absent. Given the large number of proposed and implemented interventions, the risk of a lack of coordination is substantial. This calls for a coordination table on environmental issues among all interested bodies. This framework should be set at the European level. In addition, given the global scope of environmental issues, it should be organized at the world level (see also Panetta, 2021).

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