WORLD COMMERCE REVIEW

VOLUME 16 ISSUE 1 ■ SPRING 2022

ZACHMANN *ET AL* DISCUSS THE DECARBONISATION OF THE EUROPEAN ECONOMY

NGOZI OKONJO-IWEALA OUTLINES HOW TRADE CAN PROTECT THE VULNERABLE

AVOIDING A DOOM LOOP. PATRICK MINFORD ON WHAT THE UK GOVERNMENT SHOULD DO

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Falling asleep at the wheel

In the post-cold war era the international community finds itself in the midst of tremendous flux undergoing unprecedented adjustment in a quest for a new order. The hopes for a multipolar world have not materialised. For their part, multilateral organisations have proved themselves unready and incapable of assuming broader responsibilities.

Expectations about the capacity and power of international organisations have been dashed. It is not only Ukraine that is being blown to pieces in front of our eyes, but our most vaunted global institutions. The United Nations hasn't even featured as a backdrop to the crisis. The European Union is squabbling. The G7 stands impotent. And what of NATO? Inflexible. Obsolete. Totally incapable of confronting the aggression it was built to deter.

Whether it is the response to COVID, the failure of green policies, a predictable invasion of Ukraine, soaring inflation, an energy crisis, multilateral institutions are proving to be unfit for purpose. Much like the failure of the League of Nations before WW2, the world is being made more dangerous by the very institutions charged with maintaining peace and prosperity.

These institutions are divorced from the requirements of many of their members. Recent years have revealed deepening differences as regards priorities for action by international organisations. Many countries want to devote increasing attention and resources on economic development programmes. They may say certain phrases to appease the West, but carry on developing their economies and improving the health and wellbeing of their populace, no matter what the environmental consequences.

On the sidelines, China is eyeing how the West is reacting to the Ukraine crisis. They may have been counting on the West's disunity, but they have delivered in geopolitical, business and financial terms with a punch, which could never have been imagined.

Germany has gone to the barricades with an increased defence budget and turned its energy policy, which made it so dependent on Russia, on its head. One by one the assets of the oligarchs are being seized. Companies have scuttled their Russian operations. Russia has been frozen out of the global financial payments and banking system, killing its access to Western money. Goldman Sachs and JPMorgan are among lenders heading for the exit.

The unity of purpose by Western nations and corporations will have been heeded in Beijing. China's rise to become the world's second largest economy has been fostered by its embrace of the global trading system, which has also created an enormous interdependence with the West.

China's success means it has built up huge financial reserves. The larger part of this $3 trillion war chest is tied in US Treasuries which means if push came to shove Washington could freeze them at the stroke of a pen. Indeed, the global investments it has built up could be frozen as easily as an oligarch's assets.

The lessons of Western unity in confronting Moscow will not have been lost on a leader as comfortable with globalisation and open markets as President Xi. ■

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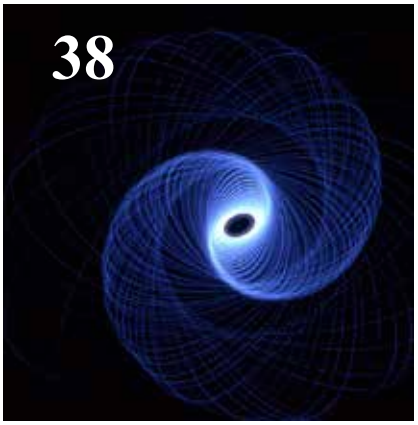
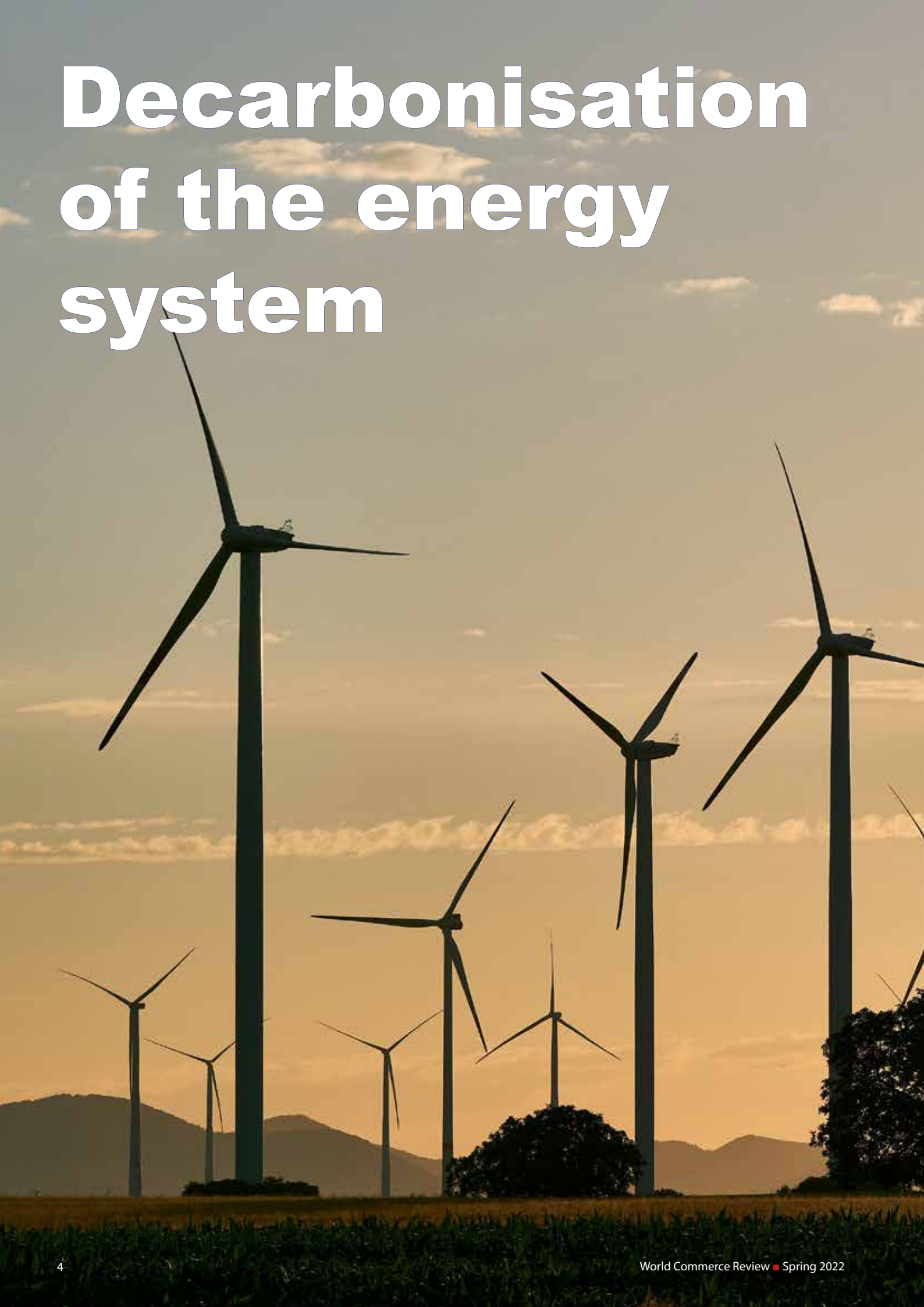


Decarbonisation of the energy system



Georg Zachmann, Franziska Holz, Claudia Kemfert, Ben McWilliams, Frank Meissner, Alexander Roth and Robin Sogalla highlight that the current national energy and climate plans (NECPs) of EU countries are insufficient to achieve a cost-efficient pathway to EU-wide climate neutrality by 2050

Summary

Three quarters of the European Union's greenhouse gas emissions stem from burning coal, oil and natural gas to produce energy services, including heating for buildings, transportation and operation of machinery. The transition to climate neutrality means these services must be provided without associated emissions.

It is not possible today to determine tomorrow's optimal clean energy system, largely because the cost, limitations and capability developments of competing technologies cannot be predicted. Energy systems with widely diverging shares of 'green fuels', in the form of electricity, hydrogen and synthetic hydrocarbons, remain conceivable.

We find the overall cost of these systems to be of the same order of magnitude, but they involve larger investments at different stages of value chains. A large share of synthetic hydrocarbons would require more investment outside the EU, but less in domestic infrastructure and demand-side appliances, while electrification requires large investment in domestic infrastructure and appliances.

Current projections show an overall cost advantage for direct electrification, but projections will evolve and critical players may push hard for alternative fuels. Policy will thus play a major role in shaping this balance.

Political decisions should, first, push out carbon-emitting technology, primarily through carbon pricing. The more credible and predictable this strategy is over the coming decades, the smoother will be both divestment from brown technologies and investment in green technologies.

Second, policy needs to help ensure that enough climate-neutral alternatives are available in time. Clear public support should be given to three system decisions about which we are sufficiently confident: the massive roll-out of renewable electricity generation; the electrification of significant shares of final energy consumption; and rapid phase-out of coal from electricity generation.

For energy services where no dominant system has yet emerged, policy should forcefully explore different solutions by supporting technological and regulatory experimentation.

Given the size and urgency of the transition, the current knowledge infrastructure in Europe is insufficient. Data on the current and projected state of the energy system remains inconsistent, either published in different places or not at all. This impedes the societal discussion.

The transition to climate neutrality in Europe and elsewhere will be unnecessarily expensive without a knowledge infrastructure that allows society to learn which technologies, systems, and polices work best under which circumstances.

1 Introduction

For the European Union to become the first climate-neutral continent by 2050, the decarbonisation of the energy sector will be crucial. Production and use of energy accounts currently for more than three quarters of the EU's greenhouse gas emissions[1], and most of the EU energy system still relies on the combustion of oil, natural gas and coal.

Meanwhile, the potential to reduce demand for energy services is most likely limited and therefore most energy services currently based on fossil-fuels need to be replaced by climate-neutral alternatives. One of the open issues is the relative role of different non-fossil fuels[2] – primarily electricity, hydrogen and synthetic methane – in final energy use.

We present three extreme scenarios to highlight the consequences of different energy-policy choices: first, the full electrification of the economy; second, the widespread use of hydrogen; and third, widespread use of synthetic methane. In practice, a combination of the three scenarios is most likely to be implemented, and the three scenarios are not equally probable.

Irrespective of the choices made, we emphasise three main 'no-regret' policies that should in any case be implemented[3]: (a) rapid deployment of more renewable electricity generation, (b) electrification of significant shares of final energy uses (such as heating and transportation), and (c) the swift phase-out of coal.

Our analysis also highlights that the current national energy and climate plans (NECPs) of EU countries are insufficient to achieve a cost-efficient pathway to EU-wide climate neutrality by 2050. Consequently, a strong commitment framework is needed to ensure that NECPs are aligned with European targets.

2 Different scenarios

How the European energy system will develop over the next decades is highly uncertain. In particular, the roles in the future energy mix of hydrogen (H_2), synthetic methane (CH_4) and their derivate products (such as ammonia) remain hard to predict. These fuels can be produced using renewable electricity (and/or biomass). On this basis, they are referred to as 'green'.

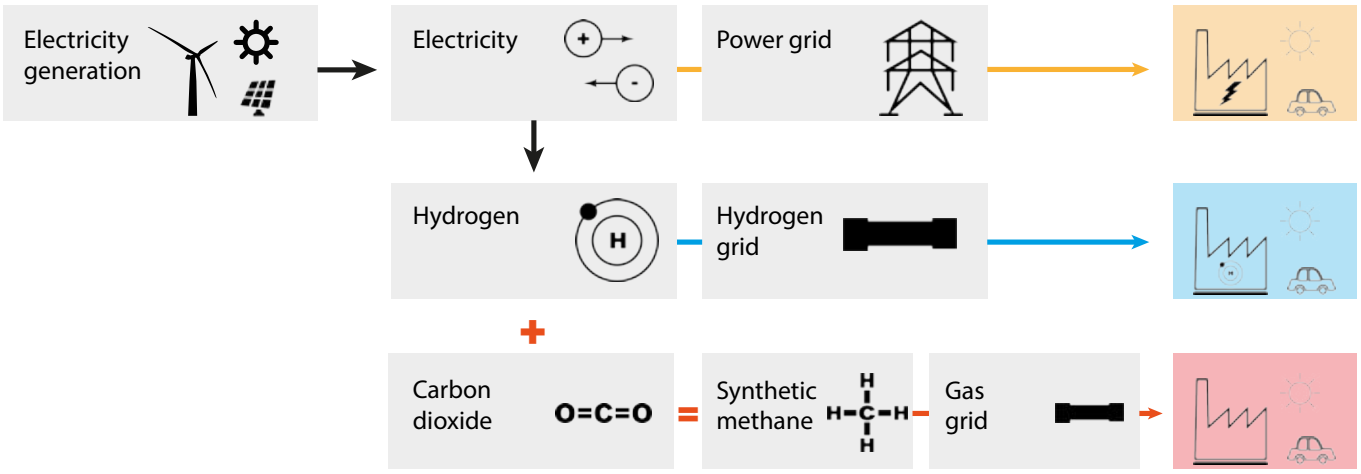
Hydrogen can be produced from electrolysis of water (Figure 1). Synthetic methane can then be produced via an additional electrochemical process known as the methanation of hydrogen. In this process, hydrogen and carbon dioxide are used as inputs (Götz *et al* 2016).

If the inputs are 'clean' over their lifetime – for example, hydrogen obtained from electrolysis using renewable electricity, and CO_2 captured from the atmosphere – the final product is considered greenhouse-gas-neutral. The additional methanation process makes synthetic methane more electricity-intensive and expensive than hydrogen (Evangelopoulou *et al* 2019).

Alternatively, synthetic methane can be produced from biogenic sources, ie. by increasing the methane concentration in biogas to almost 100 percent, but the potential for biogas production in the EU is rather limited[4]. The resulting synthetic methane might replace fossil natural gas, which is also almost pure methane.

The main advantage of synthetic methane is that it can be fed into the existing natural gas transportation and storage infrastructure. Furthermore, it requires less investment on the demand side than hydrogen or direct electrification, since current natural gas heating systems or turbines could be fuelled with synthetic methane in the future.

Figure 1. Simplified overview of a low-carbon energy system



Source: Bruegel.

Table 1. Scenario assumptions

	Green gases	Hydrogen	Renewable electricity
All-electric world	Gas transmission and distribution infrastructure is largely decommissioned	Hydrogen clusters with very concentrated pipeline network; some hydrogen storage for electricity seasonal storage	Significant upgrading and expanding of European transmission and distribution grid
Hydrogen imports to fuel EU	Gas transmission and distribution infrastructure is largely repurposed (ie. green gas is consumed where it is produced)	Meshed European transmission infrastructure connected to import points and hydrogen distribution grids in repurposed methane pipelines, hydrogen fuelling station infrastructure	Electricity distribution only strengthened where no hydrogen is available; electricity transmission modestly strengthened
Green gases in old pipelines	Gas transmission and distribution infrastructure is largely maintained and used by green methane	Hydrogen clusters with very concentrated pipeline networks; some hydrogen storage for seasonal electricity storage	Electricity distribution only strengthened where no methane is available; electricity transmission modestly strengthened

Source: Bruegel.

Box 1. Scenario analysis methodology

For each scenario, we calculated the required investments (2020-2030, 2030-2050) in the energy sector, ie. additional power generation capacities, investments in electrolyser and transmission grids, and investments in hydrogen grids – but not the cost of demand-side appliances. It is impossible to have a clear ordering of the cost of appliances that serve the same purposes but use different fuels. The corresponding energy system investment unit costs are taken from the ASSET project (Capros et al 2018). The investment volumes in the different scenarios are calculated based on the assumption that the amount of useful energy required in each sector is the same as that implied in the MIX-55 scenario results developed by E3Modelling (JRC, 2021). 'Useful' energy is the energy service finally made available to users (kilometres driven, square metres heated). As more efficient fuel systems (electricity) require less kWh of input to provide the same service (heating) than less efficient systems (hydrogen), a smaller system is required to provide the same service. For each major final use, we estimated for each fuel the required input. For each scenario, we estimated the share of each fuel in each use type. Based on this, we calculated required inputs of the different fuels for each sector and in total. This allowed us to calculate the necessary transmission and generation capacities. Ultimately, these capacities can be translated into investment figures.

However, beyond this initial capital stock advantage, synthetic methane appears significantly less attractive than hydrogen or direct electrification. There would be high investment costs for production facilities[5], and substantial amounts of electricity required to run them, because of the poor overall energy efficiency[6].

The energy efficiency of hydrogen produced from a unit input of renewable electricity is higher. However, hydrogen cannot be pumped through existing natural gas pipelines, which would need to be retrofitted to transport hydrogen safely.

Our three scenarios illustrate the uncertainty around the future energy system and find robust, no-regret developments that appear in all scenarios. We assume a plausible level of energy demand in 2050 and make extreme assumptions about the contribution of each of the three fuels to meeting this demand.

We distinguish: a) an 'all-electric world'; b) a hydrogen-dominated world in which hydrogen demand is so great that hydrogen imports are required; and c) a 'green gases' world, in which synthetic methane plays a major role as a replacement for natural gas.

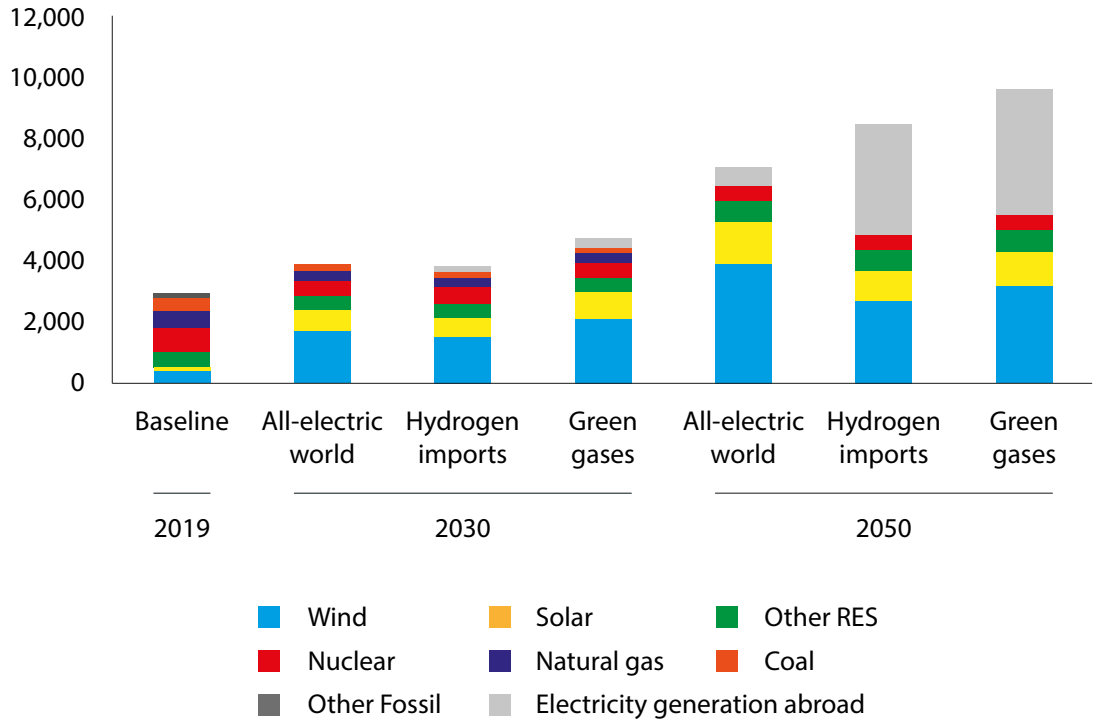
All scenarios rely on extensive electrification of energy supply and demand, and a phase-out of coal and fossil natural gas.

We assess the future energy system in 2030 and 2050 according to these three scenarios. We assume the same useful energy demand in all scenarios, but this demand would be satisfied with different technologies and from different sources (Box 1).

In addition, the role of energy imports varies across the scenarios; domestic energy demand is met from a mix of domestic renewable energy generation and imported fuels. In the scenarios focussing on transition to hydrogen and synthetic methane, energy imports would meet a large share of demand. This implies less demand for electricity generation domestically which is off-shored via production of these fuels abroad (Figure 2).

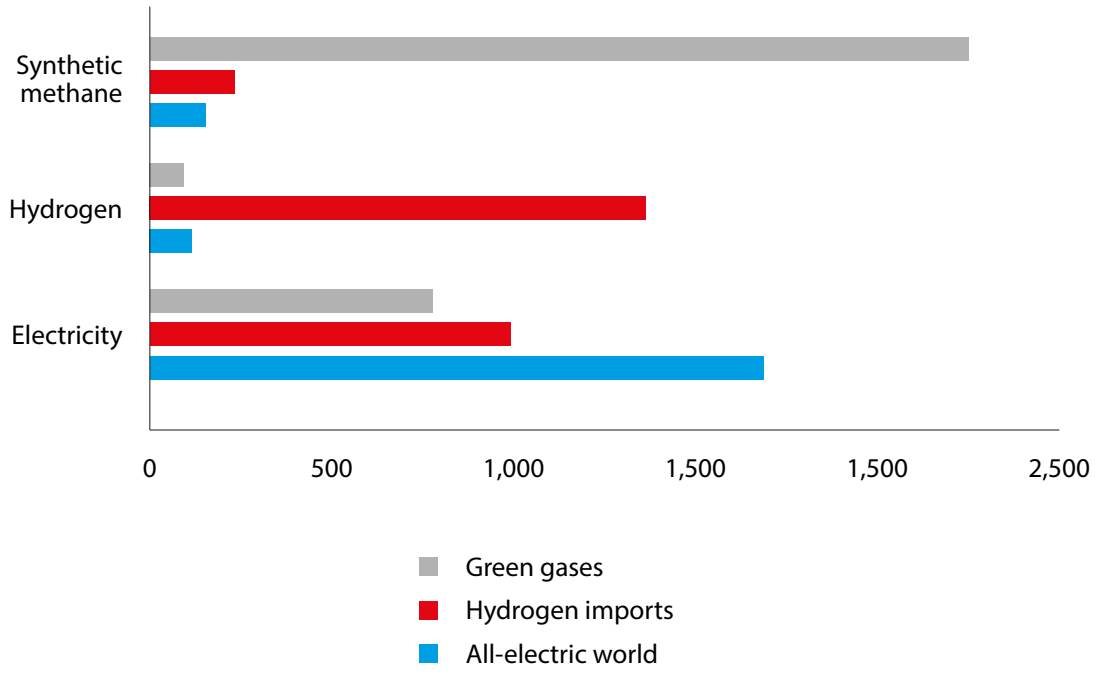
More importantly, a major increase in renewable electricity generation in the EU is required to achieve the emissions

Figure 2. Electricity generation in 2019, 2030, and 2050 in TWh



Note: RES = renewable energy sources.
Source: Bruegel (see Zachmann et al 2021).

Figure 3. Change in final energy consumption by fuel between 2020 and 2050 (TWh)



Source: Bruegel (see Zachmann et al 2021).

"Political decisions, particularly on agreements with third countries for the future import of green fuels, act as commitment devices"

reductions from the energy sector. Figure 2 shows that electricity generation levels must at least double by 2050 compared to today (with potential deployment abroad in the case of energy imports).

We assume that all of the growth will come from renewables, mostly wind and solar. Electricity generation in the EU from coal and natural gas will have to be phased out in line with international commitments such as the Glasgow Climate Pact[7].

The greater role of electricity will be visible in the future through more direct use of electricity in final energy use ('electrification', eg. of transportation) and through the introduction of hydrogen and synthetic methane produced from electricity ('indirect electrification').

Figure 3 shows that direct electrification will play a major role in all scenarios because it is a low-cost way of decarbonising many energy demand areas.

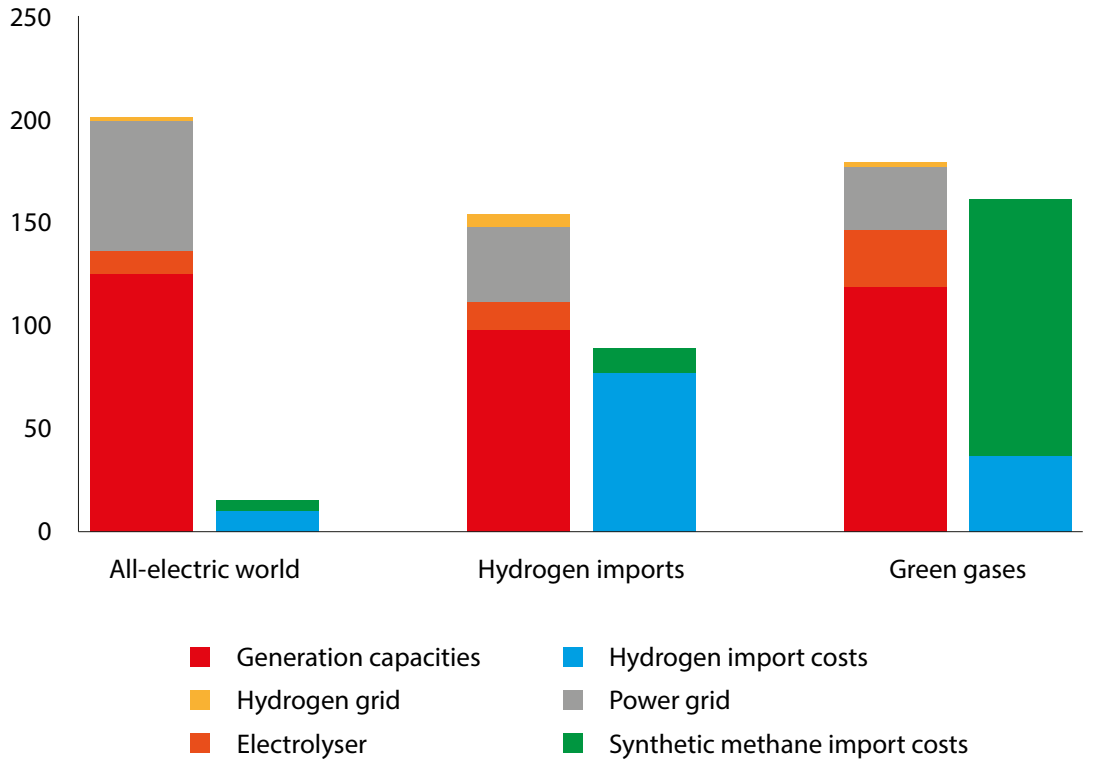
Due to their energy-inefficient production processes, hydrogen or synthetic methane will only become viable bulk-energy carriers if low-carbon electricity generation in Europe (or in the interconnected neighbourhood) turns out to be severely limited.

Even assuming learning and cost decreases, only small amounts of hydrogen and synthetic methane are no-regret decarbonisation solutions[8] for sectors where electrification is impossible or hard to achieve.

The scenario approach helps us to investigate the relative costs of each decarbonisation option. Clearly, there is too much uncertainty around key parameters (learning rates, future appliance costs, supply constraints, etc) to be able at this point to determine the optimal future energy system. However, some insights are gained from comparing the three scenarios.

First, different scenarios have different investment needs (Figure 4). For example, the 'all-electric world' scenario with widespread electrification requires massive expansion of

Figure 4. Annualised investment costs (left-hand bars) and fuel import costs (right-hand bars) in the three scenarios, 2021-2050, € billions



Note: In each case, the left bar indicates the average annual investment cost and the right bar the annual fuel import cost.
Source: Bruegel.

electricity grids, even more than in the other scenarios because of the interconnection of all possible demand areas.

In contrast, a hydrogen-focused energy system will incur costs for the retrofitting of pipelines to enable hydrogen to be transported.

Second, all scenarios require significant investment in low-carbon power supply. Expansion costs for low-carbon electricity generation are more than half the domestic EU investment costs in all scenarios.

Third, the need for domestic generation investment would be even greater in the 'hydrogen imports' and 'green gases' scenarios, unless much of the electricity production is offshored and imported in the form of hydrogen and synthetic methane. This leads to high import costs (Figure 4).

In sum, electrification is a no-regret option across all three scenarios. In addition, the scenario focusing on widespread electrification has the lowest cost of the three scenarios. From a cost perspective, hydrogen use is more likely than synthetic methane use. Hydrogen can plausibly be a complement to widespread electrification, with hydrogen helping to decarbonise demand areas where electrification is hard or costly (eg. aviation).

An energy system biased towards synthetic methane would be the costliest choice. The advantages of re-using existing natural gas infrastructure would not compensate for the high investment and operation costs of synthetic methane production facilities.

3 Encouraging the needed private investment

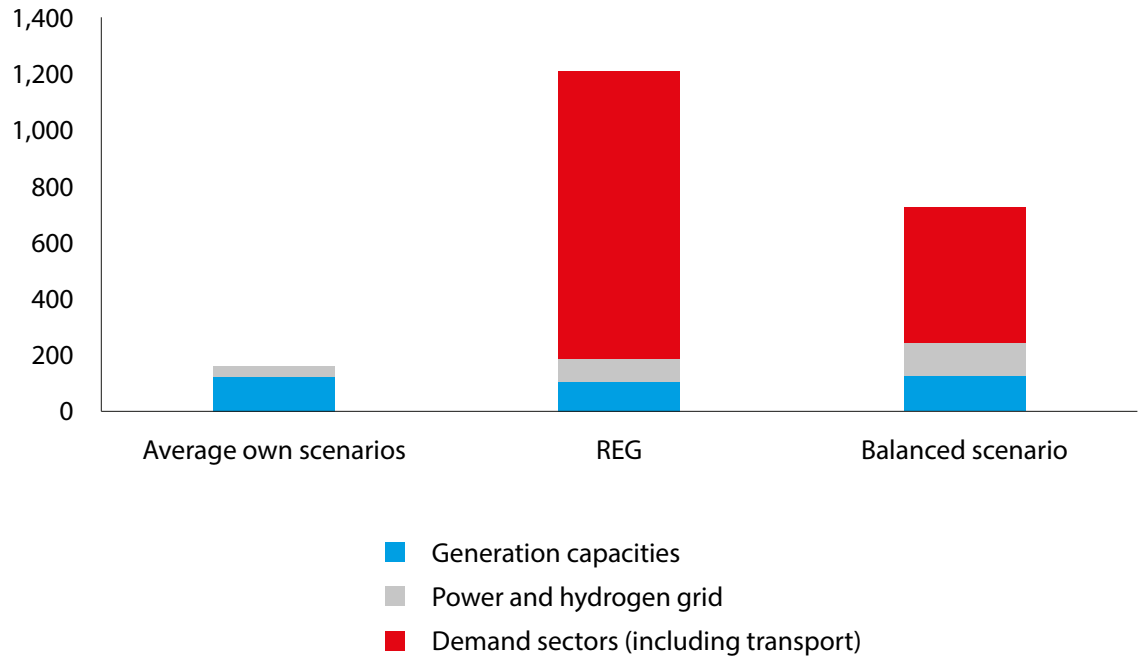
While our scenario analysis is focussed exclusively on the supply-side, previous modelling studies have shown that the vast majority of investment needs are on the demand side (Figure 5).

Households must purchase clean vehicles and install clean heating systems, and firms must invest in clean production processes. Figure 5 shows that demand-side investment exceeds supply-side investment expenditures by a factor of at least five.

In order to provide the private sector with sufficient confidence to make these investments, policy must pursue two complementary tracks. First, credible signals should indicate that the energy use of fossil fuels and the investment in the appliances that consume them will be relentlessly regulated out of the market. Simultaneously, policy should demonstrate that alternative low-carbon fuels will be available and cost-effective.

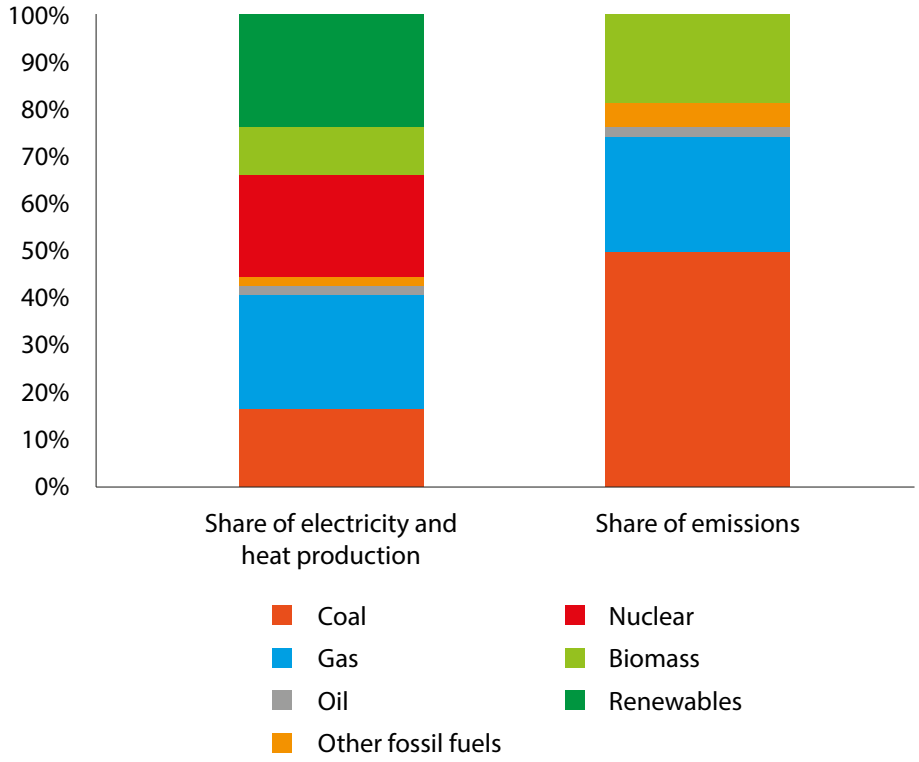
These policy tracks complement one another. Without convincing signals that fossil fuels will not be available in the future, investors will not be motivated to invest capital in switching, preferring instead to wait and see[9]. But announcing

Figure 5. Required average annual investments (2031-2050)



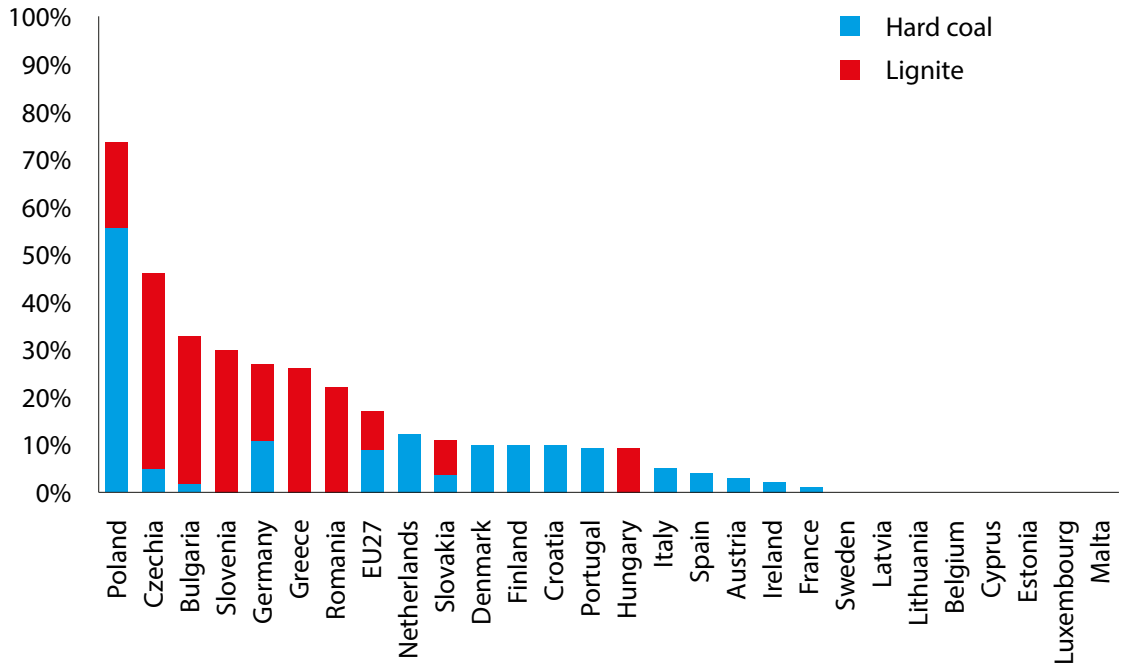
Note: REG (regulatory-based) scenario comes from the European Commission (2020a); Balanced scenario is from Evangelopoulou et al (2019). All investments and costs are depicted in billions of 2020 €. Our scenarios do not consider demand-side investments.
Source: Bruegel.

Figure 6. Share of coal in emissions and electricity and heat production (2019)



Note: Renewables are without biomass and renewables waste; biomass includes renewables waste; 'other fossil fuels' includes non-renewable waste.
Source: Bruegel based on Eurostat (ngr_bal_peh) and EU CRF Tables reported to UNFCCC (see https://www.eea.europa.eu/publications/annual-european-union-greenhouse-gas-inventory-2021/eu_crf_tables_eua_2021_unfccc_2021.zip/view).

Figure 7. Share of coal in electricity and heat production in the EU (2019)



Source: Bruegel based on Eurostat (dataset ngr_bal_peh).

only fossil fuel phase-outs without credible commitments as to what new energy systems will be made available also will not work.

Social and political constraints imply that governments will ultimately never follow through on fossil-fuel bans or high carbon prices if no alternatives are in place to provide essential services (ie. governments will not permit household fossil energy bills to grow too large without alternatives available[10]).

3.1 Ending the use of fossil fuels

In our discussion on ending the use of fossil fuels, we differentiate between 'neutral' (no-regret) choices and policies that favour one of the described scenarios.

Technologically-neutral policies can contribute to ending the use of fossil fuels. These are policies that keep all pathways open and do not favour any clean fuel.

They include for example: greenhouse gas pricing, which increases the costs of carbon-intensive production, but is neutral about its alternatives[11]; bans on/strict standards for internal combustion engine vehicles and gas boilers, which phase out the use of fossil fuels but do not prescribe specific alternatives; and mandates to stop fossil-fuel investment that would only be economically viable if there is still unabated combustion after 2045, which do not prescribe a specific replacement technology.

However, such technology-neutral policies are not necessarily sufficient to end the use of fossil fuels, as shown by coal. There exists no foreseeable future in which coal will play any (significant) role in the European energy system.

Especially in electricity and heat production, which presently uses almost half of hard coal[12] and almost all lignite in the EU, a coal phase-out must be achieved swiftly to not over-exploit Europe's carbon budget and to maintain international credibility.

Using coal to generate electricity and heat is highly emissions-intensive: coal provides only 17 percent of total electricity and heat production in the EU, but generates half of the greenhouse gas emissions in this sector (Figure 6).

The importance of coal in electricity and heat production varies across the EU, with many countries – predominantly in North and West Europe – having no or almost no coal in their systems, and a few countries – in Central and East Europe – with very high shares (Figure 7).

Seven EU countries (Poland, Czechia, Bulgaria, Slovenia, Germany, Greece and Romania) have coal shares above 20 percent. On the other hand, twelve EU countries have shares around 10 percent. Germany has the fifth largest share of coal, but due to its size has the second-largest coal-sector in the EU.

Because of an annual reduction factor, the annual issuance of emission allowances into the EU emissions trading system (ETS) will continue to decline, reaching zero in less than 30 years.

This provides a clear and powerful signal to national and regional administrations and companies that coal combustion will have to be phased-out.

Regarding the short-term operation of existing coal plants, increasing carbon prices affect the equilibrium[13] between coal, gas and electricity prices – incentivising a reduction in the operating hours of coal units.

In longer-term decision making, tightening emission budgets will not only prevent new-builds of coal assets but also encourage the early closure of existing ones.

However, if this process is left entirely to market forces and individual operators, the resulting closure schedule is likely to be inefficient. Political uncertainty over future policy direction, and notably the ability of large companies to influence this, implies that companies face some incentive to continue running coal plants at negative profit margins to avoid paying large decommissioning costs today.

In this case, a strict time schedule for phase-out is required to avoid the postponement of closure decisions. On the other hand, rapid and uncoordinated plant closures may threaten (regional) security of supply.

Therefore, a geographically determined phase-out schedule is crucial to manage the physical limitations of electricity grids as dispatchable generation drops offline. The need to manage the regional economic and social repercussions also calls for a planned phase-out.

Most EU countries already have national coal phase-out policies, usually with a phase-out schedule and a terminal date for coal-fired power plants.

Only a few EU countries in central and eastern Europe do not have an end date (including Bulgaria, Slovenia, and Croatia), or have a very late end date (such as Poland, 2049, and Germany, 2038)[14], for phasing out coal from electricity generation.

Finally, without a clear vision of publicly acceptable and competitive alternative power supplies, the phase-out plans are not credible. Here, public support for alternatives reduces the cost of the transition (eg. through accelerated learning) and also serves as a public commitment.

High carbon prices are thus an efficient driver of a coal phase-out, but can only be credible and hence successful if it is made sure realistic alternatives will be phased in at the same time.

3.2 Ensuring availability of low-carbon alternatives

Policy must focus not only on ending the use of fossil fuels, but also on providing credible low-carbon alternatives. To do so, certain actions are essential under all scenarios.

The first is to build out low-carbon electricity generation capacity. At least an additional 2,000 terawatt hours of domestic electricity generation in 2050 compared to 2019 is required in all scenarios, which is approximately a 70 percent increase.

Second, in certain areas, direct electrification appears likely to be the optimal solution, including for passenger vehicles[15], large shares of household heating[16] and low-temperature industrial heat[17].

Here, policymakers should be willing to do what is needed to provide the policy framework (infrastructure, regulation, support for research, development, demonstration and deployment) to enable the fast roll-out of decarbonised systems.

This does not imply that policy will blindly favour one system, but that the burden of proof will be on alternative technologies to provide not-yet-seen evidence of their superiority. Direct electrification will work for a substantial percentage of EU's decarbonisation needs and this should be swiftly exploited.

The coal phase-out is a prime example highlighting the need for significant deployment of new low-carbon electricity capacity. The deployment record in the past two decades indicates that renewable electricity is the cost-efficient option[18].

However, as wind and solar PV power plants have structurally lower full-load hours (hours in which the entire power capacity of a power plant is used), the overall capacity of the power plant fleet has to be substantially increased to provide the same amount of energy.

Among EU countries, the need to deploy renewable power plants in order to phase-out coal varies. Countries with a low share of coal in electricity and heat production will be able to replace coal with modest investments in additional renewable energy capacities.

Countries with high shares of coal (especially Poland, Czechia, Bulgaria and Slovenia) must invest aggressively in renewable energy capacities so they can phase-out coal in the next decade. Renewable capacities need to be multiplied by a factor of at least six by 2050 in the seven most coal-intensive EU countries (Figure 8).

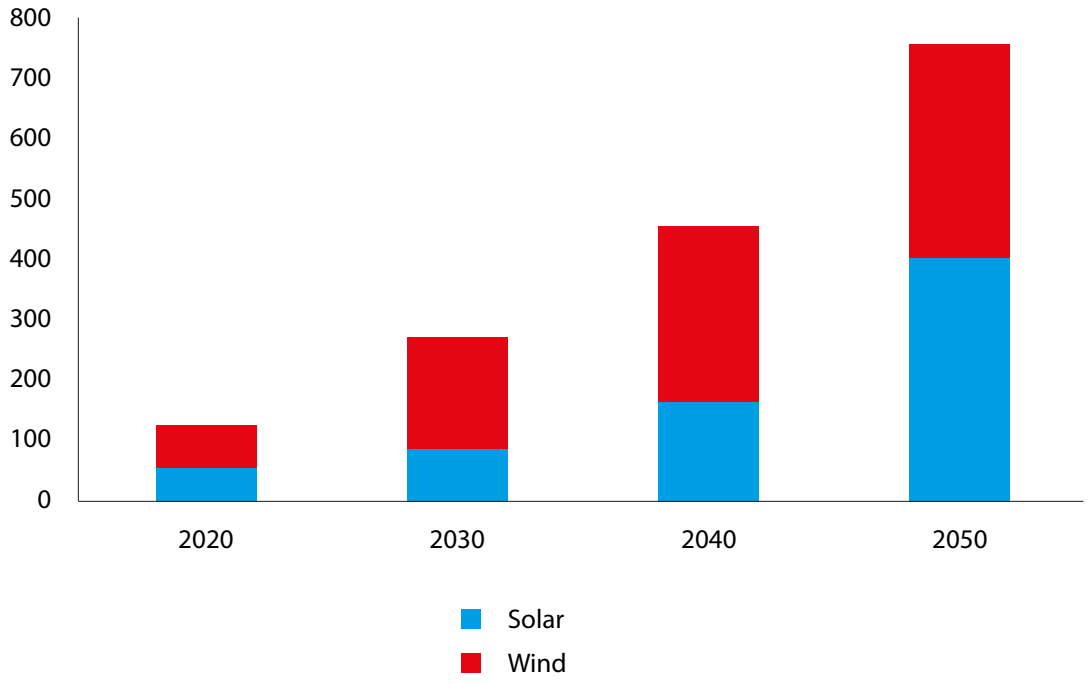
However, all EU countries need to increase renewable energy deployment rates substantially to achieve climate neutrality by 2050.

As the coal phase out progresses, gas-fired power plants could play an important transitional role. They have relatively low capital costs (about half that of coal plants) and can be dispatched more quickly than coal plants when needed to back-up fluctuating wind and solar PV power plants. They can thus support the system for the few days/weeks of the year when demand exceeds renewable energy production.

However, new gas power plants risk becoming stranded assets if they cannot be operated commercially under strict carbon-neutrality constraints.

Depending on the needs of the future power sector, three different types of gas fired power plant are conceivable: 1) plants with relatively low capital costs and low planned load factors, and which can be switched to carbon-neutral fuels

Figure 8. Wind and PV power plant capacities needed for decarbonisation in the seven most coal-intensive EU countries (in GW)



Note: The data covers EU countries with significant shares of coal in electricity and heat production: Bulgaria, Czechia, Germany, Greece, Hungary, Poland, Romania and Slovenia.
Source: Zachmann et al (2021).

such as synthetic methane or hydrogen; 2) plants designed to recover their fixed costs over a short period; 3) very efficient plants with higher load factors that can be commercially operated with carbon capture and storage.

Given the legacy power plant fleet and the decreasing cost of renewables, the first niche currently appears to be the largest. A predictable regulatory environment and a well-functioning electricity market is the best approach to identify efficient solutions.

Beyond these two uncontroversial solutions (direct electrification where appropriate and the massive deployment of renewable electricity generation), the most promising solutions for other energy uses (including significant industry applications, aviation or seasonal energy storage) are less clear.

Hence the approach should be two-pronged: to provide a European and national policy framework encouraging the rapid deployment of the uncontroversial solutions, and encouraging companies to explore in depth different solutions in the less-clear areas.

In the next decade, this two-pronged approach will be particularly important for industry and households (including transport). In these sectors, emissions reductions have so far been too slow; in order to meet 2030 targets, a step change is necessary.

The major focus on these areas in the European Commission's Fit for 55 policy push, and the spending plans of countries under Next Generation EU (Darvas *et al* 2021), reflect this. The policy challenge is to strike the right balance between allowing fair competition between low-carbon technologies while providing enough of a technologically-specific push for the required solutions to be deployed at scale in time.

For comparison, the 2005 launch of the EU ETS placed neutral pressures on the power sector to decarbonise, but was accompanied by the roll-out of massive support schemes for renewable power generation.

These policies favoured the development of those renewable technologies that were already mature enough to compete for subsidies, and were very successful in dramatically bringing down their costs.

Without this complementarity, the ETS would have led to a stronger temporary switch from coal to natural gas, while increasing prices and dependencies might have undermined the political sustainability of European carbon pricing.

In a similar vein, policies to end the use of fossil fuels in industry and households[19] must be accompanied by a second category of policies providing clear signals on the future availability of clean fuels. This requires governments to make credible commitments to facilitate the necessary infrastructure for new fuels (both physical and institutional), which will be laid out through a series of path-nudging choices over the coming years.

First, access to energy will be determined increasingly by low-carbon sources of electricity and the fuels derived from this. Therefore, new infrastructure is essential to connect supply and demand of these energy vectors.

The signals sent by policymakers today regarding infrastructure roll-out provide a signal for private-sector investment (eg. greater electricity transmission capacity, roll-out of hydrogen transmission pipelines). We argue that bold decisions need to be taken today to stimulate a wave of new infrastructure investments.

This includes questions for policymakers outside the current comfort zone, such as: should competition concerns be temporarily ignored and should vertical integration of the generation, pipeline transportation and consumption of new green fuels be permitted, in order to allow nascent markets to grow quickly?

How can EU countries be made more cooperative and ambitious when constructing projects of common interest and transmitting clean fuels across borders? Beyond transmission-level infrastructure, there will also be a role for government support for/permitting of investments to reinforce distribution grids and final infrastructure, eg. charging for electric vehicles.

Second, energy markets are not self-organised institutions but are designed by policy. The current market design for electricity and natural gas reflects the ambition of gradually realising a European energy market by coupling short-term markets – and expecting that these price signals will ultimately lead to coordination of energy-sector investments in different EU countries.

But so far, national instruments to support specific technologies (eg. solar in Germany; nuclear in France; gas in Italy) have superseded European market signals. The net zero transition will require a substantial rethink about how investments are coordinated to result in an energy mix that is relatively efficient.

Most attention should be given to getting right the electricity market design and sector rules, as electricity will in any scenario be the most important future clean-energy fuel. But rules for other fuels also require a rethink. For natural gas, the main question is how to manage the phase-down with as little disruption as possible (eg. no uncontrolled death spirals of decreasing use and higher per-unit infrastructure cost).

Meanwhile emerging fuels such as hydrogen, which has historically been treated as a chemical input product, will have to be re-considered as a fuel.

Finally, political decisions, particularly on country-level agreements with third countries for the future import of green fuels, act as commitment devices. Signing such agreements sends a message that a government believes in a particular green fuel and is prepared over the coming years to back it through the different stages of production (or import), transport and consumption.

For example, Germany has signed a number of bilateral deals to import green fuels[20]. The volume of agreements suggests that Germany intends to emphasise imports in its future fuel mix. Choices will have to be made on the extent of the value chain exported.

Importing green hydrogen implies off-shoring the stages of electricity generation and electrolysis, while importing green ammonia or synthetic hydrocarbons implies off-shoring another stage of the value chain. Fuels that are the subject of political agreements are therefore revealing of the political perspective on the future domestic energy infrastructure.

4 Enhancing the transition toolbox

As Europe decarbonises, lessons must be learned to provide guidance to the later stages of European decarbonisation and also to third-countries that want to follow Europe's path.

As a bloc of 27 countries with different geographies, economies and politics, there is likely to be significant divergence in the pathways EU countries follow to reach net zero. While coherence and collaboration in certain areas are important for efficient investments, in certain areas a diversity of approach should be celebrated.

The pursuing of different policies, and ultimately fuel mixes, by EU countries will provide important data on the pros and cons of respective pathways.

However, country-level plans must conform to minimum levels of ambition. So far, EU countries' national energy and climate plans (NECPs) are insufficient as net zero pathways. For example, Figure 9 shows that NECPs consistently miss required energy efficiency gains.

Member states that will fall short in terms of energy efficiency gains must demonstrate that they are able to make up for this shortcoming with alternative policy, eg. more rapid deployment of renewable capacity.

Finally, efforts should be made at EU and member-state level to improve the collection and transparent communication of relevant data. Currently, NECPs are difficult to compare and not structured coherently.

The European Union should consider creating a European Energy Agency (similar to the United States Energy Information Administration), which would be responsible for detailed analyses of NECPs and all other aspects of the EU's low-carbon energy transition.

The policies implemented over the coming years will fundamentally reshape the lives of every European citizen. A transparent reference point for the often very technical issues will be essential to ensure high quality political discussions. ■

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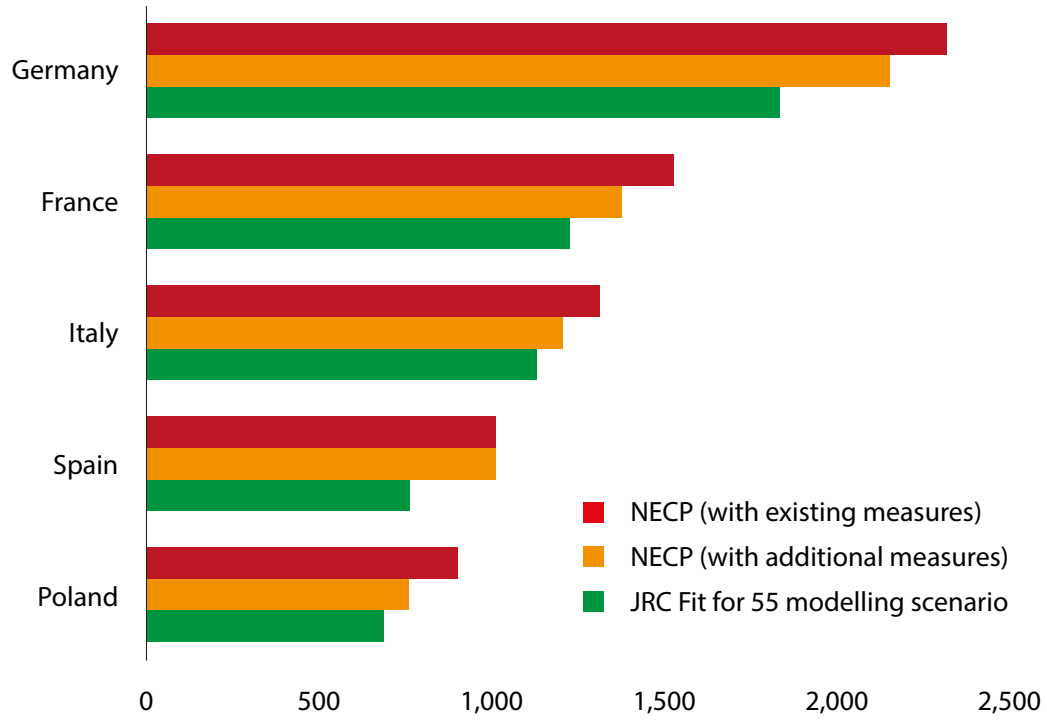
Figure 9. Final energy consumption projections in 2030 (TWh), selected countries



Source: Zachmann et al (2021).

Endnotes

1. See Eurostat, 'Greenhouse gas emissions by source sector' dataset (https://appsso.eurostat.ec.europa.eu/nui/show. do?dataset=env_air_gge), 'energy' value. Note this includes fuel combustion for power generation, transport and industrial applications. Measured in CO_2 equivalent.

2. For simplicity's sake, by 'fuel', we mean the three energy vectors of electricity, hydrogen and synthetic methane.

3. Full details can be found in Zachmann et al (2021).

4. The JRC (2018) estimated a "realistic biogas potential" of 18 billion cubic metres in Europe, corresponding to about 5 percent of current natural gas consumption; see Scarlat et al (2018).

5. Schiebahn et al (2015) explored the costs of synthetic methane production.

6. The efficiency of the process, from renewable electricity, via hydrogen and methanation, into the energy contained in methane is about 64 percent (Schaaf et al 2014).

7. See https://ukcop26.org/cop26-presidency-outcomes-the-climate-pact/.

8. To be precise, the term 'defossilisation' should be used instead of decarbonisation when describing a system with synthetic methane. Indeed, methane is a carbon-containing energy carrier. CO_2 is emitted from its combustion and CH_4 is a greenhouse gas itself, which might leak during transportation.

9. The IEA highlights this challenge when contrasting the required reductions in oil and gas investments in a net zero scenario with the required increases in clean energy and infrastructure. While the world appears on track for the former, it is markedly missing the latter (IEA, 2021).

10. While current European government subsidies are in response to high gas prices, they indicate the measures governments are willing to take in the case of high energy prices (Sgaravatti et al 2021).

11. In the EU, emissions of carbon dioxide, hydrofluorocarbons and nitrous oxide from large point-emission sources are capped and priced under the EU emissions trading system. Methane, another potent greenhouse gas emitted from coal mines and oil and gas infrastructure, needs to be limited too; see European Commission (2020b).

12. Half of the hard coal used serves as an input to industrial processes, which will be difficult to abate; however, technological alternatives are being developed.

13. This equilibrium is complex and non-linear and affected by many exogenous factors including electricity demand development, global energy market developments and public decisions to support/close other electricity generation assets, such as nuclear and renewables.

14. The 2021-2025 German coalition agreement states that the coalition wants to "accelerate" the phase-out and complete it "ideally already by 2030" (Koalitionsvertrag 2021–2025).

15. The share of electric cars in new registrations already reached 10 percent for the EU, Iceland, Norway, and the UK in 2020, and is increasing quickly, see European Environment Agency, 'New registrations of electric vehicles in Europe', 18 November 2021, https://www.eea.europa.eu/ims/new-registrations-of-electric-vehicles.

The share is also above 10 percent for the global market; see Nathanial Bullard, 'Electric Vehicles Are Going to Dent Oil Demand—Eventually', Bloomberg Green, 9 December 2021, https://www.bloomberg.com/news/articles/2021-12-09/peak-oil-demand-is-coming-but-not-so-soon.

16. For example, Flis and Deutsch (2021) explored clearly the financial benefits of heat pumps at household level.

17. Madeddu et al (2020) found that 78 percent of existing industry energy demand is electrifiable with existing technologies, while 99 percent of the demand is electrifiable with the addition of technologies currently under development.

18. The Lazard Levelized Cost of Energy Report shows significant cost-advantages for new-build solar and wind (Lazard, 2021).

19. For example, strengthening the ETS price, roll-out of second ETS/national-level carbon pricing, combustion- engine vehicle bans.

20. The European Commission in December 2021 approved Germany's H2Global plan, which mobilises €900 million for investment in green hydrogen production in non-EU countries with the intention of importing into the EU. See https://ec.europa.eu/commission/presscorner/detail/en/ip_21_7022

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The climate transition and its social dimension



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The proposal by the European Commission for a Council Recommendation on the social and labour aspects of the climate transition, presented last December, is another welcome sign that employment and distributional aspects of climate change mitigation have been recognized at the highest policy level.

As well as the inclusion of the notion of just transition into the preamble of the 2015 Paris Agreement, and then in the Glasgow Climate Pact, this can be seen as a modest but important achievement of a several decades-long campaign for a just transition by the labour movement.

The announcement of the European Green Deal (EGD)[1] in 2019 had already included pledges to 'leave no-one behind.' The Just Transition Mechanism[2] and the proposed Social Climate Fund[3] are some of the main EU measures announced to date intended to mitigate the impact of the transition on the most affected regions, vulnerable individuals and businesses.

The expected Council recommendation, which is not legally binding, would provide guidance to member states on how to ensure that the green transition takes place in a just and fair way. This is a huge challenge that spans across many questions, such as the distributional effects of decarbonization policies, jobs losses and employment transitions, the protection of basic social rights and inclusion of citizens in decision-making, to name but a few.

By no means should this instrument be seen as a substitute for strengthening the social dimension of EU legislative and policy measures on climate change. Nor should it give reason to lower climate ambitions – a 'just transition' does not mean 'slow transition.'

A just transition for the EU can only be 'just' in a true sense if it goes with maximum climate ambition, particularly given Europe's historical debt to low carbon footprint developing countries. With this in mind, we outline some of the key labour and social effects of the EU's Fit for 55 climate package[4] on the EU population and potential responses that the recommendation should consider.

Employment effects

Climate policies are having and will continue to have a major effect on the world of work. Millions of new jobs are being created in the transition to a net zero carbon economy, but a large number of jobs will also disappear. The majority of jobs will go through a fundamental transformation.

This unprecedented wave of restructuring will have unequal effects on many fronts, including skills, gender, age, economic activity and region. Sectoral differences are particularly high.

The energy and automotive sectors will be the ones most affected by the decarbonisation drive from climate and environmental regulations at European and national levels. While coal has no future and coal-dependent jobs will be gone, the automobile does have one, albeit in quite a different form from the one we know.

In the coal-based power sector the majority of currently existing jobs will disappear in a decade and the regional effects will be harsh[5], as over 90% of coal jobs are concentrated in ten NUTS 2 regions, four of them in Poland.

With a more than 5% share of total European employment, the automotive sector is a key employer. For the car industry, the demise of the combustion engine and the electrification of the powertrain will require the development of new competences, skills and forms of work organisation. These will have a substantial impact on the comparative advantages held by certain nations and manufacturers[6].

The renewable energy sector, construction and low-carbon infrastructure are expected to deliver most of the job creation[7]. However, transitional policies should consider the local dimensions of the transition - the places where jobs are

lost and created are not necessarily the same and relocating labour is not straightforward.

Jobs and skills

Climate change policy will have a major impact on jobs, their skill contents and how they are performed. The transition will come along with increasing demand for skills in the renewable and cleaner energy sector, energy and resource efficiency, digital competences, STEM knowledge to trigger innovation and breakthrough technology, greener construction methods, city planning and design, technical competences in adaptation, waste management, maintenance and repair technologies to reduce resource exigency as well as boost circular economy practices, to name a few[8].

To match the rising demand in specific skills and competences for the green transition, training programs and education curricula need to be adapted to the needs of the labour market. Public sector and businesses could cooperate to adapt the training and education programs.

Training, reskilling and upskilling should be made available to the wider workforce and in a flexible format to the extent possible (eg. online or flexible hours) to ensure that nobody is left behind and attract new talents to green jobs, avoiding skill gaps.

Working time and work conditions will also be impacted by climate change and environmental degradation. For example, extreme and frequent heatwaves will necessitate reorganization of working time in key sectors or equipment of air conditioners will be needed to provide appropriate health and care services in regions experiencing adverse climate effects[9].

Distributional effects

Effective climate policies can only be based on a comprehensive policy framework that include regulation, standards, taxes and market mechanisms in a balanced manner. While market mechanisms – such as the EU's Emissions Trading Scheme[10] - that set price signals to market actors are one important element of this in changing investment and behavioural patterns, they can only have the desired effects in well-functioning markets, but current energy markets are far from that.

Moreover, the signals themselves have significant regressive distributional effects, disproportionally affecting low-income households, for whom fuel and transport consumption make up a higher share of their income[11].

Poorer households also have less capacity to change, as while low-carbon products (electric vehicles, rooftop solar panels, and so on) may have low operating costs, they tend to have high, upfront capital costs – presenting a hurdle for households with little access to cheap capital.

Certain vulnerable groups are likely to be affected more than others during the transition. For example, climate change induces gendered effects as men are disproportionately employed in polluting sectors.

"A just transition means that addressing both the employment and distributional effects of a transition to net zero should be an integral part of the package and not supplementary corrective measures"

This can imply mitigating effects for women: while it can result in overall poverty for the household as men lose jobs, it might also encourage women to enter into the labour force for paid employment – yet with concerns about job quality – to support household income.

However, there is also wide evidence pointing to disproportionate vulnerabilities – such as having fewer resources at disposal, reduced access to education as well as being frequently excluded from information and decision-making processes – faced by women during green transition[12]. Just transition must mean also empowering women and addressing these structural inequalities.

Another group experiencing vulnerabilities is migrants. For one, most of the foreign-born workers are employed in relatively low-paying and polluting sectors and have no or only limited access to training to upskill towards transition to low-carbon economy[13].

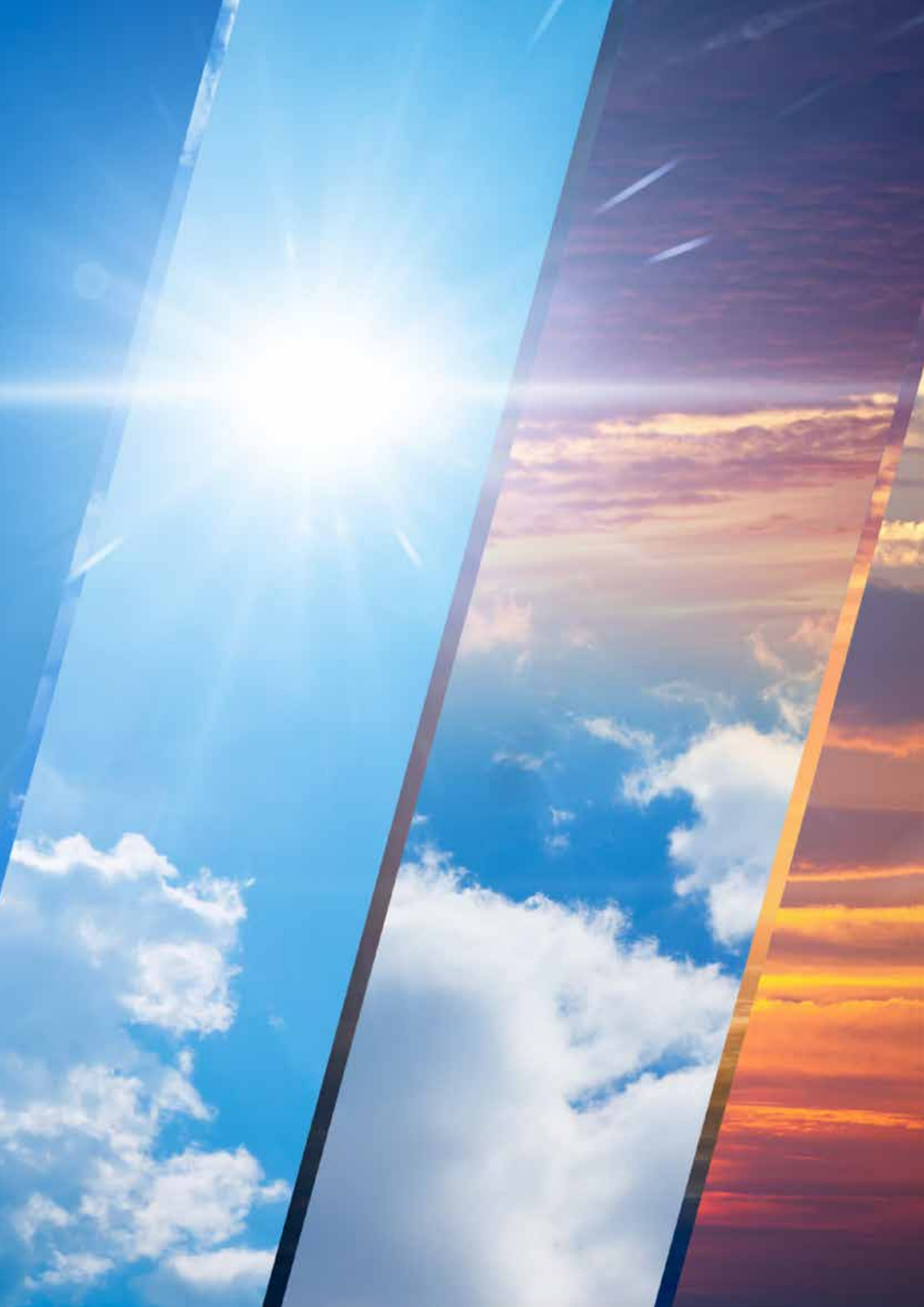
The other aspect relates to the future – both internal and international – migratory movements towards Europe as a result of climate emergency. Both of these aspects point to the importance of targeted social and labour market policies to manage flows, ensure successful socioeconomic integration and just transition for everyone including migrants. This would contribute to global climate justice as the ones most adversely impacted by climate change are not the main contributors to it.

Fundamental rights

The environmental, social and economic effects of climate change and related mitigation policies threaten the enjoyment of fundamental human rights[14]. These include basic social and economic rights, widely recognised in international and European human rights instruments and national constitutions[15]. They constitute entitlements to basic conditions for a decent human life, without which it is impossible to speak of a 'just' transition.

Both the distributional and employment consequences of climate change policies could affect various basic rights such as the right to work, the right to just working conditions, the rights to an adequate standard of living and to protection from poverty and social exclusion.

As the burdens of the transition fall disproportionately on those who are already most vulnerable, disparate impacts of



policies along the axes of gender, ethnicity, migrant status, disability or other protected status could impinge on the right to equality and non-discrimination.

Threats to fundamental rights in global supply chains arise in the context of delivering the resources and technology necessary for decarbonisation[16].

At the same time, fundamental rights can provide a normative framework for the basic elements – *necessary but not sufficient* – of just transition policy. Aside from the rights mentioned above, ensuring respect for rights to vocational training, fair remuneration, social security, equal opportunities, and collective bargaining – and others – could constitute the foundations of a strategy to address the impacts of the green transition on workers and citizens more broadly.

Discussion of fundamental rights is, however, largely absent from the European Green Deal and Fit for 55 package. Reference is made to the European Pillar of Social Rights[17], a list of 20 principles without binding legal effect. There is no mention of the EU's own Charter of Fundamental Rights[18], nor other international legal norms.

The Recommendation could be an opportunity to strengthen the link between the just transition agenda and long-standing frameworks for the protection of fundamental labour and social rights, such as the European Social Charter or the core Conventions of the International Labour Organization.

Citizen participation

Climate protest movements such as Fridays for Future, as well as the tens of thousands of people who took to the streets during COP26 make clear that citizens want to have their voices heard when it comes to climate change.

A key challenge for a procedurally fair green transition is to ensure that the public, and especially the most affected communities and citizens, have an opportunity to participate in decision-making.

Participation is a means to empowering and fostering cooperation with affected communities and contributing to better outcomes and increased democratic legitimacy. In the labour context, this means meaningful participation by workers and social dialogue.

Climate citizen assemblies, convened in France, the UK and some other European countries over the last years are gaining popularity as a forum for public debate on climate change. The on-going Conference on the Future of Europe includes a panel on climate change, too.

But simply providing a forum is not enough – decision-makers also have to listen. Transparency, information and capacity-building are crucial to meaningful involvement, as are active steps to include marginalised groups and to ensure diversity across factors such as gender, ethnicity, age, socio-economic status or geographic location.

The way forward

Getting climate change under control is in the interest of humanity, the unprecedented restructuring process economies need to go through in a few decades to reach net zero emissions is policy-driven. These policies will have differential effects on people with different socio-economic characteristics, and policymakers have a dedicated responsibility to address these.

A just transition means that addressing both the employment and distributional effects of a transition to net zero should be an integral part of the package and not supplementary corrective measures.

The EGD has recognised this, but in practice social and employment policy initiatives have remained fragmented and additional. This shortcoming has become very clear with the announcement of the Fit for 55 package in July 2021.

Europe now has a Just Transition Fund with limited resources, dedicated mostly to helping coal regions manage the social and employment effects of coal phase-out. This is very important but reaches a small fraction of people affected by decarbonisation.

The newly announced Social Climate Fund has a very specific target, namely to fend off the detrimental distributional effects of a new emissions trading system for buildings and transport, but even for that it may not be enough[19]. Sectors that are highly affected, the automotive sector and energy intensive industries do not have dedicated instruments and a fund.

European-level labour market and social policy initiatives should provide guidance to member states to manage change, and the proposed Council Recommendation is one way of doing so. In this context, 'leaving no-one behind' should be more than a slogan and translate into concrete measures.

Contrary to the declarations, just transition policies are not yet an integral part of the European Green Deal agenda and of the more concrete Fit for 55 policy package. A comprehensive just transition policy framework should include the following elements:

1. Support for workers in the transition to new jobs with measures targeted to specific sectors (automobile, energy intensive industries, etc.) tailored to national and regional specifics.

2. Deal with the distributional effects of climate policies with targeted measures against energy and transport poverty, supporting and facilitating the affordability and accessibility of low carbon technologies to lower income households (retrofitting of buildings, access to renewable energy, vehicle fleet change, developing public transport).

3. Regional development initiatives to help carbon intensive regions towards a sustainable low-carbon economy.

4. Promote social dialogue and stakeholder involvement at all levels (EU, national, regional and plant level) in managing change towards a zero-carbon economy, including meaningful involvement by citizens.

5. Make sure that newly created green jobs are also good jobs in terms of contract type, social security, wages and working conditions in line with the ILO decent work agenda.

Today a large part of the workforce is in fear of change, a concern that is justified in a labour market environment characterised by increasing precariousness. As long as 'change' remains fearful, the biggest transformation since the industrial revolution ahead of us cannot succeed.

Inclusive and comprehensive social and economic policies are therefore essential to securing social justice, resilience and sustainability. ■

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Climate finance and development

Saliem Fakir is Executive Director of the African Climate Foundation

Climate finance is largely viewed as a form of finance that is locked in narrow negotiations at the UNFCC Paris process and climate talks revolving around the $100 billion/annum target. This target is still to be met but it is also clear it will be a trickle compared to the needs for energy transitions and global resilience investments that need to be put in place.

Also, it has largely been treated as a form of aid support, particularly for adaptation work in Africa, rather investment support needed for economic transformation on the continent.

Climate finance needs to be linked to the development pathways that Africa needs for the next two decades; particularly around sustaining reasonable and balanced economic growth – meeting the need for increasing national income and income for households.

Such economic growth should unlock potential in other low carbon economic sectors such as in renewables, electric vehicles and batteries amongst other things. In the long run this should reduce dependency on the export of raw commodities and helps to diversify African economies through a structured process of industrialization and for that matter exports of high value agricultural products and services. It ought to also reduce imports of fossil fuels.

The work of the African Climate Foundation as a philanthropic foundation is to identify a pipeline of initiatives, which we refer to as country platforms to support energy and resilience transitions.

One example of this is the Just Energy Transition Transaction (JETT) for South Africa that has secured a pledge for $8.5 billion worth of climate finance from bilateral and multilateral sources of funding (largely public funding).

The $8.5 billion package is currently being negotiated between the South African government and international partners who have committed to ensuring that this deal will support various infrastructure financing needs for South Africa's energy transition.

The deal is meant to provide blended finance options and facilities that catalyses on a much larger scale South Africa's transition to clean energy and a managed phase out of coal.

South Africa needs much more than $8.5 billion for the transition but the idea would be that additional domestic

public and private finance would be mobilized on the back of international climate finance.

The deal is meant to steer support for scaling in three areas:

- Scaling of renewables, linked to the repurposing of coal plants and doubling the current provisions within the Integrated Resource Plan (IRP).
- Supporting the scaling of electric vehicles in South Africa
- Building a stronger green hydrogen economy, which South Africa has potential to exploit.

This deal that South Africa and its partners announced in Glasgow is a unique type of climate finance package, which is tied to South Africa's nationally determined contributions.

It is a way in which advanced economies, in accordance with Article 9 of the Paris agreement, have the historical responsibility to assist developing countries in their transitions.

The deal is aimed at reducing the country's dependency on coal and de-risk South Africa's economy from the problem of having coal stranded assets that could pose systemic risk to financial sector, but also the electricity utility Eskom and the South African economy.

Crucial matters that need still be resolved is unpacking what the pipeline of projects look like – how much of public finance is needed and the cost of that public finance.

It is also recognised that the $8.5 billion is insufficient where $30 – $35 billion is needed and a large part of that will have to be financed from other sources.

More importantly, the financing package needs to reduce debt, not increase it, and it must also support the 'just' dimensions of the transition.

The JETT sets a framework of how to use climate finance across the African continent. There is a growing interest beyond South Africa to do a South African-type deal. This is also the case for other emerging economies like Indonesia, Vietnam and the Philippines where there is dependency oil, gas and coal to generate electricity.

"Climate finance needs to be linked to the development pathways that Africa needs for the next two decades; particularly around sustaining reasonable and balanced economic growth"

This model of country platforms, like the one for South Africa, is a recipe that sets a useful framework for designing catalytic financing initiatives in other parts of the world.

It is an interesting model to turn climate finance as an instrument for strengthening investments in energy transitions on the continent and crowding in other sources of finance. ■

ABOUT THE ACF

The African Climate Foundation is a new philanthropic re-granter on the African continent. Its primary aim is to support the achievement of climate and development nexus outcomes.

The key is to understand climate risks as well as opportunities and use philanthropic support to drive new investment pathways that climate-proof African economies and increase investments in new infrastructure as well as protection of climate vulnerable sectors important for jobs and exports.

A deeper shade of green?

Martijn Groot is VP Marketing and Strategy at Alveo

The concept of making responsible investments according to ESG criteria has been around for decades. In the past, however, this was a niche area and was generally the focus of highly specialist companies, often known as impact, or green investors.

They developed their own data collection process in-house and frequently built their own, what we would now call, environmental, social and governance (ESG) data hub to supply their analysts and portfolio managers. This data was then used as the basis for asset allocation, helping to support firms in the screening of companies and selecting the ones that aligned with their investment philosophy.

When other firms started to collect data to identify ESG risks and growth opportunities, they too treated it as a separate silo or bucket. The focus was on homegrown data management, with firms evolving the data over time into their own in-house ESG hub.

However, as we have moved into 2022 and the deadline for key ESG related regulations such as the Sustainable Finance Disclosure Regulation[1] draws nearer, firms will need to do more to fully integrate ESG data across the business and firms will increasingly need to integrate this information into the whole investment management process: from research and asset allocation, to portfolio monitoring, to client and regulatory reporting.

Scoping out the use cases

The number of use cases for ESG data is growing rapidly. The need to disclose data to meet regulatory reporting requirements is a major driver for buy side firms like investment managers or asset managers and owners, as SFDR approaches.

Firms are obligated to report on a number of criteria. SFDR prescribes the reporting on 18 mandatory PAI (Principal Adverse Impact) Indicators for corporates, real estate investments and sovereigns. Effectively, any firm that sells or distributes investment products into the European Union has to do that.

Paradoxically, the disclosure requirements for corporates themselves lag behind the disclosure requirements of their investors. This has caused the need to estimate information or rely on third party expert opinion to fill the gaps in the data that portfolio managers and analysts need to support their decision-making around new product development, for instance.

Investors have also acquired more appetite for making investment choices based on green criteria, so fund managers and wealth managers too need relevant data to help develop client reports for those investors.

Those are among the key requirements for asset managers and asset owners but there is also a growing need for ESG-data on the banking or sell-side of financial services. ESG data, for example, is much needed to support customer onboarding and, in particular Know Your Client (KYC) processes.

In core banking and in corporate lending, in particular, banks will, in the future, have to report on the composition of their loan book: what firms are they lending money to, for example, and what are the main business activities of those firms? The European Union has developed the EU Taxonomy which provides a classification of business activities.

So, in the future, if a company signs up to get a bank loan, as part of the screening criteria, it will be asked to disclose what kinds of business activities it is involved in and what kinds of sustainability criteria it has in place. Banks may then also be incentivised to give a cut on the interest rate on loans made to more sustainable businesses.

Banks and other sell-side financial services firms will also frequently screen their suppliers, as part of a process known as KY3P (Know Your Third Party) or KYC (Know Your Supplier). They like to know in detail who they are doing business with, so they can then report on that in their annual report to shareholders.

Another key use case for banks is climate stress testing. Banks have to stress test the products they hold in their trading book for their own investment against certain climate scenarios – two degrees temperature change by 2050, for instance, to give one example.

ESG data also has a role to play in the way banks manage their mortgage book. Banks are increasingly looking for geospatial data, for example to work out the flood risk of the properties

they finance. Are they next to the ocean, for example? Are they in a flood plain of a river? A lot more attention is being paid today to the banking book and trading book and, more generally, to retail and residential commercial real estate funding.

As part of this process, both sell-side and buy-side financial services companies will need to integrate ESG data with data from the more traditional pricing and reference data providers.

That will give them a composite view, incorporating not just the prices of instruments and the terms and conditions but also the ESG characteristics – all in a single place. Firms will also need to put the right data quality metrics and governance on top of all this in terms of onboarding new data sets; requesting new metrics and new screening criteria.

If they get all this right, firms will usher in the coming of age of the ESG data function as it transforms from a homegrown cottage industry into fully-integrated core business function. ESG considerations, like all of sound decision making, requires good quality data. The process of ESG data collection, vetting and integration will mature and will be integrated with financial, regulatory and client reporting functions.

Decisions taken in business processes using ESG criteria will be documented and tracked. Firms will make different trade-offs and use different 'shades of green' but all will have to communicate, track and report.

Like all of data management, consistent and high-quality information on ESG now needs to percolate across the whole organisation and be put on a firmer footing. It needs to integrate with all the different data sets to provide a composite picture.

That can then become a key source of intelligence, not just for the front office but also for multiple business functions, including supply, client reporting, regulatory reporting and portfolio construction.

Challenges to negotiate

Today, companies are maturing fast in their approach to ESG data management. But there are nevertheless barriers along the way. One of the big challenges is data availability. There are different types data providers on the scene today. These include firms that aggregate third party disclosures and bundle them into their enterprise data offerings.

Another source of ESG data that financial services firms need to tap into, given the gaps in corporate disclosures, comes from rating providers, who provide their expert judgment as to how green firms are or how well they are achieving against a broader range of ESG criteria.

However, there are challenges here also. It is not always transparent as to how these providers have arrived at their ratings, what input data and what weights they have used to arrive at a single rating, so like-for-like comparisons are not easy as ratings are subjective.

"They need to effectively cover the E of ESG - in other words the environmental aspect [...] data will need to be gathered around specific companies' carbon emissions, pollution footprint, water usage and biodiversity"

The third area of data that financial services firms need to access relates to expert opinion, often generated by third parties. CDP[2], the not-for-profit charity that estimates carbon emissions, is a case in point. The fourth key element is around sentiment data: how a company is perceived in the market.

Often this includes an assessment of how a given firm is covered in the traditional news media and also on the public Internet and how it is regarded in social media discussions. Typically, this is more useful in helping to form a view over the short-term because opinions in this area inevitably change quickly.

Data quality is often a further challenge. Many data sets are incomplete or suffer from spotty coverage. Attaining a complete data set is in itself challenging. And because not every rating provider provides information on how they arrive at their rating, it is often difficult to compare rating A to rating B, for example, and then aggregate it at portfolio level.

Another important challenge is workflow integration. The biggest issue here often is how to anchor the ESG data in a range of different business processes in order to put users on a common footing.

First of all, financial services firms need a common data set on the ESG characteristics of all the companies they deal with, whether they invest in them, whether they lend to them, whether they supply them with goods and services. They need a broad range of data.

They need to effectively cover the E of ESG - in other words the environmental aspect. That means data will need to be gathered around specific companies' carbon emissions, pollution footprint, water usage and biodiversity, for example.

Equally, this data set should include content relevant to the S of ESG (the social element of the term). That might cover areas like the gender pay gap and human rights and so on. Finally, the G covers areas like board composition and general governance.

Firms also need workflow integration in the technical sense meaning the ability to mould data into different shapes so it can be fed into different applications that may have their own data models their own technical standards definitions and data dictionaries.

It then needs to be cross-referenced, supplied, sourced and published via streaming data. Businesses need to put all of this kind of wiring in place as a process that comes after building the common composite data set.

Then, of course, over and above the common footing of ESG data, firms will also need for certain use cases, specific criteria that they use when it comes to what is sometimes called the 'secret sauce' around front office asset allocation, where each individual organisation may well build their own metrics, ratings and criteria on whether or not they invest in something. But that is built on top of the common foundation.

It is effectively a different kind of data management. There is the data management for control, where firms need data quality, data lineage, proper quality assurance carried out on the data before they hand it over. That is typically used for business as usual (BAU) applications and operations.

It can be contrasted with data management for insight where firms are looking to add value and build up their own intelligence and metrics to support portfolio managers, quants and analysts that work in the front office.

Finding a way forward

So, ESG data is increasingly in demand by financial services companies, both buy side and sell side. However, accessing it, ensuring it is of good quality, comparable with other ESG data sets and well-integrated within existing workflows is challenging and difficult.

Fortunately, data management solutions are now coming on stream that enable companies to start providing a process of collecting and aggregating ESG data, comparing it for quality, proofing it and enabling users to fill in the blanks through business rules and their own metrics.

Firms will need to cross-reference, match and combine the data, as well as assimilating it with traditional data on companies and their financial products. The traditional prices and security terms and conditions of financial services providers helps build a composite picture from those sources. The wider variation can be that firms can choose how they interpolate, or proxy, missing data fields or build their own metrics on top.

Then there is the distribution side. There are now various ways of distributing data via streaming and different files to make sure that the last mile integration can be done quickly and effectively and that they can rapidly onboard new consuming applications.

Again, technology is increasingly available to enable firms to do all this. This kind of capability can already been offered on site hosted as application management, or as a data as a service solution in the cloud.

In other words, the challenge of ESG data integration can now be met by financial services businesses. They can increasingly move to a 'deeper shade of green', safe in the knowledge that the technology is available to support them in that critically important journey. ■

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India's commitment to renewable energy

Nirupama Soundararajan is the CEO, and Arindam Goswami a Fellow, at Pahle India Foundation

India has been committed towards alternative energy sources since early 2000. In 2002, renewable energy constituted a mere 3.2 per cent of total energy generation in India. However, by 2016 India's focus on renewables paid off and the share of renewables to total energy increased to 42.6 GW from a mere 3.4 GW[1].

The strong growth in share of renewable energy (RE) is testament to India's continued commitment to the cause. India set an ambitious target of reaching 175 GW of renewable energy generation by 2022 in the 2015 Paris climate summit. Towards this end, India has introduced various policy measures.

India has initiated a two-pronged approach to tackle climate change issues. First is the National Action Plan on Climate Change (NAPCC) adopted on June 30, 2008, comprising of eight National Missions focussing on domestic issues and encompasses action plans in relation to different sectors interrelated to energy, industry, agriculture, water, forests, urban spaces, and the environment which are in line with the UN's Sustainable Development Goals (SDGs).

The National Missions are on Solar Energy, Enhancing Energy Efficiency, creating a Sustainable Urban Habitat, Conserving Water, Sustaining the fragile Himalayan Eco-system, creating a Green India through expanded forests, making Agriculture Sustainable and creating a Strategic Knowledge Platform for serving all the National Missions[2].

The second is India's Intended Nationally Determined Commitments (INDC) submitted to the UNFCCC on October 2 2015, which centres around sustainable lifestyle, cleaner economic development, reducing emission intensity of gross domestic product (GDP), increasing the share of non-fossil fuel-based electricity, enhancing carbon sink (forests), mobilising finance, and technology transfer and capacity building[3].

As per India's Ministry of New and Renewable Energy's 2020-21 Annual Report[4], as of January 2021, India's installed RE capacity was at 92.54 GW, 24.53 per cent of total installed energy capacity. While India may miss her target for 2022 by an acceptable margin, her commitment towards RE remains ambitious and unshaken.

Indian Prime Minister Narendra Modi's five core commitments, dubbed as the *Panchamrit,* or five nectar elements to deal with the global climate change crisis, at the recently concluded 26th session of the Conference of the Parties (COP26) of the United Nations Climate Change Conference (UNFCC) garnered tremendous appreciation from the UNFCC members and from global media alike.

The five core commitments as promised by PM Modi include taking India's non-fossil energy capacity to 500 GW by 2030, meeting 50 per cent of India's energy requirements from renewable energy by 2030, reduction of the total projected carbon emissions by one billion tonnes from 2020 until 2030

Table 1. India's energy consumption mix

	Coal	Natural gas	Nuclear	Hydro	Wind, solar etc.	Biofuels and waste	Oil
2000	6,109,527	965,850	184,391	268,062	7,547	5,266,901	4,688,625
2010	11,682,321	2,277,696	286,543	449,717	83,449	6,349,398	6,785,545
2019	17,494,965	2,323,196	506,972	620,637	48,0115	7,998,012	9,859,175

Note: All units in Terajoule.
Source: https://www.iea.org/

by India, reduction of the carbon intensity of the Indian economy by less than 45 per cent, and become a net zero carbon emitting economy by 2070[5].

As part of India's focus on RE, there has been an explicit thrust on electric vehicles (EVs), given the increase in vehicular numbers and congestion. India has a target of reaching 30 per cent share of EV by 2030[6].

While this is in line with India's declared agenda for 2030 in COP26, this alone will not help. While EV will go a long way in reducing carbon emissions from vehicles, the incremental electricity load that will be required to run these vehicles would still predominantly be met through burning of fossil fuels.

A case study for New Delhi indicates that the incremental consumption of electricity could range between 755.4 MU to 1,762.6 MU assuming all households in Delhi own some form EV. Delhi's monthly electricity generation as of 2019 was only 523.3 MU[7].

The incremental electricity required for 30 per cent share of EV pan India is predictably immense, and since India is yet to put in place a suitable action plan to meet this electricity through renewables, it is imperative that alternative fuel sources are also considered to meet India's 2030 targets.

We know that one of the focus areas for the Government of India is to meet its COP26 objectives by reducing its dependence on fossil fuel, that is predominantly imported, and increase the uptake of non-carbon emitting fuel. Hence the increasing focus on biofuels (Table 1).

"... one of the focus areas for the Government of India is to meet its COP26 objectives by reducing its dependence on fossil fuel, that is predominantly imported, and increase the uptake of non-carbon emitting fuel"

The National Policy on Biofuels (NPB) 2018 iterates India's commitment to reducing fossil fuel use by concurrently increasing biofuel production and use. At present the Government of India has mandated the sale of ethanol blended petrol across the country except in the Union Territories of Andaman and Nicobar Islands and Lakshadweep.

The Government of India formally initiated the ethanol blending petrol (EBP) programme way back in 2003 when it considered supplying of 5 per cent ethanol blended petrol in nine states and four union territories (UT) in the country.

By 2008, blending of 5 percent ethanol with petrol was mandated in twenty states and four UTs with the further option of increasing the blend up to 10 percent of ethanol. The formulation of the National Policy on Biofuels in 2009 allowed ethanol to be procured from non-food feed stock like molasses, celluloses and lignocelluloses material including petrochemical route.

Table 2. Annual world fuel ethanol production (million gallons)

Region	2016	2017	2018	2019	2020	2021	% of World production
United States	15,413	15,936	16,091	15,778	13,941	15,000	55%
Brazil	6,870	6,760	8,080	8,790	8,080	7,500	27%
European Union	1,240	1,320	1,360	1,380	1,260	1,300	5%
China	730	850	810	1,010	930	860	3%
India	270	210	420	470	510	820	3%
Canada	450	460	460	500	430	440	2%
Thailand	330	380	390	430	390	390	1%
Argentina	240	290	290	290	210	260	1%
Rest of World	627	664	729	682	659	740	3%
Total	**26,170**	**26,870**	**28,630**	**29,330**	**26,410**	**27,310**	

Source: https://ethanolrfa.org/markets-and-statistics/annual-ethanol-production

In 2013, oil manufacturing companies (OMCs) were directed to sell ethanol blended petrol with percentage of ethanol up to 10 per cent as per the Bureau of Indian Standard's (BIS) specifications to achieve 5 per cent ethanol blending across India.

The same year a decision was taken by the Cabinet Committee on Economic Affairs (CCEA) to procure ethanol only domestically and only from molasses and disallowed the usage of sugarcane and sugarcane juice as raw material. This had a negative impact on the supplies of ethanol.

Since 2014, the Government initiated reforms to boost indigenous production of ethanol. Some of these reforms over the years include reintroduction of administered price mechanism, opening of alternate route for ethanol production, amendment to Industries (Development & Regulation) Act, 1951 which legislates exclusive control of denatured ethanol by the central government, and reduction in Goods & Service Tax (GST) on ethanol meant for EBP Programme from 18 per cent to 5 per cent.

Notification of National Policy on Biofuels in 2018, which aims at mainstreaming of biofuel generated from non-food feedstock through next generation technology, explains the pledge towards climate change mitigation while enhancing energy security. The National Policy on Biofuels in 2018 aims to reach 20 per cent ethanol blending in petrol by 2030[8], which has subsequently been advanced to 2025.

Recently, an expert committee formed under the NITI Aayog submitted its report titled *Roadmap for Ethanol Blending in India 2020-25* in July 2021 appraising the work undertaken by the Government in regard to the EBP. The Committee highlighted few of the steps which have worked for furthering EBP in India such as:

- Approval of the interest subvention for augmenting and enhancing ethanol production capacity by the Union Cabinet in December 2020
- Setting of standards for E5 (Ethanol 5 per cent, Petrol 95 per cent), E10 and E20 blends of EBP by the BIS
- Notification for adoption of E20 fuel as automotive fuel and issuance of mass emission standards for it by Ministry of Road Transport & Highways (MoRT&H) on 8th March 2021
- Notification for safety standards for ethanol blended fuels on the basis of Automotive Industry Standard (AIS 171) laying down safety requirements for type approval of pure ethanol, flex-fuel and ethanol-gasoline blended vehicles in India by MoRT&H on 25th May 2021
- Approval for BS-VI Emission norms for E20 Vehicles since 1st April 2020

The Committee pointed out that as a result of such efforts, the ethanol blending rose from 1.53 per cent during Ethanol Supply Year (ESY) 2013-14 to 7.93 per cent in ESY 2020-21. The Committee has further estimated that based on the expected growth in vehicle population of India, the ethanol demand till 2025 for achieving the goal of E20 will be 1,016 crore litres (10.16 billion litres) and has provided its recommendations based on the same.

To increase the ethanol production capacity, the Committee has recommended that the production of ethanol in India be raised to 760 crore litres (7.6 billion litres) from the existing 426 crore litres (4.26 litres) generated through molasses and 740 crore litres (7.4 billion litres) from the existing 258 crore litres (2.58 billion litres) generated through grain-based distilleries.

This, the Committee predicted will require 60 lakh MT of sugar and 165 lakh MT of grains per annum in ESY 2025. The Committee called for use of technology for production of 'advanced biofuels' from non-food feedstock.

On ethanol blending, the Committee recommends that pan-India availability of E10 fuel by April 2022 should be notified at the earliest and launch of E20 by April 2023, while additionally notifying all public and private sector OMCs to mandatorily join the programme.

The Committee also suggests formulation of specifications for intermediate blends such as E12 and E15. Literacy programme for consumers has also been suggested. Dispensing mechanism for various blends such as E10, E20 and E100 for two wheelers at retail outlets with lesser space requirements and logistical options for supplying ethanol all over the country have been suggested to augment infrastructure of OMCs.

Measures to expedite environmental clearances for producing ethanol, setting up a single window clearance for new projects for ethanol productions, and allowing unrestricted movement of denatured ethanol have been suggested to push the regulatory clearances for ethanol producing units.

Production of higher ethanol compatible vehicles, incentives for ethanol blended petrol vehicles, pricing policies of ethanol blended gasoline, and ways to encourage use of water saving crops to produce ethanol have been some of the other recommendations.

However, it is important to put things into perspective in terms of production and in terms of impact. First, we know that 10 million litres of blended fuel is supposed to reduce 20,000 tonnes of carbon emission[9].

As per India's COP26 targets, India plans to reduce carbon emissions by one gigatonne or 1 billion tonnes[10]. A basic calculation therefore suggests that if India manages to meet the ethanol demand target of 10.16 billion litres by 2025, this would result in a reduction of 0.10 billion tonnes of carbon emissions, which can barely be considered even as dent even these figures were to be extrapolated for 2030.

Clearly India needs to step up the targets of EBP. Hence purely from an impact point of view, the current EBP targets are a far cry from India's larger 2030 objective of reducing carbon emissions.

Table 3. Ethanol supply, procurement, and blending (figures in billion litres)

Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Tendered	1.03	1.15	1.28	2.66	2.80	3.13
Quantity allocated	0.32	0.704	0.865	1.305	0.807	1.6104
Quantity supplied	0.154	0.38	0.674	1.114	0.665	1.505
Blending % (OMCs)	0.67	1.53	2.33	3.51	2.07	4.22

Source: 'Note on Biofuels', Ministry of Petroleum and Natural Gas, 2019. http://petroleum.nic.in/sites/default/files/biofuels.pdf

Second, it is apparent from Table 3 that the quantity supplied has almost always been less than the quantity tendered/ contracted, and the quantity allocated. While phenomena like droughts, and issues like storage capacity can be listed as causes for some part of the difference in quantities, they do not explain the large discrepancy and inconsistency in supply figures.

Inconsistency in supply of ethanol will lead to uncertainty with regard to meeting blending targets, whether in 2022 or 2030. Part of the problem may also be that the primary feedstock for ethanol in India currently are molasses and the move to explore other sources of feedstock have been once recent. This has also been a common criticism of the ethanol blending programme[11].

Alternative feedstocks for ethanol would be those from second generation (2G) pathways, such as biomass and agricultural waste with high cellulosic and lignocellulosic content that can be converted to ethanol using 2G technologies.

These are precisely the feedstocks that the NPB seeks to tap into, as the NPB notes *"studies undertaken in India have indicated a surplus biomass availability to the tune of 120-160 MMT annually, which, if converted, has the potential to yield 3000 crore litres (30 billion litres) of ethanol annually[12]."* This is the path the government should opt for.

Third, in 2021 India's domestic ethanol production was 820 million gallons or 3.1 billion litres[13]. In the same year, India's total imports for ethanol was 750 million litres[14]. Around 25 per cent of domestic production, is being met through imports.

Ironically, India's largest import partner is China. This does not behove India. India clearly has the capability to use domestic feedstock to meet the demand for ethanol. It makes even less sense to import from China given India's own tumultuous relationship with the country.

India's ethanol programme is crucial to India's growth and self-reliance. The ongoing Ukraine-Russia standoff has already resulted in spiralling oil prices upwards. Even if India does consider procuring excess oil from Russia, it would come at the cost of jeopardising relations with other important trading partners including America and United Kingdom.

India has always had the intention of reducing her dependence on crude oil, first for economic reasons (as a way to control the current account deficit), then for environmental reasons, and now more than ever for geopolitical reasons. ■

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Recalibrating global growth

Elise Donovan is CEO of BVI Finance

With the second anniversary of COVID-19 now behind us, there are many reasons to be optimistic about a resurgence in global investment, growth and productivity.

Emerging and developing economies are displaying impressive resilience and, with the help of global finance and investment, are making strides in the areas of financial technology, digital infrastructure, and green energy.

The British Virgin Islands (BVI) is set to play a crucial part of this recovery. Over the last three decades, the BVI has steadily increased its role in the global financial system, responsible for mediating the equivalent of six percent of all sectors total cross-border liabilities, contributing tens of billions in tax to national revenues, and supporting millions of jobs worldwide (Source: Capital Economics).

We are now in a great position to help in the post-COVID economic recovery, facilitating collaboration across borders and enabling growing economies and markets to access the finance and investment they need to thrive.

Asian Tigers rising

According to Morgan Stanley, as the pandemic eases Asia will post the largest increase in GDP over the next two years. Asia's GDP is expected to expand in nominal terms from $33 trillion in 2021 to $39 trillion in 2023.

This presents a growth opportunity for the BVI which has built an enviable reputation in the region. The 'BVI Company' has become the premium choice for investors, business and entrepreneurs that combined, have driven the Asian Tiger economic model and led to decades of growth, jobs and prosperity.

Our longstanding relationship with Asia, particularly Mainland China and Hong Kong, therefore remains, as BVI structures have proven successful for Asian corporates, high-net-worth individuals, and investors over the last three decades.

With approximately 75 percent of companies listed on the Hang Seng Index having BVI companies incorporated into their structures, our support for Asian businesses is evident and is always evolving (Source: Capital Economics).

The recent recognition by the BVI Financial Services Commission of the Fusang Exchange, Asia's leading fully regulated end-to-end digital security exchange, is another example of this. The first of its kind to be recognised by the BVI FSC, the move will pave the way for Asian-based BVI companies to benefit from the efficiencies of listing their shares digitally via equity token.

Staying on track with global financial trends is a top priority for us and this move will allow us to enable Asian-based companies to embrace the opportunities in the new digital financial ecosystem.

In South Asia, Singapore, India and Indonesia are also showing impressive growth and the development of financial technology and digital infrastructure for their vast populations. This is creating strong opportunities for global investment to have a long-term impact that we are well positioned to strengthen our relationships across the region and contribute to this economic growth.

Africa: the next frontier

With its young population, abundance of natural resources, and growing focus on digital innovation in the finance and energy space, countries across the African continent are emerging as the next frontiers for global growth.

The post-pandemic restart of the Africa Continental Free Trade Agreement (AfCFTA), the revival of tourism and a rebound in commodities prices provide a positive outlook. The success of the next decade will now rely on policy makers recognising the importance of international investment, diversifying their economies and focusing on job creation.

The BVI specialises in creating neutral platforms to facilitate cross-border trade, investment and finance and can play an integral role in the development of AfCFTA and the continent. By creating effective vehicles for joint ventures, the BVI brings parties together to participate and invest in economic opportunities.

Africa is also making major inroads in the fintech space. According to Briter Bridges, investment into African tech has grown at a rapid pace, rising from $2.4 billion in 2020 to $4.9 billion in 2021, with fintech leading the way[1].

The BVI is perfectly placed to harness this opportunity. In 2020, the BVI introduced the Regulatory Sandbox for Fintech Innovation, creating an ecosystem where tech start-ups and traditional financial institutions alike can innovate and create new solutions for financial services without outdated regulatory burdens.

The rise in popularity in cryptocurrencies and other digital assets such as Non-Fungible Tokens (NFTs) has been phenomenal in recent years, and although jurisdictions and traditional financial institutions across the world are still figuring out how best to regulate and integrate them, staying ahead of the trends and exploring ways to best harness the opportunities will be vital.

Looking ahead at Africa, climate change and the transition to green energy will be a major focal point across the continent, with 'green finance' taking a particularly important role. The opportunities for global investment in this area will be significant and will be essential for empowering communities across Africa to make real progress on these urgent issues.

A global view

The BVI is unique for its fully global view and commitment to international finance. For example, around 20 percent of our BVI Businesses Companies are based in Latin America and Caribbean, and we expect this relationship to grow further as our estate planning products and world-class trust legislation gain increased interest in the region (Source: Capital Economics).

We also see further growth opportunities in the Middle East – particularly building on the BVI's growing reputation in trust and estate planning. We know that family businesses are the foundations of the economy across many Middle Eastern states and PwC has estimated that over $1 trillion of assets will pass from one generation to the next in a decade in the region.

As businesses become more intricate and multi-jurisdictional, there has been a rise in demand for UHNW family offices to manage global portfolios of assets. Many families are using offshore structures within or on top of local structures, allowing them to organise and better manage international assets, such as foreign-based properties.

Holding relatively illiquid assets, such as foreign property within a BVI structure makes them easier to sell as part of the succession process.

BVI structures enable these businesses to be managed in a tried-and-tested jurisdiction that operates under English common law and with robust internationally recognised regulatory standards to thwart financial crime globally.

"A vibrant global economy requires international collaboration [... the BVI's] role in facilitating cross-border business and providing pathways for investment to flow into developing and emerging markets has never been so crucial"

As a conduit for global trade and investment, the BVI contributes towards the creation of millions of jobs worldwide with a fifth of these being in Europe (Capital Economics).

BVI companies are also used by major international financial institutions such as, the International Finance Corporation and the European Bank for Reconstruction and Development to help fund projects around the world, and this collaborative approach will be increasingly essential during the global post-COVID recovery.

Meeting the challenges of tomorrow

From Africa to Asia and the Middle East to Latin America, our optimism for the future of global growth remains as strong as ever.

A vibrant global economy requires international collaboration – that is one lesson we have learnt over the last two years – and as the world embarks on the road to recovery, our role in facilitating cross-border business and providing pathways for investment to flow into developing and emerging markets has never been so crucial.

Over the next decade our global economy will continue to evolve as we rise to meet the challenges that lie ahead; from combatting climate change and tackling inequality, to incorporating new digital assets and currencies into our global financial structures.

The BVI will remain steadfast in our commitment to recalibrating global growth and remaining at the forefront of these developing trends. ■

Endnote
1. https://african.business/2022/01/trade-investment/economic-outlook-2022-africa-faces-rickety-rebound/

Avoiding a doom loop

Patrick Minford is Professor of Applied Economics at Cardiff University

Growth is the sine qua non of Britain's future, just as it is for countries everywhere. With it we can raise productivity, create jobs, generate profits underpinning pension returns and produce the tax revenues to pay for vital public services. As a side effect the state will pay off its debt and bring the public debt ratio down to the low safe level we achieved before the financial crisis.

This should be obvious. Yet we recently had a Budget in which our Chancellor, Rishi Sunak, presented himself as wanting the low taxes he knows are needed for growth and yet in practice putting taxes up nevertheless, for reasons of public finance. This stance is self-contradictory and flies in the face of economic sense.

The whole point of government borrowing and public finance, is to enable tax and public spending to be set according to the long-term needs of the economy, with short term pressures dealt with by borrowing- an idea known as the 'tax-smoothing' role of borrowing.

Of course, we have just had a good example of that in action during the COVID crisis in which the temporary support needs of the economy were met by borrowing. But just as it would have been wrong not to support the economy during COVID for misplaced fear of borrowing, so it is wrong not to support the economy's need for growth post-COVID on these grounds.

The economy is now recovering from the pandemic and growth in 2021 turned out at 7.5%, a strong recovery from last year's collapse and the resulting run-up in public debt to pay for the emergency. Post-Brexit and post-COVID there are major challenges for government policy; the recovery needs to be sustained, and policies must be put in place for solid long-term growth and 'levelling-up' (catching-up by slower-growing regions). This policy formulation requires the government to take a long-term view and not to panic in the face of short-term pressures.

One of those pressures is the sharp rise in public debt due to COVID, to around 100% of GDP. Over recent years the government has been concerned to bring the debt ratio down, especially after the financial crisis hit.

So the natural instinct of a Conservative government is to revert to the same austerity policies. We recently had a report from the Public Accounts Committee[1], warning us of the dire state of the government finances post-COVID. The PAC joins the lugubrious OBR - the Office of Budget Responsibility - in its reports.

Mind you, we should not be surprised at or critical of these bodies. They were set up with the role of standing guard over the public finances, and their job is, Cassandra-like, to warn about the downside risks.

However, unlike Cassandra, these bodies are wrong in their forecasts; and good policy needs to balance risks against returns; and most important of all, it must take a long-term view at this crucial junction in our history, with the overwhelming need to boost growth and bring down regional inequality.

Currently, there is a huge return from bold policies designed to boost post-COVID growth. It is growth and to a lesser extent inflation that will bring down the ratio of public debt to GDP over the long term, as it has done before in our history, as shown in Figure 1.

You can see the gradual fall of the debt ratio from peaks of over 200% after the Napoleonic wars and WW2. During these long adjustments there was never any panic over UK solvency, as can be seen in the second chart of market/par value.

This fluctuates around unity; the fluctuation reflects fluctuating market interest rates compared with issue rates. Feared insolvency would show up as a collapse in the ratio, which we do not see. The UK has never defaulted; and it is not about to do so now.

The OBR has been too gloomy about growth and the finances: without tax increases the debt ratio will fall steadily anyway

In the current post-COVID situation, there has been a big bounce back in GDP, and with it will come a bounce back in tax revenues net of welfare payments, with a fall off too in emergency spending.

So the PSBR, the Public Sector Borrowing Requirement, will fall back to a modest level quite quickly. A cautious approach to the finances implies keeping the PSBR low enough to ensure that growth in nominal GDP gradually brings down the debt ratio.

Overleaf is an updated forecast by my Cardiff research group for the public finances to the 2030s, assuming no change in policies. It also projects 2% growth with no change in policies; this is about the same as growth over the past thirty years on average (1989-2019).

The OBR has been too gloomy, as the tables show. In spring 2021 - Table A - they said growth in 2021 would be only 4%; it has come out at 7.5%. Even the Consensus, hostile to Brexit and so gloomy too, was closer to the outcome. The OBR has also had to revise its March 2021 PSBR forecast down for 2021-22 - Table B - as the outturns have improved.

Turning to the latest OBR forecasts for the economy and public borrowing, they remain excessively gloomy. As just noted, this comes from the OBR's professional bias as the appointed 'keeper of the budget rules'. The OBR figures are overleaf.

As can be seen from our forecasts set out, they are for much larger borrowing than ours. For example, borrowing in 2024-25 is £46 billion in the OBR forecast, against £22.7 billion in ours, where the economy returns to its trend.

The discrepancy comes about from the OBR's pessimistic GDP outlook; GDP grows by 15.9% from 2020 to 2024, against our 20.9% in our Quarterly Bulletin of the same date.

This 5% discrepancy has a massive effect on net revenue/GDP, the average net tax rate, as we will explain in more detail below, implying a difference of 2.3% of GDP, or about £50 billion pa. by 2024. So the OBR is greatly downplaying

"... good policy needs to balance risks against returns; and most important of all, it must take a long-term view at this crucial junction in our history, with the overwhelming need to boost growth and bring down regional inequality"

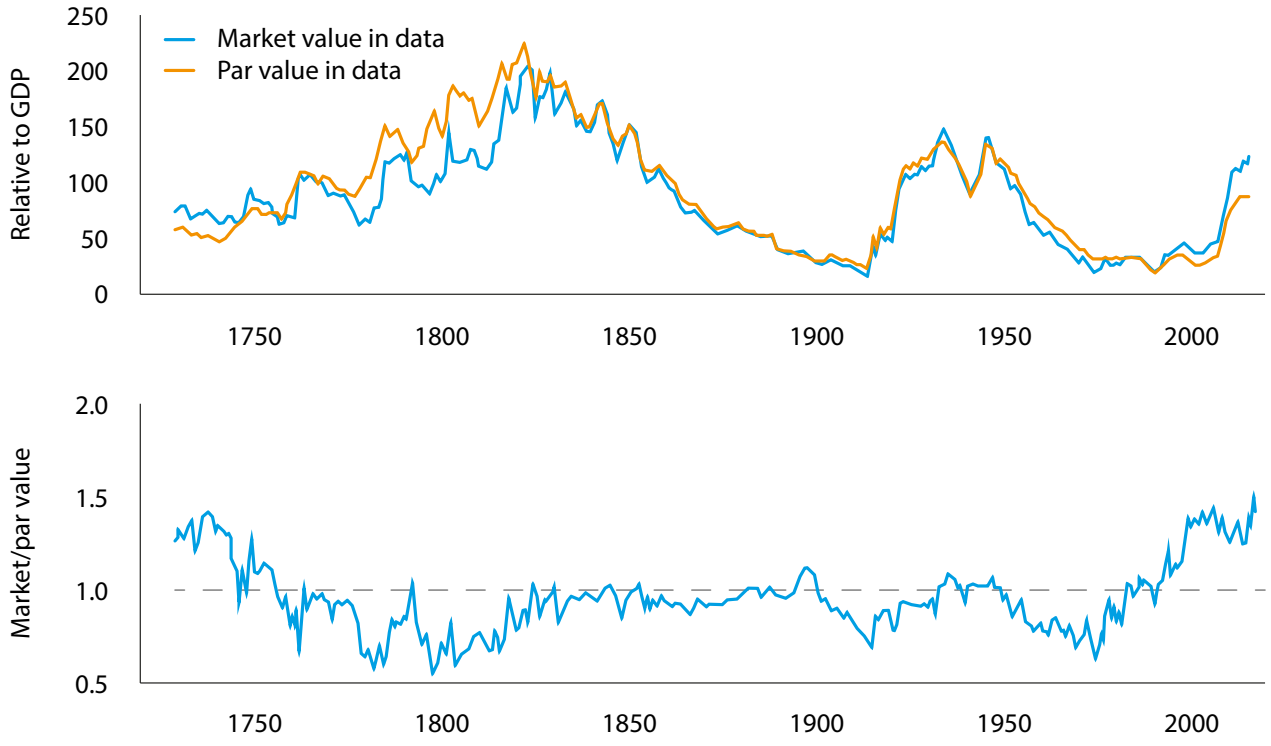
the way recovery will raise gross revenues and lower benefit payments.

Our forecast by contrast shows the PSBR dropping steadily and both enabling public spending to rise and pushing the debt ratio down to around 50% by the mid-2030s. There is no need for tax increases.

This clearly implies that the tax increases imposed in the Budget are a bad mistake. These include not indexing income taxes to inflation, so pushing people into higher bands; raising National Insurance Contributions by 1.25% for both employees and employers; and raising Corporation Tax from 19% to 25%.

These tax increases will depress growth, investment and employment; and they should be rescinded as soon as possible, as now widely demanded in response to the fall in living standards looming over the coming year.

Figure 1. Market value of debt in UK since 1694



Source: Ellison and Scott (2017) '323 years of UK national debt'. [https://voxeu.org/article/323-years-uk-national-debt]

Table A. The OBR forecast of GDP for 2021

	OBR	Cardiff	Consensus	Latest estimate
GDP growth (%) 2021	4.0	5.4	5.4	7.5 (latest ONS)
PSBR (£billion) 2021	234	140	223	183 (Jan 2022 consensus)

Source: OBR, Office of National Statistics, ONS, and HM Treasury 'Forecasts for the UK economy — a comparison of independent forecasts'; Consensus is forecast average.

Table B. OBR forecasts of the PSBR

	£ billion						
	Outturn	Forecast					
	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
March 2020 forecast	54.8	66.6	61.5	60.2	57.9		
March 2021 forecast	354.6	233.9	106.9	85.3	74.4	73.7	
October 2021 forecast	319.9	183.0	83.0	61.6	46.3	46.4	44.0

Source: OBR Report on Economy, October 2021.

Table 1. Basic Forecast- Public Finances without tax increases

	Nom PSBR	Nom GDP	Nom Pub Spend	Spend/ GDP	PSBR/ GDP	Nom debt	Debt Interest	Debt/ GDP	Net Taxes	Net Tax Rate
2019/20	49.1	2,196.3	472.2	21.5	2.2	1,621.0	48.1	73.8	471.2	21.5
2020/21	306.6	1,990.1	468.9	23.6	15.9	1,932.2	39.8	97.1	202.1	10.2
2021/22	179.5	2,307.1	526.7	22.8	7.8	2,111.7	42.6	91.5	389.8	16.9
2022/23	57.8	2,562.1	561.2	21.9	2.3	2,169.5	41.1	84.7	544.5	21.3
2023/24	42.0	2,721.0	600.5	22.1	1.5	2,211.5	42.9	81.3	601.4	22.1
2024/25	23.3	2,859.9	639.5	22.4	0.8	2,234.8	41.1	78.1	657.4	23.0
2025/26	3.7	2,974.3	669.5	22.5	0.1	2,238.5	44.7	75.3	710.4	23.9
2026/27	0.2	3,093.3	720.9	23.3	0.0	2,238.7	48.0	72.4	768.8	24.9
2027/28	0.2	3,217.0	780.5	24.3	0.0	2,238.9	51.2	69.6	831.5	25.8
2028/29	0.0	3,345.7	845.1	25.3	0.0	2,238.9	54.3	66.9	899.4	26.9
2029/30	0.0	3,479.5	915.6	26.3	0.0	2,238.9	57.1	64.3	972.7	28.0
2030/31	0.0	3,618.7	992.2	27.4	0.0	2,238.9	59.9	61.9	1,052.1	29.1
2031/32	0.0	3,763.4	1,075.5	28.6	0.0	2,238.9	62.5	59.5	1,138.0	30.2
2032/33	0.0	3,914.0	1,165.9	29.8	0.0	2,238.9	65.0	57.2	1,230.8	31.4
2033/34	0.0	4,070.5	1,264.0	31.1	0.0	2,238.9	67.3	55.0	1,331.3	32.7
2034/35	0.0	4,233.4	1,370.4	32.4	0.0	2,238.9	69.5	52.9	1,439.9	34.0

Table 2. Long run effects of different tax/regulative measures on North and South according to Regional Model - each measure costing £10 billion pa.

Percentage change in	GDP_N	GDP_S
Cut standard rate of income tax or VAT or other general income/consumption tax	1.1	0.5
Cut corporation tax rate	0.8	0.4
Cut marginal tax rate and regulative burden on entrepreneurs/SMEs	2.0	17.0
Increase infrastructure spending in North	1.6	-

Table 3. A fiscal stimulus package costing £100 billion pa.

Tax cuts	Amount
Cut corporation tax by 10%	£32 billion
Abolish the very top additional 5% rate	£1 billion
Cut the top rate of income tax to 30%	£15 billion
Cut the standard rate of income tax by 5%	£28 billion
Total Tax cuts[1]	£76 billion
Public spending[2]	£24 billion
Total package	£100 billion

1 Representing a weighted average tax cut across all income of about 15%
2 On public services and infrastructure

Table 4. Effects on growth in Regional Model (% of GDP over next decade) from full policy package of £100 billion pa.

Percentage change in	GDP_N	GDP_S	GDP
Cut standard rate of income tax or VAT or other general income/consumption tax	3.3	1.5	2.4
Cut corporation tax rate	2.4	1.2	1.8
Cut marginal tax rate and regulative burden on entrepreneurs/SMEs	20.0	17.0	18.5
Increase infrastructure spending in North	3.8	-	1.9
Total	29.5	19.2	24.6

However, a serious strategy for growth would not merely rescind these wrong-headed tax rises but go a lot further and cut the UK tax burden over the longer term.

This, our research finds, would not just stimulate growth but do so relatively more in the 'northern' slower-growing parts of the UK, so contributing to the levelling-up objective of this government. In the next section I explain how this programme would work.

Instead of tax rises tax cuts are both necessary for growth and affordable

Hence we must not forget that tax/spending policy must not merely avoid damaging growth but also sustain and encourage it. In truth projected growth of 2% with constant policies is low and we can do better. Higher growth in turn will bring down the debt ratio, so in effect paying for those policies.

These growth-supporting policies involve supply-side tax-cuts and spending rises whose short-term effect is of course to increase the deficit. But in the long run they bring the debt ratio down, so in effect paying for themselves- as I illustrate below.

These very policies also generate levelling-up where growth in the North exceeds that in the South- we define the South as consisting of London, the South East and the South West and

Table 5. Variant Forecast — Public Finances including Fiscal Stimulus Package, with assumed effect on growth of +1% pa.

	Nom PSBR	Nom GDP	Nom Pub Spend	Spend/ GDP	PSBR/ GDP	Nom debt	Debt Interest	Debt/ GDP	Net Taxes	Net Tax Rate
2019/20	49.1	2,196.3	472.2	21.5	2.2	1,621.0	48.1	73.8	471.2	21.5
2020/21	306.6	1,990.1	468.9	23.6	15.9	1,927.6	39.8	96.9	202.1	10.2
2021/22	179.5	2,307.1	526.7	22.8	7.9	2,111.7	42.6	91.5	389.8	16.9
2022/23	57.8	2,562.1	561.2	21.9	2.3	2,169.5	41.1	84.7	544.5	21.3
2023/24	42.0	2,721.0	600.5	22.1	1.5	2,211.5	42.9	81.3	601.4	22.1
2024/25	127.9	2,859.9	662.8	23.2	4.5	2,234.9	41.2	81.8	576.1	20.1
2025/26	97.6	3,002.9	693.6	23.1	3.2	2,437.0	45.2	81.2	641.2	21.4
2026/27	80.7	3,153.0	745.1	23.6	2.6	2,517.7	49.2	79.9	713.6	22.6
2027/28	63.8	3,310.7	804.9	24.3	1.9	2,581.5	53.2	78.0	794.3	24.0
2028/29	42.7	3,476.2	869.7	25.0	1.2	2,581.5	57.1	75.5	884.0	25.4
2029/30	17.4	3,650.0	940.4	25.8	0.5	2,641.6	60.9	72.4	983.9	27.0
2030/31	-13.4	3,832.5	1,017.4	26.5	-0.3	2,628.2	64.4	68.6	1,095.1	28.6
2031/32	-50.4	4,024.2	1,100.9	27.4	-1.3	2,577.9	67.6	64.1	1,218.9	30.3
2032/33	-94.5	4,225.4	1,191.6	28.2	-2.2	2,483.3	70.4	58.8	1,356.6	32.1
2033/34	-147.0	4,436.6	1,290.1	29.1	-3.3	2,336.4	72.8	52.7	1,509.9	34.0
2034/35	-209.1	4,658.5	1,397.0	30.0	-4.5	2,127.3	74.4	45.7	1,680.5	36.1

the 'North' as all other regions (with apologies to Wales, the Midlands and the east).

My research group in Cardiff has been working for the past two years on a new regional model of the UK to frame the best way for policy to address this agenda. Our work[2] produces the policy results shown in Table 2.

The model is based on well-known and well-tried ideas of supply-side channels through which targeted tax cuts and regulative reform raise entrepreneurial incentives to innovate as well as creating labour market flexibility and lowering labour costs.

Previous work has shown that these sorts of policy have worked well in the UK to boost the economy in the 1980s and 1990s. Later in this piece I show fuller details of these effects, in the form of a full proposed policy package combining them all.

Much policy commentary has criticised the government for aiming at levelling-up without any strategy for achieving it. I show here that there is a potential strategy that is feasible without affecting public sector solvency; also, that it levels up the North without cutting down the South - all boats rise in this strategy.

To embark on this strategy the main need is to close our ears to the voices of gloom that urge the need to raise taxes and cut spending to reduce the COVID debt - that way lies only a downward spiral of falling growth and a rising debt ratio - a 'doom loop' of stagnation, austerity and worsening finances.

I now turn to the prospects for growth, taxes and debt in the context of the post-COVID economic prospects. Begin by noting that the progressiveness of our tax and benefit system causes a 1% rise in GDP to raise net taxes, ie. taxes minus benefits (tax credits) by about 3%, an 'elasticity' of 3. By implication the average net tax rate rises by 2%, an elasticity of 2.

Hence growth has a tonic effect on taxes and the public finances. Our research in turn shows that the policy package proposed in Table 3 will raise growth by 2.3% per annum, that is to 4.3% against the 2% baseline assumed above (see Table 4 for the model-based growth effects). For the sake of caution we will assume only a 1% uplift to 3% per annum in our projections for the finances in Table 5.

In Table 5 I show projected rising spending against rising tax receipts net of tax credits. In the Base Run forecast shown above, where current policies continue, the debt/GDP ratio falls to 52% by 2034/35, illustrating the point that there is no

need to rush and pay off a large debt ratio after a crisis such as a war or COVID - it will fall steadily to a safe sustainable level with growth.

Then when we implement the Fiscal-Fund-plus-Reform package of tax cuts and infrastructure spending, we get the forecast set out in Table 5 below. As noted above, according to our Regional Model the package raises growth by 2.3% pa. over the decade to 2034/35; but in Table 5 we have conservatively projected a higher growth rate of only 1% pa. to remain on the cautious side.

With this higher growth comes a rising average net tax rate after the initial drop in revenues from the programme. Again the debt ratio falls with now faster growth to a safe and sustainable 45% by 2034/35. In effect the package pays for itself.

These tables show that the fiscal package pays for itself via higher growth. What does it do for the regional picture according to our new Regional Model?

On our cautious assumptions in Table 5 the gap is reduced by 4%, even while both North and South grow more strongly, with average GDP up 10% over the decade. During this period the growth of the North is roughly double that of the South. The policy effect is therefore levelling up without pushing down.

According to the Regional Model (Table 4), the extra growth is more than double what is assumed in Table 5, implying even stronger finances, with growth in the North nearly 3% pa. higher than base and in the South, about 2% higher, and the North-South gap reduced by 8% over the decade.

To look at this another way, our Regional Model implies that we could achieve the same growth outlook assumed in Table 6 at just a third of the fiscal cost in tax cuts and higher spending; that would mean that by 2035 the debt ratio would have fallen to 32% of GDP.

Conclusions: low taxes boost growth and make all round sense for the economy

In spite of all this, some voices have been raised recently to urge tax rises and expenditure cuts by the government to push down the high post-COVID public debt/GDP ratio rapidly; these voices are dominant in UK official circles, led by HM Treasury, and as we have seen have led to substantial announced tax rises.

However, for the long-term good of the country fiscal policy should now focus on boosting growth, particularly in the 'Northern' regions outside the relatively prosperous South.

As we have seen, our research implies that reversing the announced tax rises and instead embarking on a bold package of tax cuts and targeted spending on infrastructure will boost growth across the country, but particularly in the North, reducing the North-South gap, and will also pay for itself through its long-term effect on the public finances.

According to our Regional Model, to get these growth effects the package adopted need only be a third of the size I have set out above.

The Chancellor, Rishi Sunak, claimed in his budget that there was a 'morality' behind low taxes and controlling the size of the state. Nevertheless, his plans push up the prospective UK tax take to over 36% of GDP, while projecting real growth of public spending of 3% per annum.

His reasons for the spending rises are simply plain politics: the government needs them to satisfy public opinion on the requirements of the NHS and other key public services, plus the levelling-up agenda.

His reason for raising taxes was to satisfy short run budget rules on borrowing. The latest form the 'rules' have taken is that the current budget must be balanced over the forecast horizon.

These rules, to repeat, make no sense. The government on behalf of the people it serves must simply obey the arithmetic of the government budget and so be solvent, which means that it must commit to raising in future taxation sufficient in present value to pay the interest on its debts; in practice it means that the public debt ratio will come down in the long term to a safe level.

It can do this in numerous ways; there is nothing that compels it to balance the current budget at any pre-set point in time. As I have shown above, there is a baseline downtrend in the debt ratio.

Furthermore, lowering taxes boldly would increase growth and push that trend down further. So there is no case for raising taxes now that is based on solvency considerations.

However, the Treasury, backed by the OBR, has pushed the government into raising taxes prematurely. The Chancellor says he aims to cut them later. But by then the damage to growth will have been done.

Better to support growth now through low taxes. That is best both for the economy and the public finances in the long run. ■

Endnotes
1. Covid19 Cost Tracker update - https://committees.parliament.uk/publications/6953/documents/72750/default/
2. Written up in http://carbsecon.com/wp/E2020_14.pdf

Trade and the most vulnerable

Ngozi Okonjo-Iweala is Director-General of the World Trade Organization

Some of the biggest threats to our economies and our societies come from environmental degradation – from climate change to biodiversity loss and the natural hazards that result. The climate crisis demands a multi-faceted response. At the heart of this response is our need to reduce poverty and enhance living standards while strengthening environmental sustainability.

We must also drive positive environmental change into our recovery from the pandemic by building greener, more socially inclusive economies, and investing in the systems needed to identify and contain future disease outbreaks – such as early warning systems.

Recent crises have demonstrated that like in the 'butterfly effect' – small, imperceptible changes in part of the planet can have a profound impact on the lives and livelihoods of people everywhere on this planet.

In reflecting on the climate crisis and the global response to the pandemic, it is clear to me that trade is part of the solution to the challenges we face, far more than it is part of the problem.

There are, inevitably, some downsides associated with trade: moving goods from one place to other has generally involved carbon emissions. But let's not forget that trade also makes production more efficient, and this can reduce emissions.

Trade and open global markets have also helped lift over a billion people out of poverty in recent decades. But many poor people in rich countries, as well as poor countries, have not shared fully in the gains.

The answer to these problems does not lie in a rejection or reduction of trade. A new joint policy note produced by the WTO and the World Bank makes clear that trade will be critical in driving the post-pandemic recovery.

A better answer to the real problems we see lies in better trade – a fairer and more equitable globalisation, one that brings marginalized people and countries into the economic mainstream, while helping us decouple human well-being from environmental impact.

Developing countries, and Least Developed Countries in particular, often have insufficient capacity to manage the risks and adapt to the environmental fallouts they are already experiencing. International mitigation policies and other measures to combat climate change could, if not careful calibrated with the needs and capacities of developing countries in mind, also impair the trade competitiveness of some developing countries.

But I know that such policies are not incompatible with the growth and development needs of developing countries including Small Island Developing States and LDCs.

In this regard, there are a number of ways in which trade can contribute to curbing climate change, while ensuring a just transition for those countries that did the least to contribute to the problem.

Climate change is already affecting trade and the economy: from changing rainfall patterns to extreme weather events leading to disruptions in supply chains. UNEP estimates annual adaptation costs in developing countries to reach $140-300 billion by 2030 and $280-500 billion by 2050. The increasing frequency of natural disasters also threatens to further weaken the ability of SIDS to trade competitively.

A WTO information brief on trade resilience in the face of natural disasters, published just before COP26 last year, confirms that natural disasters have a more severe long-term impact on small economies. This occurs as immediate impacts on such countries are disproportionally large and volatility of economic activities is higher.

Developing countries, and particularly LDCs, face the challenge to enhance the climate-resilience of their trade-related infrastructure, improve digital connectivity and strengthen their policy frameworks as part of their efforts to mitigate the impact of natural disasters and adapt to climate change.

In our publication with the Global Centre for Adaptation we highlighted that trade is a mechanism for adaptation and resilience in the face of crop failure and natural disasters. Affected countries can bring in food and supplies necessary for reconstruction while domestic production remains impaired, allowing the economy to recover more quickly.

One set of models published in Nature Climate Change estimates that climate change is on track to push 55 million people into undernourishment by 2050 because of localised impacts on food production.

It found that greater trade integration could cut that number by as much as 64%, or 35 million people. Meanwhile, reducing trade in agricultural products would substantially increase the number of people likely to go hungry in the decades ahead.

On the mitigation side, developing countries must seek to use trade in support of their climate transition goals and build a diversified low-carbon economy. International competition and the emergence of a globally integrated solar photovoltaic (PV) supply chain has helped make solar the cheapest source of electricity generation in many parts of the world.

Wind energy has benefited from similar trends. Trade and competition can play a similar role in lowering costs for future technologies such as advanced batteries and hydrogen electrolysers.

Climate-related trade policies must be framed with a just transition in mind, with transition times for developing countries to find carbon alternatives, but also the financing for them to leapfrog the dirty infrastructure stage and directly build sustainable alternatives.

There is an important link here with aid for trade: trade-related development assistance to build energy, transport, and telecommunications infrastructure totalled $25 billion in 2019. Going forward, aid for trade should seek to build climate-resilient infrastructure and foster climate-proof supply chains.

Climate finance is indeed essential for allowing transition to a low-carbon economy for developing countries. For the poorest and most vulnerable countries, LDCs and SIDS, finance for adaptation represents more than 40%, almost double the share for all developing countries.

We need to demand optimized responses to the needs of developing and least developed countries. That is why the failure to mobile the 100 billion dollars a year of climate finance promised to developing countries is demotivating.

The Aid for Trade Initiative has an important role to play by mobilizing funding for critical supply-side infrastructure necessary for green transformation in developing countries and supporting the private sector to adapt to climate change.

Between 2013 and 2018, over $65 billion of Aid for Trade was provided to projects with a climate objective, including renewable power generation, distribution, and energy conservation, as well as climate-friendly and climate-resilient infrastructure.

For instance, a project in Nigeria made possible through development assistance has installed solar lamps, solar panels and cook stoves that emit less carbon dioxide to the benefit of residents and small enterprises in remote communities.

However, aid for trade needs to be better targeted to address development concerns in line with LDCs' nationally determined contributions. As I said earlier, the climate finance target as laid out in the COP16 accord has so far fallen short of the commitment to mobilize $100 billion per year by 2020.

"Effective carbon pricing is increasingly considered a key market mechanism to support low carbon just transition"

This commitment was reaffirmed last November at COP26. We must also encourage the private sector to participate in the investments necessary to address the climate crisis. For example, in 2019 private climate finance alone mobilised $14 billion, representing close to 18% of total climate finance.

We therefore need to work together to explore the opportunities through aid for trade and other innovative financing mechanisms to address climate change issues in LDCs and explore opportunities for mutual leveraging of resources.

Beyond aid for trade, new international frameworks are necessary to ensure that countries at all levels of development take progressive steps towards enhanced environmental sustainability through trade. Therefore, support is needed for LDCs to assist them in participating in some on the ongoing discussions taking place at the intersection of trade and the environment.

For example, WTO members are currently discussing several issues, such as the facilitation of trade in environmental goods and services, the transition to a circular economy, plastics pollution, sustainable supply chains, and environmentally harmful subsidies, including those related to fossil fuels.

However, given the limited participation of LDCs, technical support must be made available to support the participation of LDCs in these discussions.

Indeed, lowering trade barriers to environmental goods and services would reduce the cost of renewable energy and lower the capital costs of building climate-resilient infrastructure. It will also result in economic diversification and job creation, particularly in services.

Services jobs related to renewables are often supplied locally and carried out by women. A growing number of jobs, especially in Africa, are being created in off-grid decentralized renewables, which also boosts employment in other sectors such as agro-processing, health care, communications, and local commerce.

WTO has a lot to contribute to this respect. Environmental goods and services are a focus of the Trade and Environmental Sustainability Structured Discussions (TESSD), an initiative that brings together 71 WTO members, amongst which many developing countries. Participants have defined a road map for work in 2022, and set up exchanges with business, civil society, and academic experts.

The Informal Dialogue on Plastics Pollution and Environmentally Sustainable Plastics Trade (IDP) is another initiative seeking to foster coordinated action to address the environmental, health and economic costs of plastics pollution.

The Informal Dialogue has gathered the support and participation of developed, developing and LDC members alike, with a particular attention to SIDS and has stressed the need to strengthen technical assistance for vulnerable economies.

In closing it is important I address efforts underway to institute carbon taxation schemes. Effective carbon pricing is increasingly considered a key market mechanism to support low carbon just transition. And the LDCs must be part of the discussion.

International cooperation can help ensure that efforts to put a price on carbon do not lead to avoidable business costs and trade frictions or place disproportionate burdens on poor countries. Fragmentation raises compliance costs and uncertainty for the private sector – and weighs heaviest on small businesses.

In addition, some developed countries are considering 'border tax adjustment measures' intended to equalize carbon costs across foreign and domestic producers.

However, many developing countries fear such measures could in practice be misused as a pretext for protectionism against their exports. This could weaken global cooperation on climate change when we need to strengthen it.

In my view, the optimal solution would be a shared global carbon price approach aligned with the Paris Agreement and its principles, though politically we are not there yet.

In the meantime, we must work closely with other international organisations, such as the IMF, the World Bank, the OECD, and others, and work on common approaches to carbon pricing, ensuring that measures are not adopted in a discriminatory manner and that the needs of developing countries and LDCs are addressed to enable a just transition.

Ultimately, this discussion is about people and planet. It is about ensuring that environmental sustainability is integrated into how we trade and what we trade. I must thank the leadership of the Climate Vulnerability Forum for the continued interest in advocating for strengthening the multilateral response to climate change.

In sum, LDCs are in need of support for a green transition and the WTO can play a key role in that regard. LDCs should not be left behind. ■

Hope for the best, plan for the worst

Dr Graham Bright is the Head of Compliance and Operations at Euro Exim Bank

Having survived the rigours of Christmas, with panic buying now a distant memory, December saw a flurry of international trade activity, with deals signed between the UK and Australia, and digital trade deals with Singapore.

And rather than the expected lull in January activity, negotiations have commenced towards a free trade deal spanning 5 years between the UK and India. This cements a long-standing history of trade and investment, aimed to increase jobs and revenue in pharmaceuticals, leatherwear, textiles and footwear. Service sectors will also benefit in areas such as nursing, education and IT.

Additionally, the UK Department for international Trade has set its sights firmly on securing membership of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) by the end of 2022, giving access to trade worth USD13.5 trillion. Known as TPP-11, the member nations span the Far East, Australasia and South America incorporating such powerhouses as Japan and Singapore.

With this positive step, the agreement aims clearly to increase economic security, enable non-tariff barriers to trade to be removed help to diversify trade links and re-position the UK as a true global hub following Brexit and the challenges brought by the pandemic.

And, by trading with nations already acting in different FTA's, there should be even greater opportunities, markets and exchange of products and services, to fulfil the ambitions of all the member nations which in turn brings benefits and resources for people to work on problems that all nations are facing, in tech, the environment, healthcare and other sectors.

So, a rosy outlook to start the year. But, major challenges are still ahead, as the worlds' second largest trading nation, China, with GDP larger than those of the next four economies

- Japan, Germany, the United Kingdom, and India – combined, is facing a new reality when looking at sustainability of growth. Despite the intent, collaboration and reach of FTA's, some countries are maintaining their protectionist, restrictive access, subsidy driven stance.

After its rapid rise, China growth rates have slowed, with the biggest factor being the fall in production in domestic markets, ageing population and reduced numbers of workers estimated to be in the region of 35 million over the next 5 years.

Just as the UK Government has acted to raise the retirement age and keep people in employment longer, China aims to do the same to preserve tax contributions with creation of new jobs.

The global appetite for Chinese goods is insatiable, and as a prime example, the UK imported £40.5 billion more from China than it exported to the country in the year to June 2021, a rise of imports from China of 38% increasing the trade surplus to over USD670 billion. In the same period, UK exports fell by 34%, a picture reflected in many other nations internationally.

China is set on promoting more self-sufficiency, greater domestic consumption and less reliance on the export market long term. But when things go wrong, the repercussions are immense as 'debt bombs' are created with companies 'too big to fail'.

The Evergrande issue is ongoing, with unfulfilled debt obligations of USD300 billion, hundreds of unfinished properties now classified as distressed assets, thousands of unpaid workers, millions of jobs at risk and loss of home buyers.

"We hope for the best outcome and plan for the worst. The next quarter will be critical"

Closer to home, international trade is not quickly returning to pre-COVID levels or pricing. Just as forward transactions in currency markets may secure future prices, so contracts in shipping were agreed months ago at a time where exporters could negotiate prices with the luxury of excess capacity.

How different it all seems today. Rates to move goods cross-border have never been higher, as contraction of supply chains has caused every player in the ecosystem of trade to review capacity. Starting with transport companies, prices are expected to double (not helped in the UK by additional demands for costly ow emission or electric vehicles, highest ever diesel prices at pumps and congestion charges).

The freight sector, handling the physical movement of goods is also impacted in areas of warehouse costs, displaced containers, ocean shipping and local logistics. And companies are still subject to market demand and the influence of a rapidly changing spot market on a short-term basis.

One example is the Brent crude oil price, at USD55 per barrel one year ago is now standing at approx. USD90, with predictions of USD150 within three months.

In addition to containers being in the wrong place at the wrong time, with less overall capacity, we have already witnessed the staggering increase in spot prices for standard 40-foot containers, with prices up to 5 times higher than pre-pandemic levels and set to move higher still.

In some instances the cost of container transport even surpass the value of goods they contain, making it uneconomic and therefore impossible for smaller traders and niche businesses to sustain a healthy trade and cash flow.

Looking at the other areas of logistics in the supply chain, the cost of warehousing, increase in demurrage fees (namely the charge that the merchant pays for the use of the container within the terminal beyond the free time period), labour costs, increased fuel costs and shortage of drivers to move goods will lead to inevitable price rises.

With such uncertainty and taking into account the rising costs (up 25% on average for leasing warehouse space, it is no surprise that companies are not prepared to lock in long term leases and taking the financial hit on shorter terms.

Whilst in the past the demand for goods at low price has meant shippers absorbing costs, the time has come where increases have become so common and of such magnitude that these costs must be passed on to consumers. Even using AI technology for innovating least cost routing, consolidating shipments, sharing containers and only renting delivery vehicles when required, the choice is stark.

Inflation is on the rise and consumers must pay more as shippers and other players in the global supply chain find themselves with drastically reduced margins, operating expenses and more pressure than ever to deliver at a price the consumer can afford.

But experts say companies have little choice other than absorbing the cost or passing it along to their customers. Overall, transportation rarely exceeds more than 7% of the cost of goods being shipped. For most companies, the value of the product being sold and the importance of that sale is much greater than a slight increase in transportation costs.

Companies always want the cheapest route to the client, but will not want to compromise long terms trade and future customers if the only differentiator is the cost of delivery.

The next big thing? The rise, appeal and acceptance of crypto and asset tokenization. With banks providing loans as far back as in Babylon in 1,800 BC, and 'modern' banking coming about in the 1470s, banks have not been the fastest innovators.

However, the past 10 years has seen more advanced products and more adoption of disruptive technology than in the previous 100 years, where traditional bricks and mortar, large branch network, limited product financial institutions have given way to mobile, agile, multi-currency, e-banking, global, internet driven service providers.

And it is not only the service delivery method that has changed so dramatically, but the pace of change, sparked by the inclusive nature and tech-savvy social media generation demanding faster, more diverse, secure services.

The demand for data, information and financial services, and the technology to support vast data consumption now, has only been made possible by the advent of high-speed networks, smartphones and technology companies, translating those needs, enabling anyone, anywhere to trade international equities, bonds and derivatives, arrange a mortgage, make deposits, trade crypto currency, electronically sign and send vital documents, at the click of a button.

Whilst the past 20 years may be the era of internet banking, 2020 onwards has launched the decade of crypto. As of January 2022, there were approximately 10,000 cryptocurrencies in existence, many created for specific purposes with solid use cases, and others as speculative investment tools with spectacular volatility, few investors and even less volume.

Always a case of buyer beware, some earlier coin offerings experienced bad press through hacking, loss of consumer confidence, no activity, price collapse and where the mere mention of blockchain sent the investment community into a frenzy.

And how times have changed, with much more consumer demand, as, like bond and equity offerings, new coins are coming to market via initial exchange and security token offerings following extended due diligence by the trading platform.

Cryptocurrency (especially Bitcoin) is no stranger to volatility. However, in the past, the equities markets have also produced

spectacular returns and losses, albeit across different timelines and remain considered a safer haven than crypto markets

Whilst the 1929 Wall Street Crash witnessed significant falls such as RCA common stock from $505 to $26 and DuPont from $217 to $80), black swan events have also elevated stock markets.

For example, Alcoa experienced 12 month returns of 217%, and risk averse long term portfolio holders have borne fruit with Monster, with shares at $2 in 2005, hitting $140 in 2015, and the darling of the equities market Amazon, with canny investors buying at $2 in the 1990s, where today they trade at $3,500.

Whilst equities still represent a more stable investment platform, crypto has captured a new imagination with a new demographic. With an almost baffling choice of cryptocurrencies, the key issue for investors will be the ability to seamlessly cash out of low volatility, low value stock and move in and out of fiat currency in deciding which type of coin best suits a long-term strategy.

So, with a requirement for a more stable, digital crypto instrument, the latest area of investor interest and some may say hype, is asset tokenisation. Blockchain technology remains the vital component, the mechanism and enabler to underpin crypto transactions.

In asset tokenization, digital tokens are used to fractionalize ownership of assets. Physical items are reflected on the blockchain which manages ownership rights – and anything from property to university degrees and from gold to stocks can be tokenised, with over USD500 million already tokenized in real estate.

These tokens are created during a so-called STO (Security Token Offering), in which the real estate is essentially split up into digital, tradable assets stored on a blockchain.

The idea of fractional real estate ownership is nothing new. Since 1960, REITs (Real Estate Investment Trusts) were introduced in the United States and by pooling investors' capital, the real estate market suddenly became much more accessible and makes it possible to invest in the underlying asset without having to buy or manage the entire property.

Fast forward to 2022 and the advent of more commercial tokenisation, where real estate is more readily fractionized into small pieces, namely tokens. What are the benefits?

Global increases in property prices, expensive and rising bank rates, less monetization opportunities, languishing assets earning low interest, high costs of ownership with less people able to afford current and future prices all of these can be managed, by fractionising and tokenization.

And as digital tokens on a blockchain can be securely and efficiently transferred without a middleman, trading of these asset-backed tokens suddenly becomes much easier and cheaper, leading to increased liquidity.

It's easy to see why investors of all sizes are enthusiastic about this development. With a much lower market entry point with less initial investment, the global real estate market is valued at around $280 trillion, making it one of the largest, most illiquid, and non-transparent markets on earth.

And post pandemic, in an era of rising costs, there are many distressed assets where such an investment approach may provide an economic lifeline to owners, and competitive opportunities for smaller investors.

One can almost imagine the scenario where an investor might be able to increase their international holdings through the purchase two tokens in a block or apartments in Chennai, ten tokens of a factory in Malaysia, and three tokens of a flat in Hong Kong - all payable in coins, through a single platform.

Recognising this opportunity, Euro Exim Bank are investigating the tokenization of such assets and looking at offering several unique coins, asset backed by investment grade instruments in an easy to trade blockchain-based token.

Whilst the industry is always on the lookout for the next best thing, we believe the tokenisation projects will position the bank as a crypto provider of choice, with provenance, security, asset backing, assurance, and value.

In addition to our strategy on coins and tokens, our journey towards full digitisation of documents and digitalisation of processes across the extensive trade ecosystem continues apace.

Our lofty ambitions and aspirations are to be the premier provider of trade and crypto currency services through stable coins and tokens, contributing to better customer experience. With fast, cross border payments, low transaction fees, efficient settlement, and management of platforms, we will facilitate access to distributed financial services for the unbanked, ultimately enabling digital financial inclusion.

At the time of writing, with the UK COVID wine and cake Partygate debacle seriously overshadowed by ongoing international tension as Russia invades Ukraine, fears abound of its longer-term intentions to extend its reach to re-establish a power bloc similar to the former multi-state Soviet Union.

The West will need to be mindful and fully prepared to deal with trade implications, sanctions, which have now started, repercussions in the event of invasion, NATO and European military support, and how to handle possible nation state cyber-attacks on all manner of businesses across the supply chain.

With such a fluid situation, whilst free trade agreements were supposed to bring unity, collaboration and increase in collective wealth, their purpose is clearly being eroded as former allies become enemies, and protectionism, nationalism and isolationism become the new order.

We hope for the best outcome and plan for the worst. The next quarter will be critical. ■

New wine in new bottles

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The running consensus in trade policy discourse in India is that Indian Free Trade Agreements (FTAs) have been at best, a mixed bag and at worst, the cause behind stagnancy in the Indian manufacturing sector. There is some truth in the statement.

The preference utilisation rate of Indian FTAs is among the lowest in Asia[1]. Additionally, increasing import demand and trade deficit with most FTA partners has added to the ire[2]. However, it is another matter that the deficits would have occurred regardless of FTAs being in place[3].

Disenchantment and sour grapes led to a noticeable hiatus during which India did not see bilateral or regional trade negotiations to fruition[4]. This culminated with India walking away from the world's largest trade deal – the Regional Comprehensive Economic Partnership (RCEP) for Asia and the Pacific in 2020.

Fortunately, there is now a break in the pattern. India recently concluded its first 'new age FTA' with the United Arab Emirates - her third-largest bilateral trading partner, with unprecedented speed and enthusiasm[5].

With several major FTA negotiations ongoing or lined up, and the simultaneous revamping of policies on industry, infrastructure, logistics, and export, among others, there is a clear and unambiguous signal from the Government – India is determined to give export-led economic growth another shot.

This second chance is as timely as it is necessary. With a median age of twenty-eight, India stands at the cusp of reaping a demographic dividend or spiraling into a demographic disaster. India needs a massive upsurge in employment opportunities, and the manufacturing sector, not services can support these numbers.

The geopolitical stars have aligned as well. Foreseen as *"an engine for regional growth and development"* in the Indo-Pacific, India has large shoes to fill[6]. Well-positioned to shape alternate and resilient supply chains, and manufacture strategic as well as global public goods for the world, India can be a driving force for the collective good.

Thus, even as the international community largely turns inwards and embraces gated globalisation, there is an understanding that supporting India's rise is an essential investment and excellent bet, not just effective altruism.

India has discerned this window of opportunity brought by the recalibration of international trading and geopolitical forces. With the much-awaited overhaul of the Ministry of Commerce and Industry (primarily to strengthen negotiation capacity), the world is set to see a lot more dynamism in India's FTA negotiations. So, what can be expected from more new age FTAs?

Some early and late harvests

First, there is an attempt to swiftly integrate with regional and global value chains by incentivising investments into manufacturing while simultaneously breaking through trade barriers in export markets.

Accordingly, hand in hand with trade liberalisation through FTAs, the Government has launched Production Linked Incentive Schemes (PLIs) in fourteen sectors to grant significant financial incentives on achieving specified sale targets.

Notably, the India-UAE Comprehensive Economic Partnership Agreement (CEPA) does not liberalise sectors covered by the Government's ambitious (PLI) Schemes. However, the tariff on inputs including raw materials for PLI-covered sectors like steel, textiles, and pharmaceuticals is being brought down.

"With several major FTA negotiations ongoing or lined up, and the simultaneous revamping of policies on industry, infrastructure, logistics, and export, among others, there is a clear and unambiguous signal from the Government – India is determined to give export-led economic growth another shot"

This is a smarter and more sustainable approach towards liberalisation (especially seen against the backdrop of India's infamous inverted tariffs) and reorients the industry to engage with trade policies in a positive manner.

Thus, even as the comfort and security of the domestic market is being subject to a sunset clause (the PLI scheme is valid for a fixed period), the industry is being nudged to focus on quality and move up the value chain to become competitive in foreign markets.

Second, the differentiation between strategic and economic interests is blurring. Earlier FTAs mostly aimed at neighbourhood bonhomie (India-Sri Lanka, India-Nepal) and/or regional integration (South Asian Free Trade Area, Asia-Pacific Trade Agreement), and the influence of foreign policy on trade was limited to seeking engagement with partners in the East (India-Association of Southeast Asian Nations, India-South Korea, India-Japan).

However, recent geopolitical and geo-economic churns mean that India's engagement will now involve diversified

partners that may offer limited economic benefits in comparison to larger strategic ones. For instance, a Preferential Trade Agreement with Uzbekistan is on the cards to build connectivity with Central Asia, in light of political developments in Afghanistan, among other factors.

Third, apart from new partners, India is also looking at new agendas. With the signing of the UAE CEPA having chapters on digital trade and government procurement – areas that India vociferously opposes linking trade with, at the World Trade Organization (WTO) – it is now clear that India is being pragmatic and flexible in its approach.

In fact, the digital trade chapter also takes into account consumer protection, an oft-overlooked interest in trade negotiations, despite consumer welfare being the raison d'être for trade for garnering increased access, choice, and quality of goods and services.

Furthermore, in its first round of FTA negotiations with the United Kingdom, India covered twenty-six policy areas including gender and sustainability. This is a welcome development and bodes well for smoothening irritants in negotiations with the European Union and the United States of America as well.

Taken together, they reflect that rising public consciousness is incentivising producers to enter a 'race to the top' and distinguish products from competitors based on their social values rather than cost alone.

Thus, domestic exporters will inevitably need to upgrade their products and processes as per increasingly higher environmental/labour standards in developed countries.

By signing up for gradual and incremental Trade and Sustainable Development obligations for greater market access, India would incentivise exporters to comply with its provisions to avail the FTA's benefits.

This voluntary acquiescence to short-term pain for long-term gains also charts a realistic path for attaining a just transition, by shifting the Indian workforce from low in productivity, highly polluting and informal ventures to resource-efficient manufacturing that is sustainable and formal in nature.

Does this also mean that in time, having tested capacities to navigate new waters, India will change its default negotiating stance at the WTO from a no to a maybe, or even yes? Perhaps. This and next decade's experience with new age FTAs will be crucial in shaping India's multilateral position on WTO-plus and WTO-x issues.

Overall, though, the trends decipherable from the breadth and depth of recent FTA negotiations lend hope for a modern, holistic approach that synchronises India's industrial, trade, and strategic interests to achieve her ambitious domestic and international objectives. In this context, the following are a few recommendations to further invigorate India's modern FTA strategy.

Fresh fields and new pastures

First, FTAs with like-minded and developed democracies offer a great opportunity to harness the synergies between trade, on the one hand, and technology and innovation, on the other. Developed democracies like the US, EU, and the UK hold immense value for collaboration in critical and emerging technologies and fostering talent.

For instance, cooperation amongst like-minded countries can shape standards for emerging technologies to ensure interoperability, privacy, and transparency. The Quad Critical and Emerging Technology Working Group aims to facilitate coordination on technology standards development.

FTAs with these partners should complement this resolve and ensure that standards for emerging technology align with the principles outlined by the WTO TBT (Technical Barriers to Trade) Committee's decision in 2000[7]. This would ensure that these standards do not fragment markets and receive the widest commercial acceptance.

Beyond serving strategic interests, the role of technology and innovation will be critical in ensuring sustainable economic growth. A dedicated chapter/provisions on innovation could address concerns of equitable access to green goods and technologies through their transfer/licensing at fair and reasonable terms.

This is an especially valid compromise where the use of such technologies is made inevitable by environmental standards or regulations that impact the exports of developing countries.

Moreover, innovation and liberalised trade can incentivise labour-friendly technologies[8]. Such technologies can increase labour productivity by increasing human capital (for instance through personalised education/skilling through AI-enabled channels) or through direct support to workers (for instance through augmented reality or machine learning) for improved worker performance and workplace safety[9].

Second, India should develop a work programme to assess the capacity building required to operationalise deeper regulatory coherence through Good Regulatory Practices (GRP).

GRP provisions in the United States-Mexico-Canada Agreement (USMCA) and the US-Brazil Protocol Relating to Trade Rules and Transparency include obligations on regulatory coordination and planning, regulatory impact assessment, and retrospective reviews, among others.

Giving stakeholders – both foreign and domestic – adequate opportunity to comment on proposed regulations helps prevent trade barriers. This is more efficient than working to remove them.

Building on the previous point on innovation, the new age FTAs could also provide opportunities to scale Mutual Recognition Agreements (MRAs) between regulatory authorities for encouraging sharing of information and fostering mutual reliance in regulating emerging technologies like AI and cyber-security.

For instance, regulatory facilitation witnessed during the pandemic allowed Indian health authorities to cooperate with the US Food and Drug Administration and the Medicines and Health products Regulatory Agency of the UK to arrive at Emergency Use Authorisations. Lessons and principles from such partnerships can be carried forward for swiftly handling future innovation in other areas.

Finally, when navigating new territory, it's best to prepare for foreseeable second and third-order effects. Knowing that competition and innovation create winners and losers, the wisdom of a holistic policy will lie in ensuring that adequate adjustment mechanisms exist for compensating those who suffer due to trade liberalisation.

There is a need to marry new-generation FTAs with good old education and migration policies. A fund created under the aegis of the FTAs to support a trade adjustment programme is an example.

India's modernised FTA strategy is already breaking past barriers – several of which were self-imposed. Moreover, disruptive geopolitical, technological, and climatic changes have birthed emerging opportunities as multiplier forces for an already potent tool.

If the momentum seen with the UAE CEPA continues, India's upcoming negotiations for 16 new and seven existing agreements hold tremendous potential to shape the economic, social, and strategic trajectory of the country and beyond. ■

Endnotes

1. As per the Asian Development Bank, India's FTA utilisation rate falls between 5 percent and 25 percent.

2. Chandrima Sikdar & Biswajit Nag, 2011. "Impact of India-ASEAN Free Trade Agreement: A cross-country analysis using applies general equilibrium modelling," [https://www.unescap.org/sites/default/files/AWP No. 107.pdf] Asia-Pacific Research and Training Network on Trade (ARTNeT), an initiative of UNESCAP and IDRC, Canada.

3. Sunil Jain, "If You Can't Do RCEP, Can't Do US/EU Either," [https://www.financialexpress.com/opinion/if-you-cant-do-rcep-cant-do-us-eu-either/1760577/] Financial Express, November 11, 2019.

4. The last major trade deal, before India-UAE CEPA was with Japan in 2011.

5. Joint India-UAE Vision Statement - Advancing the India-UAE Comprehensive Strategic Partnership: New Frontiers, New milestones [https://www.mea.gov.in/bilateral-documents.htm?dtl/34877/Joint_IndiaUAE_Vision_Statement__Advancing_the_IndiaUAE_Comprehensive_Strategic_Partnership_New_Frontiers_New_milestones], February 18, 2022

6. Statement [https://economictimes.indiatimes.com/news/defence/india-a-driving-force-of-quad-says-white-house/articleshow/89592441.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst] by the White House Principal Deputy Press Secretary Karine Jean-Pierre to reporters, 15 February, 2022

7. WTO TBT Committee, Principles for the Development of International Standards, Guides and Recommendations [https://www.wto.org/english/tratop_e/tbt_e/principles_standards_tbt_e.htm], 2000 attempt to ensure transparency, openness, impartiality, and consensus, effectiveness and relevance, coherence, and to address the concerns of developing countries.

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Inequality and inheritance: a classical liberal approach

Patrick van Schie and Mark van de Velde are respectively the Director and a former Fellow of TeldersStichting, the Netherlands' liberal think tank

Inequality is growing. This is increasingly what is being said in the media and as part of the wider public debate. Generally, this is followed up with the idea (implicit or not) that something needs to be done about it and preferably by the public authorities.

Can liberals (classical or otherwise) shrug their shoulders in response to this or should they be concerned about such inequality (averred or not)? Sometimes the response is to downplay inequality and to dispute that it is on the increase. This is also commendable in so far as the claims of inequality (whether growing or not) are incorrect.

Neither the views that are trumpeted loudest nor juggling with figures may disturb our view of the actual situation. At the very least, any political approach designed to reduce inequality would need to be based on the appropriate facts.

Yet liberals would do well to do more than cry, 'It's not that bad'. Even if we agree (with others) on the facts, we need to question whether inequality is actually a problem. Is equality actually a core value to liberals?

A spectre of completely equal people

In 1891 the German liberal leader, Eugen Richter, published a novel called *A Social-democratic Vision of the Future*. In it he seriously considered statements made by contemporary socialist leaders about their equality ideals and he described their implications.

If the socialist ideals that had been proclaimed were to be implemented, no one would be permitted to earn more than anyone else, no one would be allowed to possess more than anyone else – savings would be prohibited in order to achieve this – no one would be permitted to live more expansively or to eat more copiously than anyone else – consequently, it would be mandatory for people to eat in soup kitchens – and so forth.

A sombre, joyless society was the outcome, one in which a constantly expanding police force checked whether everyone was towing the line. Protest was suppressed and one was prohibited from leaving the socialist utopia.

Nowadays, we recognise this as the 'actually existing socialism' in the former German Democratic Republic (GDR) or any other communist dictatorship. As such, the liberal Eugen Richter predicted the unpleasant features of a society in which all are treated equally more than half a century before the GDR was established.

Nowadays, social democrats and many others on the left would not countenance such a form of equality enforced in every respect. Nevertheless, Richter's novel clearly shows that such overall equality does not create an idealistic world but a horrific one.

Although few people on the left would still want to make everything completely equal, they would like to see numerous issues become *more equal* in many respects. If there is inequality in relation to income and wealth, they demand levelling.

They would prefer to even out any differences in levels of education through comprehensive school structures. Where men and women engage in different occupations and professions, they are quick to say that discrimination abounds.

And so it goes. Put in a nutshell, while socialists want greater equality, liberals prefer more freedom. However, this does not mean that liberals reject *all types* of equality.

Equality as part of the liberal approach

To liberals, the individual comes first. An individual must be afforded an opportunity to make their own choices in life. In order to do so, it must also be possible for them to make such choices. This is called autonomy. Freedom and autonomy are essential starting points for liberals.

Every individual is entitled to freedom. No individual may claim greater freedom than another. Put another way, in a liberal society everyone has an *equal* right to freedom.

The government must intervene (or be able to do so), if one person's freedom occurs at the expense of another, irrespective of who the latter is. Every person is equal before the law. As such, liberals want *equality under the law*.

As long as the fundamental rule is observed that every person should be able to avail himself of his freedom, the public authorities need to act with restraint. Nevertheless, almost all liberals feel that some important or at any rate essential matters cannot be left to the individual or collaborative enterprises of individuals (associations, foundations, companies and so forth).

Liberals also look to the public authorities when it comes to ensuring safety, establishing infrastructure or providing basic education and the most essential healthcare. In so far as collective decision-making is necessary or inevitable, in principle, they would like all people to be able to influence it in equal measure. As such, liberals also stand for *political equality*.

When it comes to education, we are also touching on an important part of a third aspect of the liberal approach: *equal opportunity*. Where your cradle once stood, should not matter when considering the extent of your potential self-development.

It is not the individual's origins which matter to liberals but their future. The rules differ in what they consider to be required in relation to equal opportunity.

Nevertheless, they will never automatically conclude that there was never any question of equal opportunity merely based on the existence of specific forms of actual inequality. Yet this occurs all too often in the public debate concerning inequality.

Celebrate diversity

The idea that every individual is unique is an important principle to liberals. This does not mean that we do not share common features, nor does it entail that in practice people sometimes – to reflect the statistics – have a tendency to make similar decisions in identical situations.

Even so, no single individual, and this also applies to identical twins, is entirely identical to another. Neither is every situation in one person's life always identical to that in another's.

Individuals differ in terms of their personality, interests, preferences and talents, and in their need or willingness to make an effort, to take risks or to remain calm. Given the freedom to do so, they therefore make very different choices which could logically lead to highly diverse outcomes.

" [We believe in] a relationship-neutral inheritance tax which gives heirs an equal tax treatment and allows the testator to choose how he or she wishes to distribute the inheritance, without government interference"

Sometimes luck plays a role in this respect although similarly we – as liberals at any rate – do not begrudge someone the fortune of winning a jackpot in a lottery or the benefits of a coincidental discovery which is cleverly marketed in the same way that we would not find it appropriate for a goal to be disallowed because the ball coincidently landed in a fortuitous manner before the feet of the goalscorer.

In addition, life is not a competition and it is far from certain that success – luck – can only be measured according to the extent to which someone is well heeled.

One person may pursue success through a generously salaried career in a bustling cosmopolitan environment, while another may opt for the peace and space of an outlying area, where life is less hectic and nature is closer at hand.

People are not identical in this respect either, fortunately so. After all, a person is not a number, not a statistical item but a creature of flesh and blood.

Liberals feel that people should be able to develop their potential based on their own aptitude and interests. This produces a pluriform society, the result of acknowledging the unique nature of every individual.

'Correcting' such outcomes, which seeks to eliminate or reduce inequality, amounts to an affront to the dignity of the individual. Brushing away inequality which has arisen due to the different decisions that free people have made is only possible by depriving them of their liberty.

Indeed, it is then that a liberal will opt for freedom rather than equality. No person is identical to another. It is for this reason that we liberals do not deplore and combat such forms of inequality but celebrate them instead.

We concur with Friedrich Hayek (1899-1992) when he says, *"If the result of individual liberty did not demonstrate that some manners of living are more successful than others, much of the case for it would vanish."*

Financial autonomy versus equality of opportunity

It should be acknowledged that some people do not owe their socio-economic position to their own success in life but to that of their parents. Through an inheritance they benefit, without having provided any substantial service, from the dexterity, luck or thrift of the previous generation.

Liberals are traditionally divided as to how desirable this is. On the one hand, it is perfectly natural for parents to want to give their children the best possible start in life, but on the other hand, some children are given an undeserved advantage that is at odds with the ideal of equality of opportunity.

Anyone who had hoped that the left-wing economist Thomas Piketty would have something original to say about this dilemma in his weighty tomes, *Capital in the Twenty-First Century* and *Capital and Ideology*, will be severely disappointed. Piketty worries that inheritances will further exacerbate what he sees as the already excessive wealth inequality and therefore advocated higher inheritance taxes.

However, in most European countries there is no single inheritance tax but rather a complex system with all sorts of rates and exemptions. The essence of such a system is that the further an heir is distanced from a testator, the more they will pay in the way of inheritance tax.

In Piketty's own France, for example, children pay exceptionally little inheritance tax, whereas unrelated heirs (a good friend, for instance) are immediately required to remit 60% to the tax office. Although the differences are less extreme in the Netherlands, there too a friend or acquaintance pays three to five times more inheritance tax than a child.

Are inheritances deserved?

This progression based on kinship is at odds with the most important justification for inheritance tax, which says that if a person is required to pay tax on the financial fruits of their labour, it is perfectly reasonable to require children to pay tax on wealth accumulated by their parents. After all, it is not the child's merit to have a wealthy parent.

Nevertheless, in many countries children are automatically entitled to a certain part of the inheritance and, as mentioned, at a far more favourable rate than those who are not children. There is the rub because, if there is a single category of heirs who can definitely be said to have deserved their inheritance, then it is those heirs who are not related to the testator.

For why would a testator want to leave all or some of their assets to someone who in genetical terms is an utter stranger? Apparently, such an unrelated person has shown themself to be somehow deserving in the eyes of the testator.

The testator needs to take action (draw up a will) to ensure that such a deserving person obtains an inheritance. On the other hand, parents need not do anything to ensure that their children inherit.

Their estate automatically goes to their offspring upon their death by operation of the law. The fact that unrelated heirs must nevertheless pay much more in the way of inheritance tax is extremely questionable from a liberal perspective.

In his books Piketty constantly casts doubt as to whether someone has actually deserved their wealth in moral terms. For example, in an aggrieved tone he writes that the late Steve Jobs' wealth amounted to one sixth of that of Bill Gates, although Apple's products are considerably more innovative than those of Microsoft, according to those in the know.

Whether he is right in this respect is another matter, but you would expect someone as obsessed with inequality and earnings as Piketty to denounce the tax discrimination against unrelated heirs. Yet he remains completely silent on this matter.

Given a tax rate of 60% in the case of friends and acquaintances, Piketty can probably not imagine any Frenchman wanting to leave money to a person who is not a member of his family, although it would have been to his credit if he had stopped to put himself in the shoes of the growing elderly population without children.

Considering the fact that inheritances for unrelated heirs automatically involve merit – from the testator's perspective, at least – one could even argue that it is precisely this category of heirs that should actually pay less tax than heirs who are related to the testator by blood.

However, such a system would suffer from exactly the same shortcoming as the current systems in Europe, namely, that the government tries to steer people's financial planning through rates and exemptions. Whether someone wishes to leave something for their children or for a caring girl in the neighbourhood ought to be a personal decision. And the government should *certainly not judge* whether an inheritance is deserved or not.

It is for this reason that we are pleading for a relationship-neutral inheritance tax which gives heirs an equal tax treatment and allows the testator to choose how he or she wishes to distribute the inheritance, without government interference. Many testators would probably still want their children to inherit, but friends or acquaintances who inherit would no longer be disadvantaged.

An interesting side effect could be a reduction in wealth inequality. After all, if inheritance taxes were to become relationship-neutral, the incentive to retain wealth within the family would disappear. This should be music to Piketty's ears.■

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A new role for business schools at the forefront of change

Eric Cornuel is President of EFMD (European Foundation for Management Development)

The pandemic left little choice but to throw learning institutions into a period of transformation and change. Disruption in the learning modalities unfolded, bringing digital platforms to the fore and sparking new innovative methods to further academic goals.

It was not only a moment of an accelerated tactical adaptation for us but also a moment of profound strategic reflection about our mission and values.

One of the key issues is the return to the source of the impact that business education can have on its environment. The disruption brought by the pandemic prepares ground for a new mandate for higher education institutions which looks at how institutions can have an even more positive impact on societies and ecosystems, but also how they can integrate into them even more harmoniously and effectively.

Management schools and educators should not be passive observers; they must contribute more by addressing global challenges in an increasingly complex environment. And there are many global issues that need to be tackled with quite some urgency.

You can feel the increasing tensions that exist today among a diverse range of people. Dangerous political phenomena are part of the equation. We notice an important disconnection between the political world and the rest of society that is very detrimental to trust in institutions and democratic systems.

The Edelman Trust Barometer[1] shows that trust in elites has eroded immensely, and people across all social strata have lost trust in politicians, big business, financial institutions and the media.

The 2021 results revealed an epidemic of misinformation and widespread mistrust of societal institutions and leaders around the world.

And these sentiments are not surprising. The burden of the 2008 financial crisis has been largely taken on by citizens, which has left some with the impression that the financial sector is above the law. When the system started to crack, and everything eventually collapsed, people felt that society picked up the pieces.

Karl Marx said that the end of capitalism will come from finance. I'm not a Marxist by any means, but in light of current events, it seems he was not far off the truth.

A lack of leadership in political and business governance results in the rise of anxiety and stress, unemployment, and societal defragmentation. We risk seeing ever more disenchanted and angry citizens of all generations forming a precariat, or precarious proletariat, so well described by Guy Standing. These are people who do not enjoy stable employment, rising income and a sense of belonging.

The growing precariat is coupled with a shrinking middle class. The famous 'elephant chart' designed by the economist and demographer, Branko Milanović, shows that in Western countries, people at the very top of the income distribution realise huge gains while the poorest, sitting quite figuratively at the bottom of the tail, have seen marginal improvements. In between sits the middle class.

Another phenomenon is the stalling of economic mobility across generations. The next generations are not moving up the income ladder, which was a perceivable trend since the end of WWII. We must correct by taking meaningful and strong action against the dominant, at least in practice, shareholder value model.

In fact, the shareholder value model is more recent than the stakeholder model, which emerged after the Second World War in the US. At the time, people embraced a much broader role of corporation and this ethos comes back to the mainstream discourse now, and for good reasons.

As business schools, we must actively advocate to put an end to this approach. One of the critical issues for companies as well as for organisations such as ours is to raise awareness and embrace a cohesive ecosystem approach, but this requires a paradigm shift.

Business schools have a critical role to play to rewire our missions for relevance and impact, and to be close to the needs and address real issues of society and economy.

At EFMD, we have been strong advocates of a broader approach to the role of business and management education,

and we try to encourage business schools and companies to follow this route.

Our current business education model favours academic research loosely coupled with societal needs. Several years ago, Christian Terwiesch and Karl Ulrich from the Wharton School estimated the cost of creating an A-Journal article at approximately $400,000 (about €350,000). Despite these immense amounts pouring into the systems, there is too much disconnection between research and business practice.

There is an emphasis on quantity over quality and novelty over replicability. We are spending a lot of time writing papers with unclear value to practice and frankly, to knowledge. Sadly, the main motivation is often to be published in a specialist A-journal that a narrow circle of your peers read, not to contribute to a better management of organisations or societies.

We have, of course, a scientific mission but a societal one too. The academic impact and rigorous research are important, but we also have a vital societal responsibility.

Being uniquely positioned at the intersection of social science, technology and business, and having a reasonable degree of institutional autonomy, we can contribute immensely to solving global and complex challenges such as climate change, rising inequalities, international isolationism, eroding democratic systems, and the spread of fake news.

The dominant research model must evolve fast, otherwise, we may go from 'publish or perish' to 'publish and perish'. We need to move towards an open system instead of an atomised intellectual endeavour that is constrained to narrow academic circles.

We need faculty members to be engaged in, and most importantly, rewarded for applied projects, multidisciplinary research, innovation in teaching, engagement in society and communities. We need more engaged professors, as Andrew Pettigrew calls them.

This is precisely a vision that we support via the Responsible Research in Business and Management network, initiated by Anne Tsui and supported by a group of renowned scholars. I realise that the entire ecosystem including business schools, research funding agencies, publishers, ranking media outlets, and accreditation bodies have a role to play here.

The digital revolution and rapid hybridisation of learning experience has accelerated interesting phenomena that may pave the way for the future. We can envisage a repository of shared learning resources across business schools around the world and, in a sense, re-nobilitate the role of faculty, who instead of conveying fundamental knowledge, could devote this time to in-depth discussions and development of analytical skills among students.

"A lack of leadership in political and business governance results in the rise of anxiety and stress, unemployment and societal defragmentation"

In other words, we don't need 100 introductory courses in accounting, but we need graduates who can think critically about the potential impact of their marketing campaigns on the trust in democratic institutions.

Lifelong learning means not only reskilling and upskilling, but also an opportunity for nurturing a closer connection between alumni and their alma mater. The faculty could enjoy a coaching and mentoring role, advising on career choices and leading intellectual exchange that goes way beyond the moment of graduation. The word faculty adopted for academia in the late fourteenth century from an old French faculté, meant *"ability in knowledge."*

And here, there is a great role for business schools to set this strategic compass in motion. We can be a central node in an ecosystem linking higher education institutions, business and society, but I also realise how challenging and brave it is for many business schools to be at the forefront of change, operating in a complex system of stakeholders, with sometimes conflicting interests and dynamics.

In this context, the Rotterdam School of Management[2], with its mission to be a force for positive change in the world, by carrying their innovative mindset into a sustainable future, couldn't be more timely.

The COVID-19 crisis makes it more important than ever to take a more global approach to recovery. We need more international cooperation and a greater emphasis on societal issues.

The question remains: is this a credible scenario? Is there room for optimism? Or will the political and economic agendas of the few push us towards a wilder capitalism driven by opportunistic and populistic leaders?

I hope the former, but it's up to us, really. ■

Endnotes
1. https://www.edelman.com/
2. https://www.rsm.nl/

This article was first published in EFMD Global Focus [https://www.globalfocusmagazine.com/], Issue 1 Volume 16

Accessing opportunity

Ed Bolen is President and CEO the National Business Aviation Association (NBAA)

Around the world, business aviation is a force-multiplier – opening doors, boosting efficiency and productivity, bringing people face to face and helping companies everywhere succeed. The COVID-19 pandemic underscored the value of this transport mode, which provides optimal point-to-point control over the health and safety of passengers and crew.

That said, on the international stage, a new factor has entered the business aviation equation. The ongoing conflict between Russia and Ukraine continues to affect the business aviation sector across multiple levels, from the immediate and long-term impact on operations, to broader concerns including geopolitics, banking, transactions, asset management and even cybersecurity.

For example, airspace closures have already been disruptive to established traffic patterns throughout the region. The chief pilot for a large flight operation recently noted flight times from the US to India and the Asia-Pacific have increased by as much as five hours, with European operators facing similarly circuitous flight routing and diversions around Russia and Ukraine airspace.

This environment makes it more important than ever to have a robust network supporting your international operations, particularly if you're a novice to international flying or trip planning.

Guidance from reputable trip support vendors and respected intelligence and flight handling providers can make the difference between successfully completing your trip and running afoul of international restrictions.

Operators are also encouraged to utilize information resources from their respective countries, as well as online providers that list the latest official advisories (in the US, these are known as Notices to Air Missions) and other state-issued travel guidance.

Sanctions stress oil market, supply chain

The Ukrainian crisis also carries ramifications across other

aspects of the industry, including additional stress on the global supply chain that will likely impact production rates during a time of high demand for new aircraft.

Companies with business ties to Russia also must consider the impact of international sanctions, with the environment changing *"almost by the hour,"* noted Ron Epstein, senior equity analyst for Bank of America.

The sanctions also carry significant ramifications for aircraft transactions, and place renewed emphasis on the importance of vetting buyers and sellers to ensure no blocked entities are party to the deal. Thorough documentation and due diligence by both parties are vital to avoid risk of government seizure and forfeiture.

As readers of *World Commerce Review* know, uncertainty over sanctions against Russian oil have already driven up fuel prices, with the potential for even more significant consequences to the global market. Prices have already climbed well above $100 US per barrel and are likely to exceed historic highs, due to anticipated international supply chain shocks coupled with high demand as travel returns to pre-pandemic levels.

Increased cyber-attacks by Russian actors against Ukraine and members of the North Atlantic Treaty Organization are also likely with the potential to disrupt both governmental and private computer systems, communications networks and power distribution systems.

All these circumstances stand to affect some amount of global business aviation activity going forward. *"The Ukraine crisis is having a direct effect on a relatively small share of overall flight activity,"* noted a recent WingX Advance market report, *"but the proliferation of sanctions will significantly complicate the whole business aviation market, especially in Europe, across the field from flight operations to charter brokerage, aircraft financing, management and maintenance."*

"At EBACE, the European business aviation community may learn about how new advanced technologies will impact their business, and which innovations can help make them more profitable and sustainable"

Industry remains resilient

Despite these challenges, I'm encouraged by the industry's continued spirit of resilience and innovation that has served it so well throughout the COVID-19 pandemic.

Financial analysts recognize this perseverance and remain generally optimistic about the sector: *"We're still bullish on business aviation,"* stated one analyst to NBAA, with another predicting *"…we're going to finish the year better than where we started from a business perspective and economic perspective."*

The current situation underscores the timeliness of the upcoming 2022 European Business Aviation Convention & Exhibition (EBACE2022.) Taking place from 23-25 May in Geneva, Switzerland, the first in-person EBACE since 2019 will offer a variety of sessions and other opportunities highlighting the very latest developments affecting business aviation in Europe and around the globe.

EBACE2022 is the place to experience new and future-forward aviation technologies, from an expansive outdoor aircraft display featuring more than 40 of the latest business aircraft – everything from high-tech small aircraft through ultra-modern intercontinental jets – to indoor exhibits of the advanced air mobility and eVTOL (electric vertical takeoff and landing) aircraft, state-of-the-art avionics and much more from all of the top manufacturers.

At EBACE, the European business aviation community may learn about how new advanced technologies will impact their business, and which innovations can help make them more profitable and sustainable, offering an important opportunity for attendees to engage with companies that are paving a new way in the business aviation marketplace.

Equally important, EBACE offers an opportunity for newcomers to the sector to learn more about how business aviation can suit their needs, not just in Europe, but anywhere around the world – perhaps especially in these tumultuous times.

On behalf of NBAA and the European Business Aviation Association, co-hosts of EBACE, we look forward to welcoming the global business aviation community back to Geneva for what promises to be an exciting look at the future of business. ■

Recollections on financial stability

Sir Jon Cunliffe is Deputy Governor Financial Stability, Member of the Financial Policy Committee, Member of the Monetary Policy Committee and Member of the Prudential Regulation Committee

Almost exactly 25 years ago, on the day after a general election, I was handed the incoming government's surprise, detailed plan for giving the Bank of England operational independence in monetary policy making.

I was a Treasury official at the time. I was allowed to tell only a couple of colleagues and together we worked through that night and over the subsequent Bank Holiday weekend so that, three days after taking office, the new Chancellor could announce not just that he was giving the Bank monetary policy independence from that day but the key details of how the new system would work.

Over subsequent months, we prepared the necessary legislation, redrawing the functions of the Bank of England, and managed its passage through Parliament until the Bank of England Act 1998 was on the statute book[1].

The Act did not mention financial stability, even though the legislation transferred the Bank's responsibility for the supervision and surveillance of banks to a new authority, the Financial Services Authority. The reforms to the Bank were focussed on the pressing issue of the time – the UK's high and volatile record on inflation.

There was, it is true, some consideration at the time of how the Bank, the Financial Services Authority and the Treasury should work together on financial stability issues. This was codified in a memorandum of understanding between the three authorities later that year, clarifying the roles of each and setting up the so called 'Tripartite Committee' to pursue *"the common objective of financial stability in the UK."*

But there was no statutory backing for this objective – nor was the Bank or the Financial Services Authority given any specific powers to secure it[2]. The Bank did not get a financial stability objective until 2009.

I should emphasise at this point that this was not some idiosyncratic UK blind-spot[3]. As the Global Financial Crisis was to reveal brutally, some 10 years later, the increasing integration and liberalisation of the global financial system that had been in train since the last decades of the 20th century had not been accompanied by anything like a commensurate attention to financial stability. Warning signs were not recognised. And when the crisis struck, institutional arrangements were found sorely lacking in all of the key jurisdictions.

The depth and duration of the economic damage done by the near death of the global financial system over 10 years ago, led to a general realisation of the cost of losing financial stability[4] and the need for greatly reinforced mechanisms to prevent it happening again.

In the UK, following the model of the monetary policy reforms ten years before, an independent committee of the Bank of England – the Financial Policy Committee (the FPC) – was established, armed with serious powers and charged with the responsibility of ensuring financial stability.

And, shortly after its formal establishment, in 2013, I was appointed Deputy Governor for Financial Stability. I have often, by the way, wondered whether this twist of fate was poetic justice for the failure of my younger self to understand the fundamental importance of financial stability back in 1997.

I have, in any event, spent the last 8 years, trying to embed and develop the domestic and international machinery to ensure we can have a vibrant and innovative financial system – but without periodic financial stability crises.

I want to set out some of the key lessons over that period I have learned about financial stability – about the FPC's objectives and its scope and also to talk a little about some of the challenges it currently faces.

The objective: what are we trying to achieve?

I'll start with a question that I have been asked many times over the last 8 years: *"what exactly are you trying to achieve?"* It is a very reasonable and a rather awkward question. While there are many indicators of financial activity, there is no single metric, no quantified objective for financial stability.

My answer is rooted in the human characteristic that makes financial activity – and indeed, economic growth – possible:

our ability to envisage the future. Human beings are probably unique in being able to imagine the future.

I say 'probably' because there may be evidence that suggests that some animals may share, to a limited degree, our ability to engage in what has been termed 'mental time travel' – the ability we have in our minds not only to recall the past but to use past experience to form expectations of the future.

Mental time travel no doubt evolved because it gave us advantages as a species. It is fundamental to the development of economic life which is inextricably bound up with our ability to form expectations about the future and to make claims upon it[5].

However, though we can envisage the future, we cannot know it. Whether we form our expectations by extrapolating our memory of the past or whether they are rationally formed on the basis of all available evidence, they are expectations, no more. And when, for whatever reason, the future does not match those expectations there has to be a correction.

Such corrections happen every day, of course. The future, when it arrives can exceed or disappoint expectations and investors make or lose money as a result. However, if the correction is very large and widespread, the shock can endanger the financial system as a whole, particularly if the dynamics in the system amplify rather than dampen the impact.

The correction can come because expectations of the future have become highly unrealistic and cannot be sustained, as happened in the years leading up to the Global Financial Crisis[6].

But it can also happen because an unanticipated event causes a sharp adjustment of expectations, as happened at the onset of the COVID pandemic two years ago – and indeed may be happening now as expectations adjust to the reality of the invasion of a peaceful European country by its neighbour.

Such corrections cannot be avoided. They are a feature of the financial system, generated by the fact that we can envisage the future but we cannot predict it.

The task of financial stability authorities is to ensure that when shocks occur, the financial system is resilient so that it does not amplify the impact on the real economy but rather, to the extent possible, is able to absorb them[7].

It's the tail that matters

It follows from this that financial stability authorities must focus on what could happen rather than just what is most likely to happen.

This is very different to monetary policy. For the MPC the key question is: *"what is our central forecast – the most likely outcome[8] – for inflation and GDP, and in the light of that how should policy respond?"*

The FPC's primary concern is not the central probability – what is most likely to happen – but rather the severe but plausible possibilities that lie in the 'tail' of the probability distribution, so called 'tail events'. The key question for FPC is *"what could plausibly happen and, if it happened, would the financial system amplify or dampen the shock?"*

"... securing financial stability means ensuring the financial system has the resilience to withstand severe and unanticipated shocks, however generated"

This is the basis on which we stress test the core banking system every year. To be clear, we do not try to anticipate specific types of shock – such as pandemics or wars.

Rather, using historical data, we anticipate the impacts a major shock could have on the economy – on growth, inflation, unemployment, house prices and financial markets, for example interest rates, asset prices and currencies. We then test the major banks to ensure they can withstand a stress scenario comprising those economic and market impacts.

The benefits of focussing on the tail were demonstrated vividly at the outset of the COVID crisis two years ago. The realisation of the impact of the pandemic and of the restrictions on economic activity that would be required to contain it led to an abrupt and very large correction in expectations of economic prospects.

Unlike the Global Financial Crisis, however, that correction did not lead to a loss of confidence in the banking system, to fears that it did not have the resilience to absorb the hit.

Governments, as we now know, subsequently stepped in with fiscal support to cushion the impacts on the real economy and which minimised the impact on the banking system. But in those early weeks, before the extent of fiscal support was known, the banking system remained robust and indeed was able to meet a dramatic increase in precautionary borrowing by the corporate sector[9].

One cannot of course assume that Governments will always be able or willing to provide fiscal support to cushion a shock. That is why it was important, throughout the COVID crisis to continue to test the banking system to see if it could withstand a further major shock of similar severity – but without government support to the economy. The results confirmed that it could.

Focussing on the tail has been a key to ensuring the banking system, which was the epicentre of the 2008 financial crisis, supports financial stability. But, this leads me to the second lesson I have learned over the past 8 years: financial stability is about more than the banking system.

It's not just banks…

Non-bank finance – the vast ecosystem of investment funds, pension funds, insurance companies, sovereign and private wealth funds – now accounts for around half of global financial assets[10].

Most of the growth in finance since the Global Financial Crisis has come on the non-bank rather than the bank side[11]. This growth in non-bank finance helped to support the real economy as it recovered from the downturn.

Non-bank finance carries different and perhaps lesser risks than banks[12]. Unlike banks it is less an issue of large systemic institutions but more of correlated actions by a large number of diverse players. But the sector presents its own financial stability risks.

It can be subject to 'run risk' where investors seek to redeem their investments and this leads to demand for liquidity to meet these redemptions, often in illiquid markets.

Non-banks are highly interconnected with the rest of the financial system, which means that shocks transmit quickly, including to systemic institutions, such as banks.

The FPC has been concerned for a number of years about how market-based finance might behave under a systemic stress[13]. But the breadth of the sector, the number and diversity of participants, the lack of data and the cross border nature of non-bank finance have made it far harder to apply a stress test approach like we do for banks.

We do, however, now have the result of a real life stress event, the COVID shock of two years ago. This exposed some important vulnerabilities in non-bank finance.

In February 2020, as the implications of the COVID pandemic became clearer, there was a 'flight to safety'. Investors shifted from riskier assets to safer and more liquid assets. The prices of safe assets like government bonds and gold rose. Such a shift is the correction one would expect given the adjustment in expectations of global economic prospects.

But the non-bank financial system proved unable to manage the correction. Around the first week of March 2020, what had been a move to safe assets turned into an accelerating 'dash for cash'.

In order to obtain cash – and with markets for less liquid assets effectively closed – investors sold their safest assets because they needed to meet margin and redemption requirements.

As the price of safe assets dropped, the 'dash for cash' was amplified: money market funds, investment funds, hedge funds, pension funds and others were forced to sell more assets in order to meet redemption requests, pay margin calls and reduce leverage. Core government bond markets began to seize up[14].

At a time of great stress when the global economy needed the support of easier financing conditions, the opposite was

happening. Market interest rates rose. In a nutshell, the 'dash for cash' was amplifying the economic stress of the pandemic.

These dynamics were halted only by massive central bank intervention to support the market and restore order. Around the world central banks announced plans to purchase more than $1.5 trillion of additional assets in total in March 2020. In the UK, the MPC quickly increased the stock of asset purchases by £200 billion[15].

The real-life stress test of March 2020 demonstrated how non-bank finance can amplify shocks. In November 2020 the Financial Stability Board published its initial analysis of how the various elements of the system may have contributed to the stress. Further, more detailed work is underway[16].

But with one or two exceptions, we are still a long way from agreement about whether and how policy action should be taken to make the non-bank financial system more resilient to the stress of a large correction.

And until we take coordinated international action in the areas identified by the Financial Stability Board, we remain, in my view, vulnerable to the risk that non-bank financial system amplifies a future major correction to expectations.

I will return to this concern later when I address the financial stability challenges we face today. But first I want briefly to touch on two other lessons I have learned about financial stability.

It's not just the financial sector…

The first is that financial stability is about more than the financial sector.

As I noted at the outset, the economic damage to the UK from the Global Financial Crisis was exceptionally deep and the recovery was slower than the recovery from the great depression of the last century.

One material reason for that, was that in the crisis highly indebted households cut back more sharply on their consumption. This in turn deepened and prolonged the recession, adding further to the damage to the financial sector[17].

Household debt relative to household income is an important metric for financial stability. There is a sizeable body of research on the link between rapid increases in household debt and financial crises[18].

High levels of household debt relative to income are also associated with longer and deeper recessions[19]. In the UK, household debt is driven primarily by mortgage borrowing, which in turn is driven by demand for housing and house prices[20].

In 2014, the FPC decided to introduce policy measures to constrain the growth of household mortgage debt to income, particularly in the event of a housing boom. Last year it published its latest review of those measures[21].

We have published extensive evidence and research on the impact these measures have had and the role they play[22]. I will not go into this in detail.

However, it is, I think, reasonable to conclude that they have had an impact in keeping household debt, in aggregate, growing in line with household income. And, though this is less well-established, keeping house price growth more in line with income growth.

The FPC's action on mortgages can be viewed through same the lenses of expectations, corrections that I used earlier. When household expectations of future prospects and income have to adjust sharply, the correction is more damaging – to the economy and to the financial sector – if household debt to income is high.

It isn't just financial risk

The final lesson that I will touch on briefly is that financial stability is about more than the financial risks when expectations have to adjust. The financial system is also vulnerable to operational risks which, were they to crystallise could bring key elements of the system down and cause a financial crisis.

Quite early in its existence, the FPC recognised the importance of the risks of cyber attacks on the financial system and instituted a programme of cyber penetration testing of key financial firms and of cyber stress tests of key parts of the system. I have to say that these risks look less and less like tail risks by the day.

This focus has also broadened to cover system resilience to operational risk more generally. This area of the FPC's work is very different to the work of ensuring the banking system can absorb losses or that the non- bank financial system is not prone to severe liquidity stress. But it is, as recent events perhaps demonstrate, an essential part of ensuring financial stability.

Future challenges

Having looked back at some of the lessons of the last 8 years, I want to conclude by looking forward at some of the challenges to financial stability going forward.

I will begin by briefly highlighting two challenges that are likely to be with the FPC for many years and long after I have left the committee – climate and crypto. I will then spend a little more time on the immediate challenges to financial stability of the current conjuncture of high inflation, tightening monetary policy and a war in Europe.

Climate change is in many senses the most systemic risk we face, as the IPCC's latest report reminds us. The physical effects of climate change, such as more frequent severe weather events, and the policies necessary to reach net zero have financial sector risks.

While many in government, industry, and finance are working to support the transition to a net zero economy, the future temperature pathway and policy outlook remains uncertain. To help the financial system navigate through this uncertainty we can use climate scenario analysis and stress testing to explore a range of possible futures.

We are currently considering the responses of the UK's first stress exercise to assess the resilience of the core financial system to different climate scenarios.

Over time these types of exercises and improvements in the underlying scenarios should give us a good understanding of the climate-related vulnerabilities that exist across the financial system and better inform our policy response. This will be an increasing focus of the FPC's work in coming years.

The advent of crypto technology in finance poses a very different set of questions. Recording and transferring ownership of assets is the bedrock of the financial system's role in storing value and in making transactions.

Crypto technology enables recording and transfer to take place without the banks or custodians that have historically carried out this function. At present, these technologies have been used in finance mainly to create speculative investment assets like Bitcoin. These are highly volatile because they have no intrinsic value – in other words as there is nothing behind them there is nothing to prevent their value going to zero.

The value of such assets has grown very rapidly over the past few years, and they are beginning to become connected to

the conventional financial system. We have also seen strong growth, though from a lower base, in so called 'stablecoins' – cryptoassets used for crypto payments like Tether.

And, more recently, we have seen early examples of the combination of crypto technology and the public blockchain with so called 'smart contracts' to offer financial services like lending or derivatives, algorithmically and wholly outside the conventional financial system – and outside regulation.

A great deal has been said recently about the financial stability risks from crypto[23]. In a nutshell, crypto is not at present large enough or connected enough to represent a financial stability risk. But it is growing and developing fast.

I am not a technologist but it I think is a fair bet that the use of these technologies in finance will offer benefits in finance and will grow. And as it does so the distinction between the crypto world and the world of conventional finance will become less and less clear.

Regulatory authorities are now engaging to ensure that as this technology is used to a greater extent and in different ways the same risks are protected to the same extent, whether a financial activity is carried out using crypto technology or conventional finance. This will be a major focus of financial stability and other authorities in coming years.

The current conjuncture

I want to return now to non-bank finance and the nearer term challenges of the current conjuncture. As I noted earlier, non-bank finance now makes up about half of the global financial system. The growth of this channel of finance has benefits.

One of the lessons learned in the financial crisis was that economies that were over dependent on the banking channel for providing credit to the economy suffered more when that channel broke down. In contrast, economies like the US that also had a strong non-bank finance channel suffered less economic damage.

But the growth of non-bank finance since the Global Financial Crisis has also been characterised by the so called 'search for yield'. These markets have expanded in the world of very low interest rates and abundant liquidity that has been necessary to return chronically low inflation to target and support growth.

Over the period, as investors have searched for higher returns they have had to take on more risk. There has been marked growth in riskier types of debt and in equity markets. The leveraged loan market – riskier lending to corporates that already have high levels of debt – has grown rapidly[24]. Lending standards have also weakened, increasing the risk.

The level of risk taking reached particular highs in 2021 as the world economy started to emerge from the pandemic[25]. At the same time, the compensation for risk bearing is, for many assets, close to historic lows[26].

Economic and financial conditions are now changing. The restarting of the world economy following the pandemic has led to major supply side disruptions and strong inflationary pressures.

In many advanced economies, central banks have entered a tightening phase. As interest rates rise to combat inflation, and QE comes to an end or goes into reverse financial asset prices will change and investors will rebalance their portfolios.

The adjustment to the new environment has already started. The price of riskier assets has fallen as expectations of higher interest rates have increased since the beginning of the year[27].

To be clear, a period of adjustment to bring the price of risky assets in line with the new economic and financial environment is not necessarily a financial stability event.

But the necessary adjustment is not without risks. Market expectations of interest rates should, of course, already be factored into financial asset prices. But if those expectations were to change suddenly and markets began to expect much higher rates, we could see sharp moves out of risky assets.

Moreover, if expectations of economic prospects deteriorated – if weaker growth and higher inflation were expected – concerns about creditworthiness could reinforce movement out of risky corporate debt and equities.

To these challenges, we must now add the impact of the Russian invasion of Ukraine – the first such event in Europe for over 70 years. As with the COVID pandemic, the events of the last few days have led to an abrupt shift in our expectations of the future and an increase in uncertainty.

It is not yet clear how these events will play out or what their longer-term impact will be – including in economic and financial terms. Russia is a relatively small part of the world economy, accounting for around 2% of world GDP. It accounts however for a much larger share of the world supply of energy and other commodities.

The sanctions that have been announced will do severe damage to the Russian economy but should not in and of themselves pose material risks to financial stability more broadly.

But the heightened perception of geopolitical risks, and the potential impacts on growth and inflation, can only increase risks around the adjustment away from riskier assets that is already underway[28]. And this comes during a period of relatively low market liquidity[29].

All this comes in the context of the vulnerabilities in non-bank finance, exposed in the 'dash for cash' two years ago, that can lead to powerful and adverse liquidity dynamics under stress. While, as I have set out, there has been considerable and valuable work to analyse and understand these, we have not actually taken any steps to mitigate them.

Financial stability authorities like the FPC are of course closely watching how these adjustments unfold. And we will act as necessary to protect financial stability.

I am not saying that markets will be unable to manage the necessary adjustments. Nor that we will experience another 'dash for cash'.

But all of this, in my view, underlines my first lesson: that securing financial stability means ensuring the financial system has the resilience to withstand severe and unanticipated shocks, however generated.

And that it is able to dampen rather than amplify their impact. We have made great progress towards this over the last 8 years. But there is still, I think, much to do. It is important that we maintain our commitment and take the necessary action to ensure our financial system is resilient.

I started by recalling how we did not pay sufficient attention to financial stability 25 years ago.

The subsequent lessons we learned about its importance were painful and hard won. I very much hope that, as those events become more distant, we do not forget them. ■

Endnotes

1. The Bank of England Act received Royal Assent on 23 April 1998 and came into force on 1 June 1998.
2. The Financial Services and Markets Act in 2000 did not mention financial stability.
3. Note that the Maastricht revisions to the EU treaty that created the ECB did not include a reference to financial stability.
4. The Global Financial Crisis led to a loss of economic activity equivalent to around £20,000 per person in the UK, based on the net present value of the shortfall in income since 2007 compared to its pre-2007 trend (Brazier 2019 [https://www.bankofengland.co.uk/-/media/boe/files/speech/2019/citizens-in-service-not-people-in-power-speech-by-alex-brazier.pdf]). The level of real GDP in the UK did not return to its 2007 level until 2012 and it has remained below its pre-2007 trend ever since.
5. Expectations is an important topic in economics. The workhorse macroeconomic model that the MPC uses to produce its forecast assumes that consumers and firms have rational expectations – so they can correctly analyse the available information and work out its implications for the future. But there is also evidence that in practice people extrapolate the recent past to form their expectations of the future (Shiller 2000 [https://press.princeton.edu/books/paperback/9780691173122/irrational-exuberance]).
6. See Shleifer and Gennaioli (2018) [https://press.princeton.edu/books/hardcover/9780691182506/a-crisis-of-beliefs].
7. See Brunnermeier (2021) [https://bcf.princeton.edu/the-resilient-society/] for a broader discussion of resilience.
8. The MPC also routinely considers the risks around its central forecast and publishes 'fan charts' to reflect that.
9. In March 2020 net bank lending to UK corporates was almost 30 times its average over the prior three years.
10. The share in the UK is in line with the global average, at around 50%.
11. Global bank balance sheets have grown by 60% over the period whereas non-bank finance has grown by 120%.
12. For example, it generally uses far less leverage. Investors are often also only entitled to the market value of their investment whereas bank depositors are entitled to their money back.
13. The FPC did its first in-depth assessment of non-banks – focusing on investment funds – in 2015.
14. 10-year US treasury yields spiked by 75 basis points in a week, and the average price fell by 6%, even though there was essentially no change in CDS and therefore the market-implied credit risk of the US government. Similar falls were seen in other government bonds including the UK, Germany and France.
15. The Fed announced up to $700 billion in asset purchases and the ECB announced €750 billion.
16. See the Financial Stability Board's Progress report [https://www.fsb.org/wp-content/uploads/P011121.pdf] in November 2021 and Box B of the Bank of England's Financial Stability Report [https://www.bankofengland.co.uk/-/media/boe/files/financial-stability-report/2021/december-2021.pdf?la=en&hash=62FF3E7484FF0FD1AD650FE41A77D32B3750F8CF] in December 2021.
17. See Kovacs, Bunn and Rostom (2018) [http://eprints.lse.ac.uk/90378/1/CFMDP2018-20-Paper.pdf].
18. See Jordà, Schularick and Taylor (2016) [https://academic.oup.com/economicpolicy/article/31/85/107/2392378#64468898].
19. See, for example, Mian, Sufi and Verner (2017) [https://academic.oup.com/qje/article/132/4/1755/3854928] and Bridges et al (2017) [https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/down-in-the-slumps-the-role-of-credit-in-five-decades-of-recessions.pdf?la=en&hash=7AE0571C2EC6F3B95AF5C59B9332A3FEE2C891CE].
20. See Cloyne et al (2019) [https://www.aeaweb.org/articles?id=10.1257/aer.20180086].
21. See Section 3 of the December 2021 Financial Stability Report [https://www.bankofengland.co.uk/financial-stability-report/2021/december-2021] and a recent consultation paper [https://www.bankofengland.co.uk/paper/2022/withdrawal-of-the-fpcs-affordability-test-recommendation] on the FPC's proposal to withdraw its affordability test Recommendation.
22. The FPC's most recent analysis was published in the Technical annex to the December 2021 Financial Stability Report [https://www.bankofengland.co.uk/-/media/boe/files/financial-stability-report/2021/technical-annex-evidence-on-the-fpcs-mortgage-market-recommendations.pdf].
23. See Cunliffe (2021) [https://www.bankofengland.co.uk/speech/2021/october/jon-cunliffe-swifts-sibos-2021] and the recent report [https://www.fsb.org/2022/02/assessment-of-risks-to-financial-stability-from-crypto-assets/] by the Financial Stability Board.
24. Leveraged loan issuance has grown by a quarter since the Global Financial Crisis and there is now a stock of $4 trillion.
25. The issuance of riskier high-yield debt in major advanced economies in 2021 was more than 50% higher than the average of the past decade.
26. Although risk premia – the compensation that investors demand for bearing risk embedded in the prices of financial assets – have increased somewhat in recent months, the premia for many assets remain near the bottom of their historical distributions. This includes corporate bonds, leveraged loans and equities, particularly in the US.
27. The prices of US tech stocks in the NASDAQ index, which are more vulnerable to rising rates than other stocks because of their longer-dated cash flows, have fallen by more than 10% this year. Corporate bond spreads have also widened, although they remain well below historical averages.
28. Equity prices have fallen slightly and corporate bond spreads have risen slightly in the UK and Europe over the last week. At the same time, 10-year government bond yields have fallen and the dollar has appreciated.
29. Some measures of market liquidity such as market depth and bid-ask spreads were already showing signs of illiquidity ahead of the Russian invasion of Ukraine, and have worsened since.

The views expressed here are not necessarily those of the Bank of England or the Financial Policy Committee. I would like to thank Yuliya Baranova, Edward Denbee, Zane Jamal, Ed Manuel, Rupal Patel, Simon Pittaway, George Pugh, Sophie Stone, Nick Vause, Konstantin Wiemer, Matt Waldron and Danny Walker for their help in preparing the text. I would like to thank Andrew Bailey, Sarah Breeden, Jon Hall and Michael Salib for their helpful comments. This article is based on a speech given at The Oxford Union, 2 March 2022.

Digital currencies and the soul of money

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In a speech four years ago I addressed the growth and pitfalls of cryptocurrencies such as Bitcoin[1]. Since then, the debate on the future of money has grown much broader, but it continues to touch on the very foundations of the monetary system.

I will take inspiration from Goethe. The great Johann Wolfgang von Goethe was a well-travelled cosmopolitan and a true universalist. He was a poet and novelist, a playwright and theatre director, a scientist and statesman. Remarkably, his work anticipated some key economic issues of our time, including central bank independence[2].

Goethe's work confronts fundamental questions. In his masterpiece, Faust, he addresses the *"Gretchenfrage"* – a term that has become synonymous with a fundamental question of life. For central bankers, the Gretchenfrage has always been: what is the soul of money?

Today, technologists, innovators and futurists are offering new answers to this question. Some say that in the future, money and finance will be provided by just a few big tech corporations. Others dream of a decentralised system in which blockchains and algorithms replace people and institutions. And maybe, all of this will take place in the Metaverse[3].

My main message is simple: the soul of money belongs neither to a big tech nor to an anonymous ledger. The soul of money is trust. So the question becomes: which institution is best placed to generate trust?

I will argue that central banks have been and continue to be the institutions best placed to provide trust in the digital age. This is also the best way to ensure an efficient and inclusive financial system to the benefit of all.

Let me elaborate on this theme, starting with the institutional foundations of money.

The institutional foundations of money

Money is a societal convention. People accept money today with the expectation that everyone else will accept it tomorrow.

At its core, trust in the currency holds the monetary system together. Like the legal system, this trust is a public good[4]. Maintaining it is crucial for the effective functioning of societies.

Trust requires sound institutions that can stand the test of time. Institutions that ensure the stability of the currency as the economy's key unit of account, store of value and medium of exchange, and that guarantee the safety and integrity of payments[5].

Throughout a history measured not in years but in centuries, independent central banks have emerged as the key institutions that underpins this trust in money. Alternatives have often ended badly[6].

It is for good reason that most countries have established central banks with a clear mandate to serve society. As public policy institutions, central banks have proven successful in upholding trust while adapting to societal and economic change[7]. In pursuing these mandates, central banks have managed to constantly adapt to technological, economic and societal changes.

This is why central banks are actively engaging with digital innovation. They are working on new central bank public goods such as wholesale financial market infrastructures, retail fast payment systems and central bank digital currencies.

Of course, in a market-based system, the private sector remains the main engine of the economy. In today's two-tier monetary system, deposits are by far the most prevalent form of money held by the public, since cash holdings are relatively small. Banks, in turn, place their own deposits with the central bank as 'bank reserves'.

In this case, central banks provide an open, neutral, trusted and stable platform. Private companies use their ingenuity and dynamism to develop new payment methods and financial products and services. This combination has been a powerful driver of innovation and welfare.

But we cannot take this successful symbiosis for granted. Some recent developments may threaten money's essence as a public good, if taken too far.

To illustrate this, let me offer three plausible scenarios for the future of money. In the first, big tech stablecoins compete with

national currencies and against each other too, fragmenting the monetary system.

The second relates to the elusive promise of crypto and decentralised finance, or 'DeFi', which claims to offer a financial system free from powerful intermediaries, but may actually deliver something very different[8].

The third realises the vision of an open and global monetary and financial system that harnesses technology for the benefit of all. You can probably guess which vision I espouse. I will close by discussing what it will take to achieve it.

"Central banks and public authorities are still the glue that holds the monetary and financial system together. Private sector services and innovation are essential and should thrive on this foundation. But trust can never be outsourced nor automated"

Big tech stablecoins

Let's start with stablecoins issued by big techs. Stablecoins are cryptocurrencies that base their value on collateral, often in the form of deposits with commercial banks or other regulated financial instruments. They thus piggyback on the credibility of sovereign currencies. Stablecoins are issued in this first scenario by big techs, or large companies whose primary activity is digital services.

Big techs have made important contributions to financial services. Their new and innovative products have allowed hundreds of millions of new users into the formal financial system[9]. In the process, they have also achieved systemic relevance in several major economies. For example, big techs channel 94% of mobile payments in China[10].

This trend could accelerate if one of these firms were to grow in an unfettered way and create a dominant, closed ecosystem around its own global stablecoin[11].

Once established, a company is likely to erect barriers against new entrants, leading to market dominance, data concentration and reduced competition. In addition, its stablecoin could disintermediate incumbent banks, which could even pose a risk to financial stability.

Moreover, if one big tech stablecoin takes hold, others will seek to imitate it. We may end up with a few dominant walled gardens that compete both with each other and with national currencies, thus fragmenting the national and global monetary systems. As the initial benefits fade, the well-known problems of market concentration will quickly follow.

In addition, the same economic forces that foster inclusion can also cause discrimination, privacy violations and market concentration. One reason is that data are subject to large externalities. For example, one person's data can reveal information about others[12].

Moreover, it is possible that the data holder ends up knowing more about users' behaviour than users do themselves[13]. Armed with exclusive access to data, big techs can quickly scale up and dominate markets.

Let me be clear: it is undesirable to rely solely on private money. Users may initially find great convenience in paying with a big tech global stablecoin. But in doing so they may be handing the keys to our monetary system over to private entities, driven by profits and accountable only to their shareholders and other insiders. Such an arrangement could erode trust. A public good like money needs oversight with the public interest in mind.

The elusive promise of decentralisation

A second plausible scenario for the future of money has attracted a growing number of enthusiasts. This vision replaces institutions with distributed ledger technology (DLT), in principle allowing anyone to be a validator in a shared network. It is embodied in the growth of cryptocurrencies and applications that build on them, such as so-called decentralised finance, or 'DeFi'[14].

DeFi's enthusiasts hold out some very appealing promises: DLT will 'democratise finance', cutting out middlemen such as big banks. More generally, new decentralised protocols will lay the groundwork for 'Web 3.0', or simply 'web3'. In this world, data will be reclaimed from the big techs, and entrepreneurs and artists will keep a greater share of the value they create[15].

Decentralisation can be a noble goal. In many applications, governance improves when power is genuinely dispersed, with appropriate checks and balances. This principle is embodied in free and competitive markets.

But this principle is not what DeFi applications are delivering. There is a large gulf between vision and reality.

To date, the DeFi space has been used primarily for speculative activities. Users invest, borrow and trade cryptoassets in a largely unregulated environment. The absence of controls such as know-your-customer (KYC) and anti-money laundering rules, might well be one important factor in DeFi's growth.

Indeed, a parallel financial system is emerging, revolving around two elements.

The first is automated, self-executing protocols, or 'smart contracts'. But these contracts will never be smart enough to cover every possible eventuality, and someone must therefore write and update the code, and run the platform. In practice, there is a lot of centralisation in DeFi. BIS economists have discussed this 'decentralisation illusion' in recent research[16].

The second element is, again, stablecoins. These grease the wheels of DeFi. As they aim to maintain a fixed value to fiat

currencies, they allow transfers across platforms, and form a bridge to the traditional financial system. Stablecoins are the settlement instrument in DeFi, alongside governance tokens and other more volatile cryptoassets[17].

But stablecoins may not be sound money. One drawback is the fact that they have to tie their value to regulated assets to borrow their credibility. Their issuers have an inherent incentive to invest reserve assets in a risky manner to earn a return. Without appropriate regulation, issuers can diverge from full backing, or test the margins of what counts as a safe asset – as experience has repeatedly shown[18].

More fundamentally, decentralisation comes at a cost. Trust in an anonymous system is maintained by self-interested validators who ensure the integrity of the ledger in the absence of a central authority[19]. So the system must generate enough fees, or rents, to provide these validators with the right incentive.

These rents accumulate mostly to insiders, such as Bitcoin miners, or those who hold more governance tokens[20]. These rents are also a reason why DeFi platforms have been so attractive for venture capital investment[21]. Many protocols entrench insiders, as those with more coins have more power.

Ultimately, high rents for insiders mean high costs for users. So, while insiders who have sold coins to new users have made spectacular returns, efficiency gains for average users have so far failed to materialise. And in the absence of regulation, fraud, hacks and so-called rug pulls have become rampant[22].

In addition, this structure makes it hard for fully decentralised systems to scale up. Achieving agreement in a large network takes time and effort, and consumes energy. The larger the ledger, the harder it becomes to update it quickly.

This is why many DLT systems can only handle a small volume of transactions to date, and often suffer from network congestion. This is also the reason why Bitcoin requires so much electricity. There are a variety of technical proposals to address this trade-off, but they all lead to greater complexity.

Indeed, the need for rents to maintain incentives in a blockchain is a feature, not a bug; it is a case of 'the more the sorrier' instead of 'the more the merrier'. And the growing proliferation of different blockchains means that many competing candidates aim to be a single arbiter of truth.

Meanwhile, DeFi is subject to the same vulnerabilities as are present in traditional financial services. High leverage, liquidity mismatches and connections to the formal financial system mean vulnerabilities in DeFi could undermine the stability of the broader financial system[23].

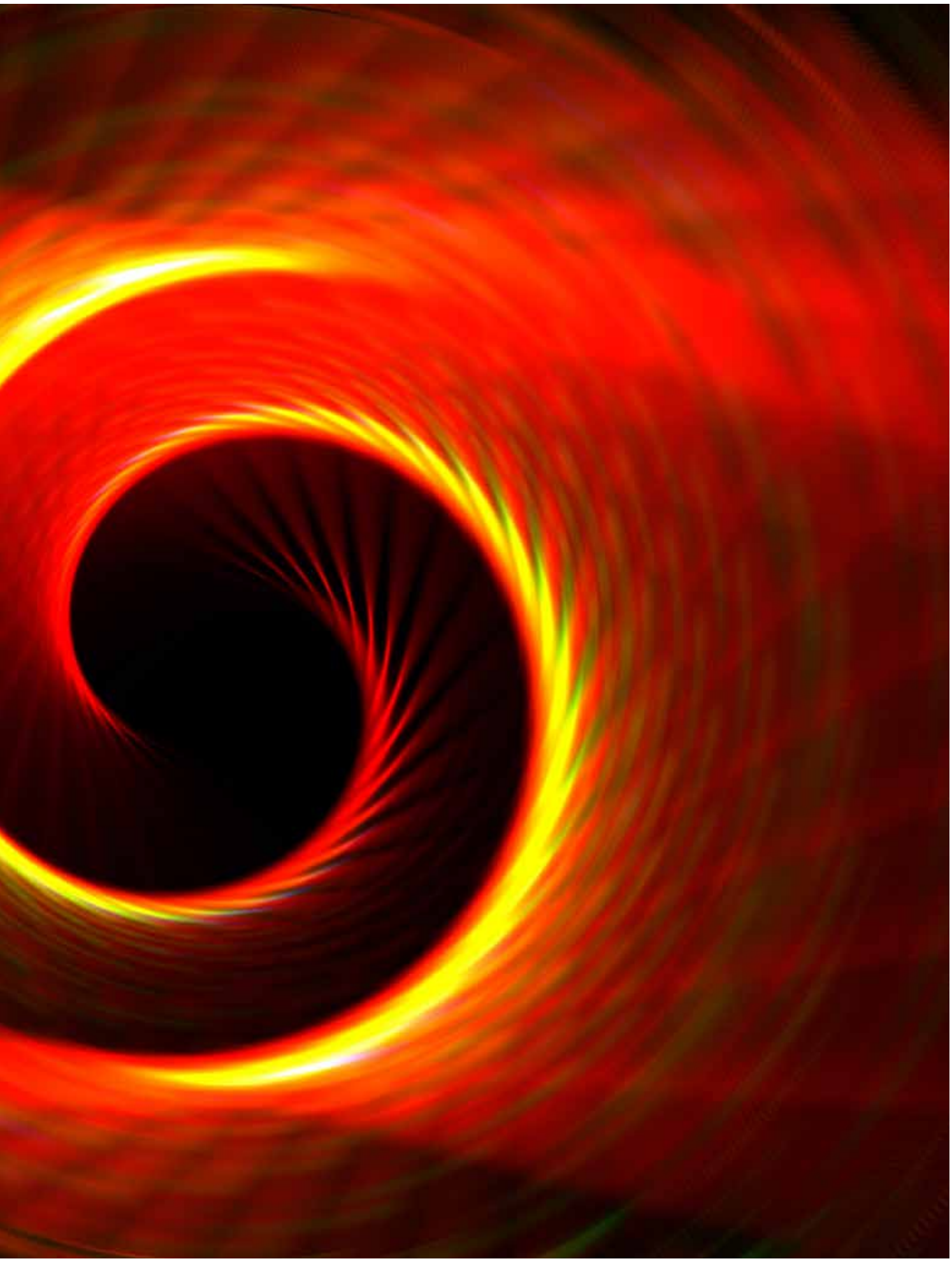
As with money market mutual funds, there is a risk that, during a shock, stablecoins could face runs. With automated protocols, there may also be unpredictable interactions, as liquidity dries up and losses cascade through the system.

Thus, there is a risk that this 'magic', once launched, may spin out of control. As in Goethe's *Zauberlehrling* (*The Sorcerer's Apprentice*), DeFi applications could take on a life of their own, interacting with one another in unpredictable ways. When a crash happens and money is lost, users will inevitably turn to a trusted and experienced party – the public authorities – to tame the unleashed spirits and restore order.

A better approach is possible. Building on sound money, new applications could stand on a stronger footing. They should not be based on anonymity but on identification and trust. And they should comply with financial regulation that is designed to keep the system safe.

Wherever private stablecoins are issued, they need to be adequately regulated to address the risks that they pose, such as runs, payment system risk and concentration of economic power[24].

We also need effective and consistent international policy on stablecoin arrangements[25]. Innovators should not fear regulators but work with them, to make their products more sound and more sustainable.



An open and global system as a public good

In a third scenario, incumbent financial institutions, big techs and new innovative entrants compete in an open marketplace that guarantees interoperability, building on central bank public goods. This means that end users can seamlessly interact across different providers – both domestically and across borders[26].

This would bring about continued innovation, and ever better outcomes for the economy as a whole[27]. Trust in money remains the bedrock of stability. End users would see low costs and convenient services, with safety, privacy and a broad range of payment choices.

This scenario harnesses the benefits of big data and DLT with market structures that foster competition and promote the public good nature of the monetary system.

In this vision, the monetary system is not fragmented into separate walled gardens, nor is it dominated by a few large corporations. There are also no high rents for insiders in anonymous networks.

At the core of this system are central banks. They do not aim for profits, but to serve society. They have no commercial interest in personal data. They act as operators, overseers and catalysts in payments markets, and regulate and supervise private providers in the public interest.

Working together, they can provide central bank digital currencies (CBDCs). Unlike stablecoins, CBDCs do not need to borrow their credibility. As they are directly issued by the central bank, they inherit the trust that the public already places in their currency. They can thus serve as a sound foundation for future innovation.

Central banks can provide this foundation domestically, but also on a global scale. Imagine a global network of CBDCs. Different central banks would design and issue a new form of public money, tailored to their economies and societies' preferences.

Importantly, central banks could work with one another, and with the private sector, to ensure that these domestic CBDCs are interoperable across borders. This would require technical compatibility, the ability for systems to 'speak each other's language' and agreement on rights and obligations[28].

To obtain this, central banks could choose whether to build a network of bilateral links, or they could adopt a hub-and-spoke model or a single common platform. DLT could be used to connect multiple CBDCs issued by different central banks. This would be useful as no single central bank could straddle all the different currencies in the system.

Such a network would be a global version of domestic monetary systems grounded in the trust placed in central banks. It could lower the cost of cross-border payments; increase their speed and transparency; and broaden access to users in different countries. Private providers could interact with clients, conducting know-your-customer and other compliance checks.

The private sector could build a host of financial services on top of such a system, from innovative payments to lending, to insurance and investment services. But safeguards can give users control over personal data. This does not require the selling of speculative coins that serve only to enrich insiders.

The BIS Innovation Hub is working actively to make this vision a reality, with several experiments involving cooperation between central banks and the private sector. What is notable is that many of these projects are based on DLT, where the central banks play the key role. Based on trust instead of rents, these systems overcome the inherent issues with scaling up. They also offer greater safety and efficiency.

Three important BIS Innovation Hub projects all make use of a DLT platform upon which multiple central banks issue their own wholesale CBDCs so that they can be traded between participants to enable faster, cheaper and safer cross-border settlements.

In Project Jura, each central bank maintains individual control over its own CBDC on a single platform with separate subnetworks[29].

In project mBridge, each participating central bank issues its own CBDCs and operates a validating node in a shared system[30].

Project Dunbar explores the advantages and disadvantages of different DLT prototypes and validating mechanisms to support a common multi-CBDC platform[31].

Overall, these projects show that there is significant potential in new technologies, including DLT, if they are applied in a way that builds on the monetary system's existing institutional framework. Central banks, as validating nodes, are not there to make money by mining coins. Instead, they perform this role as part of their public service mandate.

Working in a controlled environment and with industry partners, the BIS and host central banks are developing public goods that can be thoroughly tested and ready to be rolled out in the real world.

Conclusion

The future of money is ours to shape. While central banks share the excitement around digital innovation, we are aware of the potential consequences of some of its incarnations.

The design of money has consequences that concern all of society: the integrity and stability of money and payments, market concentration, consumer rights and efficiency.

Hence, central bankers must work with other public authorities and private stakeholders to make the vision I have described a reality.

Let's innovate in a sound, sustainable way, harnessing the benefits of digital technology in a way that is consistent with our shared values. In particular, let's ensure that our financial

system builds on the existing governance of money, serves the public interest, and works cooperatively with the private sector.

So, let me go back to where I started, to Goethe. The answer to the Gretchenfrage has not changed: central banks and public authorities are still the glue that holds the monetary and financial system together.

Private sector services and innovation are essential and should thrive on this foundation. But trust can never be outsourced nor automated. ■

Endnotes

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This article is based on a speech delivered at the Goethe University's Institute for Law and Finance (ILF) conference on 'Data, Digitalization, the New Finance and Central Bank Digital Currencies: The Future of Banking and Money', 18 January 2022

Preparing for the financial system of the future

Lael Brainard is a Federal Reserve Board Governor

The financial system is undergoing fast-moving changes associated with digitalization and decentralization. Some of these innovations hold considerable promise to reduce transaction costs and frictions, increase competition, and improve financial inclusion, but there are also potential risks. With technology driving profound change, it is important we prepare for the financial system of the future and not limit our thinking to the financial system of today[1].

The evolving digitalization and decentralization of finance

In recent years, there has been explosive growth in the development and adoption of new digital assets that leverage distributed ledger technologies and cryptography. The market capitalization of cryptocurrencies grew from less than $100 billion five years ago to a high of almost $3 trillion in November 2021 and is currently around $2 trillion[2].

In parallel, we have seen rapid growth in the platforms that facilitate the crypto finance ecosystem, including decentralized finance (DeFi) platforms. These crypto platforms facilitate a variety of activities, including lending, trading, and custodying cryptoassets, in some cases outside the traditional regulatory guardrails for investor and consumer protection, market integrity, and transparency.

The growth in the crypto finance ecosystem is fueling demand for stablecoins—digital assets that are intended to maintain stable value relative to reference assets, such as the US dollar. Stablecoin supply grew nearly sixfold in 2021, from roughly $29 billion in January 2021 to $165 billion in January 2022.

There is a high degree of concentration among a few dollar-pegged stablecoins: as of January 2022, the largest stablecoin by market capitalization made up almost half of the market, and the four largest stablecoins together made up almost 90 percent[3].

Today, stablecoins are being used as collateral on DeFi and other crypto platforms, as well as in facilitating trading and monetization of cryptocurrency positions on and between crypto and other platforms.

In the future, some issuers envision that stablecoins will also have an expanded reach in the payment system and be commonly used for everyday transactions, both domestic and cross-border. So it is important to have strong frameworks for the quality and sufficiency of reserves and risk management and governance.

As noted in a recent report on stablecoins by the President's Working Group on Financial Markets, it is important to guard against run risk, whereby the prospect of an issuer not being able to promptly and adequately meet redemption requests for the stablecoin at par could result in a sudden surge in redemption demand[4].

It is also important to address settlement risk, whereby funds settlement is not certain and final when expected, and systemic risk, whereby the failure or distress of a stablecoin provider could adversely affect the broader financial system[5].

The prominence of crypto advertisements during the Super Bowl highlighted the growing engagement of retail investors in the crypto ecosystem[6]. In late 2021, Pew Research found that 16 percent of survey respondents reported having personally invested in, traded, or otherwise used a cryptocurrency—up from less than 1 percent of respondents in 2015[7].

There is also rising interest among institutional investors[8]. So it is perhaps not surprising that established financial intermediaries are undertaking efforts to expand the crypto services and products they offer.

If the past year is any guide, the crypto financial system is likely to continue to grow and evolve in ways that increase interconnectedness with the traditional financial system.

As a result, officials in many countries are undertaking efforts to understand and adapt to the transformation of the financial system. Many jurisdictions are making efforts to ensure statutory and regulatory frameworks apply like rules to like risks, and some jurisdictions are issuing or contemplating issuing central bank currency in digital form[9].

Preparing for the payment system of the future

The Federal Reserve needs to be preparing for the payment landscape of the future even as we continue to make improvements to meet today's needs. In light of the rapid digitalization of the financial system, the Federal Reserve has been thinking critically about whether there is a role for a

potential US central bank digital currency (CBDC) in the digital payment landscape of the future and about its potential properties, costs, and benefits.

Our financial and payment system delivers important benefits today and is continuing to improve with developments like real-time payments. Nonetheless, certain challenges remain, such as a lack of access to digital banking and payment services for some Americans and expensive and slow cross-border payments. Growing interest in the digital financial ecosystem suggests that technology is enabling potential improvements that merit consideration[10].

In addition, it is important to consider how new forms of cryptoassets and digital money may affect the Federal Reserve's responsibilities to maintain financial stability, a safe and efficient payment system, household and business access to safe central bank money, and maximum employment and price stability.

It is prudent to explore whether there is a role for a CBDC to preserve some of the safe and effective elements of the financial system of the present in a way that is complementary to the private sector innovations transforming the financial landscape of the future.

The public and private sector play important complementary roles within the financial system in the United States. From Fedwire to FedNow, the Federal Reserve has over a century of experience working to improve the infrastructure of the US payment system to provide a resilient and adaptable foundation for dynamic private sector activity[11].

In parallel, private sector banks and nonbanks have competed to build the best possible products and services on top of that foundation and to meet the dollar-denominated needs of consumers and investors at home and around the world. The result is a resilient payment system that is responsive to the changing needs of businesses, consumers, and investors.

While the official sector provides a stable currency, operates some important payment rails, and undertakes regulation and oversight of financial intermediaries and critical financial market infrastructures, the private sector brings competitive forces encouraging efficiency and new product offerings and driving innovation.

Responsible innovation has the potential to increase financial inclusion and efficiency and to lower costs within guardrails that protect consumers and investors and safeguard financial stability.

As we assess the range of future states of the financial system, it is prudent to consider how to preserve ready public access to government-issued, risk-free currency in the digital financial system—the digital equivalent of the Federal Reserve's issuance of physical currency.

The Board recently issued a discussion paper that outlines the Federal Reserve's current thinking on the potential benefits, risks, and policy considerations of a US CBDC[12]. The paper

"The digital financial ecosystem is evolving rapidly and becoming increasingly connected with the traditional financial system"

does not advance any specific policy outcome and does not signal that the Board will make any imminent decisions about the appropriateness of issuing a US CBDC.

It lays out four CBDC design principles that analysis to date suggests would best serve the needs of the United States if one were created. Those principles are that a potential CBDC should be privacy-protected, so consumer data and privacy are safeguarded; intermediated, such that financial intermediaries rather than the Federal Reserve interface directly with consumers; widely transferable, so the payment system is not fragmented; and identity-verified, so law enforcement can continue to combat money laundering and funding of terrorism.

Financial stability

Given the Federal Reserve's mandate to promote financial stability, any consideration of a CBDC must include a robust evaluation of its impact on the stability of the financial system—not only as it exists today but also as it may evolve in the future.

In consideration of the financial system today, it would be important to explore design features that would ensure complementarity with established financial intermediation. A CBDC—depending on its features—could be attractive as a store of value and means of payment to the extent it is seen as the safest form of money[13].

This could make it attractive to risk-averse users, perhaps leading to increased demand for the CBDC at the expense of other intermediaries during times of stress.

So it is important to undertake research regarding the tools and design features that could be introduced to limit such risks, such as offering a non-interest bearing CBDC and limiting the amount of CBDC an end user could hold or transfer.

As I noted at the start, the digital asset and payment ecosystem is evolving at a rapid pace. Thus, it is also important to contemplate the potential role of a CBDC to promote financial stability in a future financial system in which a growing range of consumer payment and financial transactions would be conducted via digital currencies such as stablecoins.

If current trends continue, the stablecoin market in the future could come to be dominated by just one or two issuers. Depending on the characteristics of these stablecoins, there could be large shifts in desired holdings between these stablecoins and deposits, leading to large-scale redemptions

by risk-averse users at times of stress that could prove disruptive to financial stability.

In such a future state, the coexistence of CBDC alongside stablecoins and commercial bank money could prove complementary, by providing a safe central bank liability in the digital financial ecosystem, much like cash currently coexists with commercial bank money.

It is essential that policymakers, including the Federal Reserve, plan for the future of the payment system and consider the full range of possible options to bring forward the potential benefits of new technologies, while safeguarding stability.

International considerations

Analysis of the potential future state of the financial system is not limited to the domestic implications. The dollar is important to global financial markets: it is not only the predominant global reserve currency, but the dollar is also the most widely used currency in international payments[14].

Decisions by other major jurisdictions to issue CBDCs could bring important changes to global financial markets that may prove more or less disruptive and that could influence the potential risks and benefits of a US CBDC.

Thus, it is wise to consider what the future states of global financial markets and transactions would look like both with and without a Federal Reserve-issued CBDC. For example, the People's Bank of China has been piloting the digital yuan, also known as e-CNY, in numerous Chinese cities over the past two years[15].

The substantial early progress on the digital yuan may have implications for the evolution of cross-border payments and payment systems. And it may influence the development of norms and standards for cross-border digital financial transactions.

It is prudent to consider how the potential absence or issuance of a US CBDC could affect the use of the dollar in payments globally in future states where one or more major foreign currencies are issued in CBDC form.

A US CBDC may be one potential way to ensure that people around the world who use the dollar can continue to rely on the strength and safety of US currency to transact and conduct business in the digital financial system.

More broadly, it is important to consider how the United States can continue to play a lead role in the development of standards governing international digital financial transactions involving CBDCs consistent with norms such as privacy and security.

Given the dollar's important role as a payment instrument across the world, it is essential that the United States be on the frontier of research and policy development regarding CBDC, as international developments related to CBDC can have implications for the global financial system.

Technology research and experimentation

Given the range of possible future states with significant digitization of the financial system, it is important that the Federal Reserve is actively engaging with the underlying technologies.

Our work to build 24x7x365 instant payments rails leverages lessons from some of today's most resilient, high-performing, and large-scale technology platforms across the globe. It is providing important insights on the clearing and settlement models associated with real time payments as well as on fraud, cyber resilience, cloud computing, and related technologies.

In parallel with the Board's public consultation on CBDC, the Federal Reserve Bank of Boston, in collaboration with the Massachusetts Institute of Technology, has developed a theoretical high-performance transaction processor for CBDC[16].

They recently published the resulting software under an open-source license as a way of engaging with the broader technical community and promoting transparency and verifiability[17].

Moreover, the Board is studying how innovations, such as distributed ledger technology, could improve the financial system. This work includes experimentation with stablecoin interoperability and testing of retail payments across multiple distributed payment ledger systems.

The Federal Reserve Bank of New York recently established an Innovation Center, focused on validating, designing, building, and launching new financial technology products and services for the central bank community[18].

These technology research and development initiatives are vital to our responsibilities to promote a safe and efficient payment system and financial stability, whatever the future may bring.

Conclusion

The financial system is not standing still, and neither can we. The digital financial ecosystem is evolving rapidly and becoming increasingly connected with the traditional financial system.

It is prudent for the Board to understand the evolving payment landscape, the technological advancements and consumer demands driving this evolution, and the consequent policy choices as it seeks to fulfil its congressionally-mandated role to promote a safe, efficient, and inclusive system for US dollar transactions[19].

To prepare for the financial system of the future, the Federal Reserve is engaging in research and experimentation with these new technologies and consulting closely with public and private sector partners. ■

Endnotes

1. I am grateful to Alexandra Fernandez, Lacy Douglas, David Mills, Sonja Danburg, and David Pope of the Federal Reserve Board for their assistance in preparing this text. These views are my own and do not necessarily reflect those of the Federal Reserve Board or the Federal Open Market Committee.
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This article is based on a speech delivered at the 2022 US Monetary Policy Forum, New York, New York, February 18, 2022

Stablecoins Growth potential and impact on banking

Gordon Liao was a Senior Economist, and John Caramichael is a Researcher, at the Board of Governors of the Federal Reserve System

Summary

Stablecoins have experienced tremendous growth in the past year, serving as a possible breakthrough innovation in the future of payments. In this paper, we discuss the current use cases and growth opportunities of stablecoins, and we analyze the potential for stablecoins to broadly impact the banking system.

The impact of stablecoin adoption on traditional banking and credit provision can vary depending on the sources of inflow and the composition of stablecoin reserves. Among the various scenarios, a two-tiered banking system can both support stablecoin issuance and maintain traditional forms of credit creation.

In contrast, a narrow bank approach for digital currencies can lead to disintermediation of traditional banking, but may provide the most stable peg to fiat currencies. Additionally, dollar-pegged stablecoins backed by adequately safe and liquid collateral can potentially serve as a digital safe haven currency during periods of crypto market distress.

Stablecoins are digital currencies that peg their value to an external reference, typically the US dollar (USD). Stablecoins play a key role in digital markets, and their growth could spur innovations in the broader economy.

In the past year, USD-pegged stablecoins circulating on public blockchains have seen explosive growth, with a combined circulating supply of nearly $130 billion as of September 2021 – a more than 500% increase from one year ago.

As stablecoins gain increasing attention in public discourse, a host of issues have been raised, including the stability of their pegs, consumer protection, know-your-customer and anti-money laundering compliance, and the scalability and efficiency of settlements[1]. In this note, we focus our discussion on the potential impact of stablecoins on the banking system and credit intermediation[2].

While a range of stablecoin-related issues may be resolved with appropriate institutional safeguards, regulations, and technical advancements, sustained growth in stablecoins in circulation would ultimately impact the traditional banking system in significant ways that are important to understand.

We first discuss the basics of stablecoins, their current use cases, and their growth potential. Second, we study historical behaviours of stablecoins during past episodes of crypto and broad financial market distress. We find that dollar-pegged stablecoins have exhibited safe asset qualities in that their prices in the secondary market temporarily rise above the peg during times of extreme market distress, incentivizing the issuance of more stablecoins. We also highlight the risk of a 'run' on certain stablecoins that are backed by non-cash-equivalent risky assets.

Finally, we outline possible scenarios for bank reserves, credit intermediation, and central bank balance sheets should stablecoins gain broader traction. Our research suggests the broad adoption of asset-backed stablecoins can potentially be supported within a two- tiered, fractional reserve banking system without a negative impact on credit intermediation.

In such a framework, stablecoin reserves are held as commercial bank deposits, and commercial banks engage in fractional reserve lending and maturity transformation as they normally would with traditional bank deposits[3].

We also find that the replacement of physical cash (banknotes) with stablecoins could result in more credit intermediation. In contrast, a narrow banking framework, in which stablecoin issuers are required to back their stablecoins with central bank reserves, minimizes the risk of 'runs' on stablecoins but can potentially reduce credit intermediation.

I. The basics of stablecoins

Stablecoins are digital currencies recorded on distributed ledger technologies (DLTs), usually blockchains, that are pegged to a reference value[4]. The majority of outstanding stablecoins are pegged to the US dollar, but stablecoins can also be pegged to other fiat currencies, baskets of currencies, other cryptocurrencies, or commodities such as gold. Stablecoins serve as a store of value and a medium of exchange on DLTs, which enable stablecoins to be exchanged or integrated with other digital assets.

Stablecoins differ from traditional digital records of money, such as bank deposit accounts, in two primary ways. First, stablecoins are cryptographically secured. This allows users to settle transactions near-instantaneously without double-spending or an intermediary that facilitates settlements. On public blockchains, this also allows for 24-hours-a-day/7-days-a-week/365-days-a-year transactions[5].

Second, stablecoins are typically built on DLT standards that are programmable and allow for the composability of services[6]. In this context, 'composability' means stablecoins can function as self-contained building blocks that interoperate with smart contracts (self-executing programmable contracts) to create payment and other financial services[7].

These two key features underpin the current use cases of stablecoins and support innovation in both the financial and non-financial sectors.

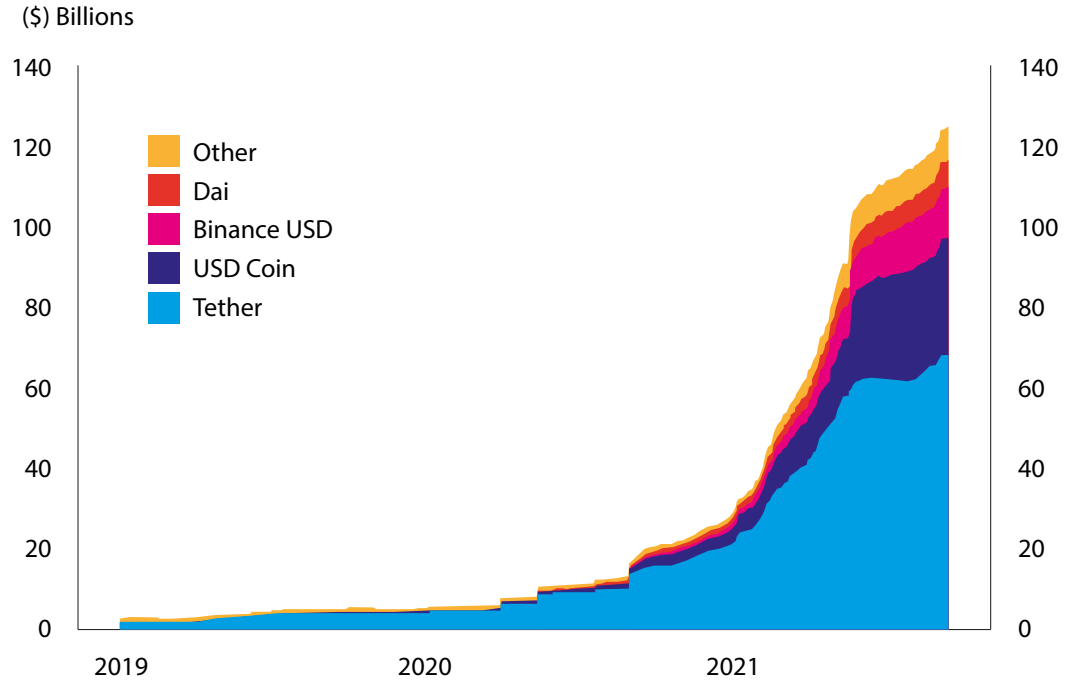
"... dollar-pegged stablecoins can serve as a safe haven relative to other cryptoassets during times of market distress if they are perceived to be sufficiently collateralized"

The use of stablecoins recorded on public blockchains such as Ethereum, Binance Smart Chain, or Polygon has surged since 2020. As of the end of September 2021, the circulating supply of the largest USD-pegged public stablecoins was almost $130 billion. In Figure 1, we show that the growth in the circulating supply of public stablecoins was especially strong in early 2021, averaging around 30% month-on-month for the first five months of the year.

Current types of stablecoins

The stablecoin is a nascent, broadly defined technology that can potentially take many forms. This technology is currently implemented in specific forms that we describe below and summarize in Table 1. However, note that stablecoin technologies are in their infancy with a high potential for innovation. The current implementations of stablecoins discussed below, as well as their current status in the regulatory landscape, do not reflect all potential deployments of stablecoin technologies.

Figure 1. Circulating supply of USD-pegged public stablecoins



Circulating supply of the ten largest USD-pegged public stablecoins by market capitalization. Data extends from January 2019 through September 2021. Other category consists of Fei, TerraUSD, TrueUSD, Paxos Dollar, Neutrino USD, and HUSD. The legend corresponds to the position of each stablecoin in the figure. Source: Author calculations based on public blockchains.

Table 1. Current types of stablecoins

Type	Description	Examples
Public reserve-backed	Backed by cash-equivalent reserves (deposits, T-bills, commercial paper), issued by centralized firms.	Tether, USD Coin (USDC), Binance USD (BUSD), Paxos Dollar (USDP).
Public algorithmic	Backed by overcollateralized cryptocurrency and/or smart contracts that automatically defend the peg by buying or selling the stablecoin.	Dai, TerraUSD, Fei, IRON (failed), Basis (failed).
Institutional or private	Issued by financial and non-financial institutions for internal account transactions, liquidity management, and transactions between user accounts within the same private network.	JPM Coin*

** Tokenized deposits issued on permissioned blockchain.*

Public reserve-backed stablecoins

Most existing stablecoins circulate on public blockchains, such as Ethereum, Binance Smart Chain, or Polygon. Of these public stablecoins, most are backed by cash-equivalent reserves such as bank deposits, Treasury bills, and commercial paper.

These reserve-backed stablecoins are also referred to as custodial stablecoins, as they are issued by intermediaries who serve as custodians of cash-equivalent assets and offer 1-for-1 redemption of their stablecoin liabilities for US dollars or other fiat currencies. The full backing and soundness of some public reserve-backed stablecoins have been called into question.

In particular, Tether, the largest stablecoin by circulating supply, agreed to pay $41 million to settle a dispute with the US Commodity Futures Trading Commission, which alleged that Tether misrepresented the sufficiency of its dollar reserves[8]. Other widely used reserve-backed USD-pegged public stablecoins with varying levels of financial audits include USD Coin, Binance USD, TrueUSD, and Paxos Dollar.

Public algorithmic stablecoins

The remaining fraction of existing public stablecoins use other mechanisms to stabilize their price instead of relying on the soundness of underlying reserves. These stablecoins are often called algorithmic stablecoins. While reserve-backed stablecoins are issued as a liability on the balance sheet of a legally incorporated firm, algorithmic stablecoins are maintained by systems of smart contracts that operate exclusively on a public blockchain.

The ability to control these smart contracts is often conferred by the possession of a governance token, a specialized token primarily used for voting on changes to protocol or governance parameters. These governance tokens can also potentially serve as direct or indirect claims on future cash flows from the usage of a stablecoin's protocols.

The public algorithmic stablecoin sector is highly innovative and difficult to categorize. However, one can generally think of the design of these stablecoins as based on two mechanisms: (1) the collateralized mechanism and (2) the algorithmic peg mechanism. Collateralized public stablecoins, such as Dai, are minted when a user deposits a volatile cryptocurrency, such as Ethereum, into Dai's smart contract protocols[9].

The user then receives a loan of Dai (which is pegged to the dollar) against their crypto collateral, at a greater than 100% collateralization ratio. If the value of the Ethereum deposit falls below a certain threshold, the loan is automatically liquidated.

In contrast, the algorithmic peg mechanism uses automated smart contracts to defend the peg by buying and selling the stablecoin against an associated governance token[10]. However, these pegs may experience instability or design flaws that lead to de-pegging, as exemplified by the temporary collapse of Fei, a public algorithmic peg stablecoin that briefly de-pegged after its launch in April 2021.

Additionally, some algorithmic stablecoins use a blend of the collateralized and algorithmic peg mechanisms. For example, the failed IRON public algorithmic stablecoin drew elements from both mechanisms, as its peg was partially backed by USD Coin, a public reserve-backed stablecoin, and TITAN, the governance token for the IRON Finance protocol.

Institutional or private stablecoins

In addition to reserve-backed stablecoins that circulate on public blockchains, traditional financial institutions have also developed reserve-backed stablecoins, also known as 'tokenized deposits'[11].

These institutional stablecoins are implemented on permissioned (private) DLTs, and they are used by financial institutions and their clients for efficient wholesale transactions. The most well-known institutional stablecoin

is JPM Coin[12]. JPMorgan and its clients can use JPM Coin for transactions such as intraday repo settlements and to manage internal liquidity[13].

These private, reserved-backed stablecoins are functionally and economically comparable to products offered by some money transmitters. For example, PayPal and Venmo (a PayPal subsidiary) allow users to make near-instant transfers and payments within their network, and balances held at these firms are backed similarly to a reserve-backed stablecoin. The key difference is the use of centralized databases rather than a permissioned DLT.

Other potential types of stablecoins

As noted previously, the stablecoin is an incipient technology, and it is possible to imagine many ways stablecoins could be implemented throughout the global financial system. For example, payments companies could use an internal, permissioned DLT to settle payments efficiently, which would be conceptually equivalent to a stablecoin.

One implementation of this is Visa's B2B Connect system, a DLT-based payment system for wholesale interbank transactions. We may also see exchanges and clearinghouses rely on stablecoins or stablecoin-like products for transacting in tokenized financial markets.

In the following section, we discuss the current use cases that are driving the growth of existing stablecoins, as well as potential innovations that could drive further growth and more diverse implementations in the future.

II. Use cases and growth potential of stablecoins

Robust use cases are driving the current growth in various forms of stablecoins. We summarize these use cases in Table 2. The most important current use case of stablecoins is their role in transacting in cryptocurrency on public blockchains.

Investors often prefer to use public stablecoins instead of fiat balances to trade cryptocurrency, because this allows for near-instantaneous 24/7/365 trading without relying on non-DLT payment systems or custodial holdings of fiat currency balances[14].

Besides their use in crypto trading, both public and institutional stablecoins are currently used for their near-instant, 24/7, non-intermediated payments with potentially low fees[15]. This is especially relevant for cross-border transfers, which ordinarily can take multiple days and demand high fees.

Firms are also using institutional stablecoins to near-instantly move cash across their subsidiaries to manage internal liquidity, and to facilitate wholesale transactions in existing financial markets, such as intraday repo transactions.

And finally, because public stablecoins are programmable and composable, they are used heavily in decentralized, public blockchain-based markets and services, known as decentralized finance or DeFi[16].

Systems of DeFi protocols allow users to use stablecoins to directly and transparently participate in a variety of

Table 2. Current stablecoin use cases

Use case	Details
Digital markets	Stablecoins are used to trade digital assets and serve as an onramp from fiat currency to digital assets recorded on blockchains.
Payments	Stablecoins are used to facilitate fast peer-to-peer and cross-border payments. They also hold the potential for new payment innovations, such as programmable money (see below).
Internal transfers and liquidity management	Institutional stablecoins facilitate transfers of funds within a firm and allow efficient movement of internal cash across subsidiaries to manage liquidity risk and regulatory requirements.
DeFi	The programmability and composability of stablecoins currently supports decentralized, blockchain-based cryptocurrency markets and services, known as decentralized finance or DeFi. Protocols allow for market making, collateralized lending, derivatives, asset management, and other services.

cryptocurrency-related markets and services, such as market-making, collateralized lending, derivatives, and asset management, without traditional intermediaries. As of September 2021, about $60 billion in digital assets were staked (locked) in DeFi protocols[17].

Future growth potential

The defining features of stablecoins, their cryptographic security and programmability, support the robust use cases that are currently driving the usage of existing public and institutional stablecoins.

However, these features have the potential to drive innovation beyond current uses cases, which are mostly confined to cryptocurrency markets, certain peer-to-peer payments, and institutional liquidity management by very large banks.

Looking forward, stablecoin technologies may see diverse implementations and drive innova- tion in several growth areas: more inclusive payment and financial systems, tokenized financial markets, and the facilitation of microtransactions for technological advancements such as Web 3[18].

More inclusive payment and financial systems

Stablecoins have the potential to spur growth and innovation in payment systems, allowing for faster, cheaper payments. Because stablecoins can be used to transfer funds near-instantaneously peer-to-peer between digital wallets for potentially low fees, stablecoins may lower payment barriers and exert pressure on existing payment systems to provide better services[19].

This is especially important for cross-border transfers, which can take several days to clear and carry high fees. These fees and delays are a burden on low and middle-income countries, which receive financial support from remittances[20].

Stablecoins may also support a more inclusive financial system through the growth of DeFi, which likely requires stablecoins as a necessary building block. It should be noted that DeFi faces serious challenges, including a complex user experience, a lack of consumer protection, frequent hacking, protocol dysfunctions, and market manipulations.

Additionally, virtually all DeFi protocols only support the trading or lending of cryptocurrencies or non-fungible tokens (NFTs).

Should DeFi protocols mature beyond the current state and become integrated with the broader financial market to support real-world economic activities, DeFi could encourage a more inclusive financial system that allows investors to directly participate in markets without intermediation. This growth in DeFi would likely drive growth in the usage of stablecoins.

Tokenized financial markets

Additionally, stablecoins may play a key role in tokenizing financial markets. This would entail converting securities into digital tokens on DLTs and trading and servicing them with stablecoins. For delivery-versus-payment (DvP) transactions, such as security purchases, a tokenized market would allow for real-time settlement at very low costs.

This could increase liquidity, transaction speeds, and transparency while reducing counterparty risk, trading costs, and other barriers to market participation. This might especially benefit certain asset classes, such as real estate, by allowing for fractional ownership of tokenized assets and more transparent price discovery.

For payment-versus-payment (PvP) transactions, such as a cross-currency swap, tokenization would also allow for near-instantaneous execution instead of the market's current conventional T+2 framework, in which a swap's payments are settled two business days after the swap is struck.

Moreover, for both kinds of transactions, tokenized financial markets would benefit from the programmability of DLTs, which could automate security servicing and regulatory requirements such as required holding periods. If financial markets were to become partially or completely tokenized, this would likely drive further growth in stablecoin usage.

Next-generation innovations

Finally, stablecoins hold the potential to support next-generation innovations. One example of such an innovation is Web 3, a possible move away from centralized web platforms and data centers towards decentralized networks[21].

Under this paradigm, internet services and social media platforms would shift their revenue from advertisements to microtransactions, facilitated by the advent of efficient, integrated online payment systems.

One could imagine, for example, a search engine or video streaming platform supported by near-instant micropayments of stablecoin instead of advertising revenue and the sale of user data. If this shift in web services were to take hold, it would likely drive further growth in stablecoins.

In conclusion, the current usage of stablecoins is primarily driven by cryptocurrency trading, limited peer-to-peer payments, and DeFi. Looking forward, stablecoins may see further growth through their facilitation of more inclusive payments and financial systems, the tokenization of financial markets, and possible next-generation innovations such as Web 3.

III. Peg stability

The stability of a stablecoin's peg to its reference value is a central issue. It is not the focus of our paper, but we briefly discuss this important issue here[22].

In this section, we will first outline the sources of peg instability for current public reserve-backed stablecoins and discuss how those sources may be addressed.

We will then review how stablecoins could serve as a potential safe asset in digital markets, and provide evidence that current public reserve-backed stablecoins may already serve that role in cryptocurrency markets.

Presently, peg instability for public reserve-backed stablecoins comes in two forms: investor redemption risk from the issuer and secondary market price dislocations. The former relates to the safety and soundness of a stablecoin's reserves.

If stablecoin holders lose confidence in the soundness of a stablecoin's backing, a run dynamic could ensue. A run on a stablecoin poses a risk of spillovers to other asset classes, as stablecoin reserves are sold off or unloaded to meet the redemption demand[23].

Additionally, a run on a stablecoin could disrupt the markets and services that rely on the stablecoin via interoperable smart contracts, causing further distress.

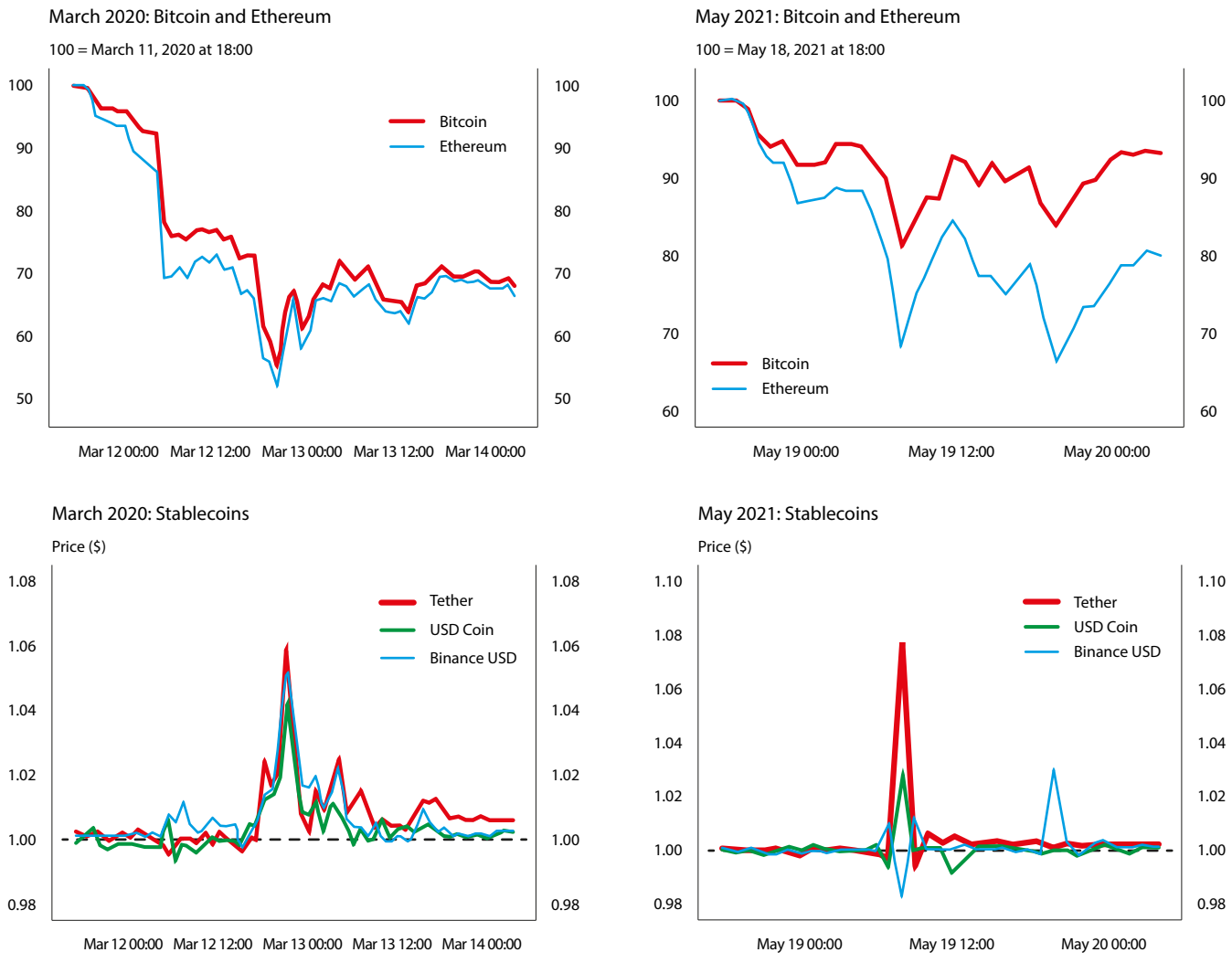
We think this type of instability is addressable with proper institutional and/or regulatory guardrails such as transparent financial audits and adequate requirements on the liquidity and quality of stablecoin reserves. The concerns surrounding redemption risk and the extent to which they can be addressed have been noted recently in Quarles (2021).

The second form of peg instability for public reserve-backed stablecoins arises from supply and demand imbalances in the secondary market. As these stablecoins are traded on both centralized and decentralized exchanges, they are vulnerable to demand shocks that may temporarily dislocate their peg until the stablecoin issuer adjusts the supply.

In particular, because public stablecoins serve as a store of value on public blockchain-based markets, these stablecoins experience high demand during crypto market distress as investors rush to liquidate their speculative positions into stablecoins.

During these episodes, the price of major public reserve-backed stablecoins tends to temporarily appreciate until the issuer adjusts the supply. To provide an example, Figure

Figure 2. Public stablecoins appreciate during crypto market distress



Note: Hourly prices of stablecoins, Bitcoin and Ethereum. Time is in GMT. Bitcoin and Ethereum prices are in US dollars, indexed to March 11, 2020 and May 18, 2021.
Source: CryptoCompare API.

2 displays the crypto market crashes on March 12, 2020 and May 19, 2021.

The first episode occurred during a period of general market turmoil surrounding concerns with the spread of COVID-19. The second episode occurred in a crypto market downturn associated with heavy deleveraging.

In both periods, as the price of the speculative cryptocurrencies Bitcoin and Ethereum crashed 30 to 50 percent, the prices of major public reserve-backed stablecoins largely spiked upwards[24].

For these episodes of extreme crypto market distress, stablecoins served as a digital safe asset, appreciating while more speculative crypto assets were temporarily in freefall, until the stablecoin issuers were able to increase their supply and purchase reserves and/or the stablecoins experienced downward price pressure from arbitrageurs[25].

The behaviours of these public stablecoins are unique and differentiated from prime money market funds, which experienced large outflows that prompted selling of commercial paper holdings during the height of the 2008 Global Finance Crisis and the 2020 COVID-19 market turmoil[26].

These episodes demonstrate the potential for stablecoins to serve as a digital safe haven during market distress. While discussions about the financial stability risk from public reserve-backed stablecoins have largely focused on redemption risks that are unique to the form of reserves of individual stablecoins, our analysis suggests that counter-cyclical demand for stablecoins in the secondary market can ameliorate risks of redemption runs during times of broader market downturns.

With appropriate safeguards and regulations, stablecoins have the potential to provide a level of stability that is on par with traditional forms of safe value.

IV. The potential impact of stablecoins on credit intermediation

If stablecoins were to see broad adoption throughout the financial system, they could have a significant impact on the balance sheets of financial institutions. Regulators, market participants, and academics are particularly focused on the potential for stablecoins to disrupt bank-led credit intermediation[27].

In this section, we analyze several plausible scenarios in which reserve-backed stablecoins see widespread adoption in the financial system. We focus on reserve-backed stablecoins, rather than algorithmic stablecoins, as reserve-backed stablecoins are currently the largest and the most closely tied to the existing banking system.

Using these scenarios, we highlight how the impact of stablecoin adoption on credit provision depends critically on two factors: the sources of inflow into stablecoins and the composition of a stablecoin's reserves[28].

We summarize our results in Table 3. We find that in most scenarios we consider, credit provision would likely not be negatively affected. In fact, the replacement of physical

Table 3. Impact on credit intermediation by stablecoin reserve framework and source of inflow

	Stablecoin reserve framework		
Source of *inflow*	Narrow bank: Stablecoin deposits placed in segregated accounts with full reserves held at the central bank	Two-tiered intermediation: Stablecoin deposits held as transactional deposits in commercial banks	Security holdings: Cash-equivalent securities held as reserve collaterals for stablecoins
Cash substitution	Neutral. Physical cash is tokenized and backed with full reserves held at the central bank	Positive. Physical cash is replaced with stablecoins, which are backed by deposit held at commercial banks performing fractional reserve credit intermediation	Positive. Physical cash are used by stablecoin issuers to purchase securities, lowering equilibrium financing cost overall. Security sellers likely deposit proceeds in banking system
Deposit substitution	Negative. As regular commercial bank deposits migrate to segregated stablecoin deposit accounts that hold full reserves at the central bank, the deposit-backed funding for credit intermediation is reduced	Neutral. Deposits from stablecoin issuers replace deposits from households dollar-for-dollar at commercial banks. The effect is neutral if stablecoin deposits are treated the same as retail deposits	Neutral to possibly negative. Commercial bank deposits are converted to stablecoin issuers' security holdings. Security seller deposits proceeds back into banks. Commercial banks partly substitute the lost deposits with other debt liabilities and may contract overall balance sheet
Security substitution	Neutral. The conversion of cash-equivalent securities and money market fund holdings into stablecoins effectively tokenizes the securities. This conversion has minimum impact on the overall deposits held at commercial banks and bank-led credit creation		

currency (banknotes) by stablecoins could potentially allow for more bank-led credit provision.

A notable exception that can lead to sizable credit disintermediation is the scenario in which stablecoins are required to be fully backed by central bank reserves, which we call the narrow bank framework. In this framework, redemption run risk is minimized at the expense of larger credit disintermediation.

Sources of inflows

If stablecoins were to see widespread adoption, major inflows could come from three sources: physical currency (banknotes), commercial bank deposits, and cash-equivalent securities (or money market funds). These sources of inflows are summarized as rows in Table 3.

First, as a form of digital currency, stablecoins stand to replace some portion of banknotes in circulation, especially as the economy becomes more digital.

In some of our scenarios, as users substitute away from physical cash into reserve-backed stablecoins, we see an increase in credit provision. This is because banknotes, which are a direct liability of the central bank, are replaced by reserve-backed stablecoins, which can be instruments of credit creation via loans or security purchases, depending on the reserve framework.

Second, stablecoins could see inflows from commercial bank deposits should households and firms prefer to hold stablecoins instead of a traditional balance at a commercial bank.

This source of inflow is of great interest to policymakers, as there is a common concern that a significant substitution away from deposits could disrupt credit provision by commercial banks. We show that the impact of deposit substitution on credit provision can be positive, negative, or neutral, depending on the reserve framework.

Finally, stablecoins could see inflows from cash-equivalent securities (or equivalently, money market funds). This would likely have no impact on credit provision, as it would entail recycling funds back into the banking system, which we discuss in a later section.

Composition of reserves

The impact of widespread reserve-backed stablecoin adoption on credit provision also depends on the composition of stablecoin reserves. We present three plausible stablecoin reserve frameworks: narrow bank, two-tiered intermediation, and security holdings. These frameworks are summarized as columns in Table 3.

Under the narrow bank framework, stablecoins would be required to be backed by commercial bank deposits that are fully backed by central bank reserves. Equivalently, it is possible commercial banks could issue stablecoins (or tokenized deposits) that are fully backed by central bank reserves.

The narrow bank approach is roughly equivalent to a form of retail central bank digital currency where the digital currency is a liability of the central bank but accessed by households and firms through an intermediary such as a commercial bank or fintech company.

This framework has been adopted by the People's Bank of China in its state-backed digital currency known as Digital Currency and Electronic Payments, the digital yuan, or e-CNY. The requirement for stablecoins to maintain reserves at the central bank has also been mentioned as a possibility in the proposed STABLE Act in the United States[29].

While a narrow bank framework would guarantee the stability of a stablecoin's peg as it is effectively a pass-through central bank digital currency (CBDC), this reserve framework poses the largest risk of credit disintermediation.

Periods of financial stress or panic could lead to large migrations of regular commercial bank deposits into narrow bank stablecoins, which could disrupt credit provision. Though this credit disruption effect could be mitigated by limits on stablecoin holdings and differential reserve interest rates, the overall structure of the narrow bank approach to stablecoin reserves is potentially destabilizing for the banking system.

Additionally, the narrow bank approach could lead to an expansion of the central bank's balance sheet in order to accommodate the demand for reserve balances from stablecoin issuers.

These concerns about narrow bank stablecoins mirror the concerns about narrow banking more generally, which have been noted by the Federal Reserve.

In a recently proposed regulation that would impact narrow banks (officially, pass-through investment entities or PTIEs), the Federal Reserve stated that it was *"concerned that [narrow banks] could disrupt financial intermediation in ways that are hard to anticipate, and could also have a negative effect on financial stability"* (Regulation D: Reserve Requirements of Depository Institutions, 2019).

Additionally, the Federal Reserve outlined serious concerns about the demand for reserve balances, stating, *"The demand for reserve balances by [narrow banks] could become quite large. In order to maintain the desired stance of monetary policy, the Federal Reserve would likely need to accommodate this demand by expanding its balance sheet and the supply of reserves."*

In contrast to the narrow bank framework, under the two-tiered intermediation framework, stablecoins would be backed by commercial bank deposits that are used for fractional reserve banking. Equivalently, it is possible that commercial banks issue stablecoins or provide tokenized deposits that are used for fractional reserve banking.

To be clear, this does not mean that the stablecoins are not fully backed. Rather, the stablecoin issuers rely on commercial bank deposits as assets, and the commercial banks practice

fractional reserve banking with the stablecoins and/or stablecoin deposits, meaning the stablecoins are ultimately backed by a mix of loans, assets, and central bank reserves.

It would effectively relabel some portion of regular deposits as stablecoin deposits. Importantly, for bank intermediation to remain the same, the treatment of stablecoin deposits has to be the same as non-stablecoin deposits in terms of the required reserve ratio, liquidity coverage and other regulatory and self-imposed risk limits[30].

Finally, stablecoin issuers could hold cash-equivalent securities such as Treasury bills and high-quality commercial paper instead of depositing their funds at commercial banks. These securities could be purchased directly or indirectly through money market funds.

This is the main framework adopted by current issuers of public reserve-backed stablecoins, such as Tether, which Federal Reserve Chair Jerome Powell recently noted are *"like money market funds"* (Oversight of the Treasury Department's and Federal Reserve's Pandemic Response, 2021).

Scenario construction

In our scenarios, we consider the impact if one or several fiat-reserve backed stablecoins were to gain broad adoption within a stylized version of the banking system. The baseline balance sheet of this banking system is displayed in Table 4.

Specifically, we consider a scenario in which households and firms substitute $10 away from banknotes, commercial bank deposits, or securities, and we then conduct an accounting exercise to determine how the stablecoin's adoption impacts the balance sheets of the central bank, commercial banks, and households and firms.

We analyze how this impact differs depending on the stablecoin's reserve framework and its source of inflows.

It is important to note that in constructing these scenarios, we are making several key assumptions. The first is that we are agnostic on the specific form of the stablecoin that is adopted. Our scenarios are not intended to analyze, for example, the specific impact of the widespread adoption of existing stablecoins such as Tether.

We do not distinguish whether the adopted stablecoin is an institutional tokenized deposit, or a stablecoin circulating on a public blockchain, or some other form.

Second, we are only presenting illustrative edge cases that are not exhaustive. In reality, stablecoins can see inflows from multiple sources and hold a variety of assets as reserves.

Third, these scenarios do not capture secondary knock-on effects or feedback loops, and they do not address heterogeneous within-sector impacts. Finally, we assume that traditional deposits at commercial banks have a 10% required reserve ratio.

To illustrate the complex flows between the various parts of the banking system that underpin our edge case scenarios, we visualize in Figure 3 a subset of the stablecoin inflows and reserve allocations we have discussed.

Specifically, we use a diagram to show the flows of commercial bank deposits (Inflow A) and banknotes (Inflow B) into stablecoins, as well as the allocation of those funds into reserves in the form of commercial bank deposits (Reserve flow A) and securities (Reserve flow B)[31].

In Figure 3, we see how stablecoin inflows and reserve flows are interconnected. In the diagram, firms and households substitute away from deposits (Inflow A) and banknotes (Inflow B) into stablecoins.

The stablecoin issuer deposits some of these funds back into the commercial banking system to hold reserves as commercial bank deposits (Reserve flow A), and also uses the funds to purchase securities for reserves (Reserve flow B).

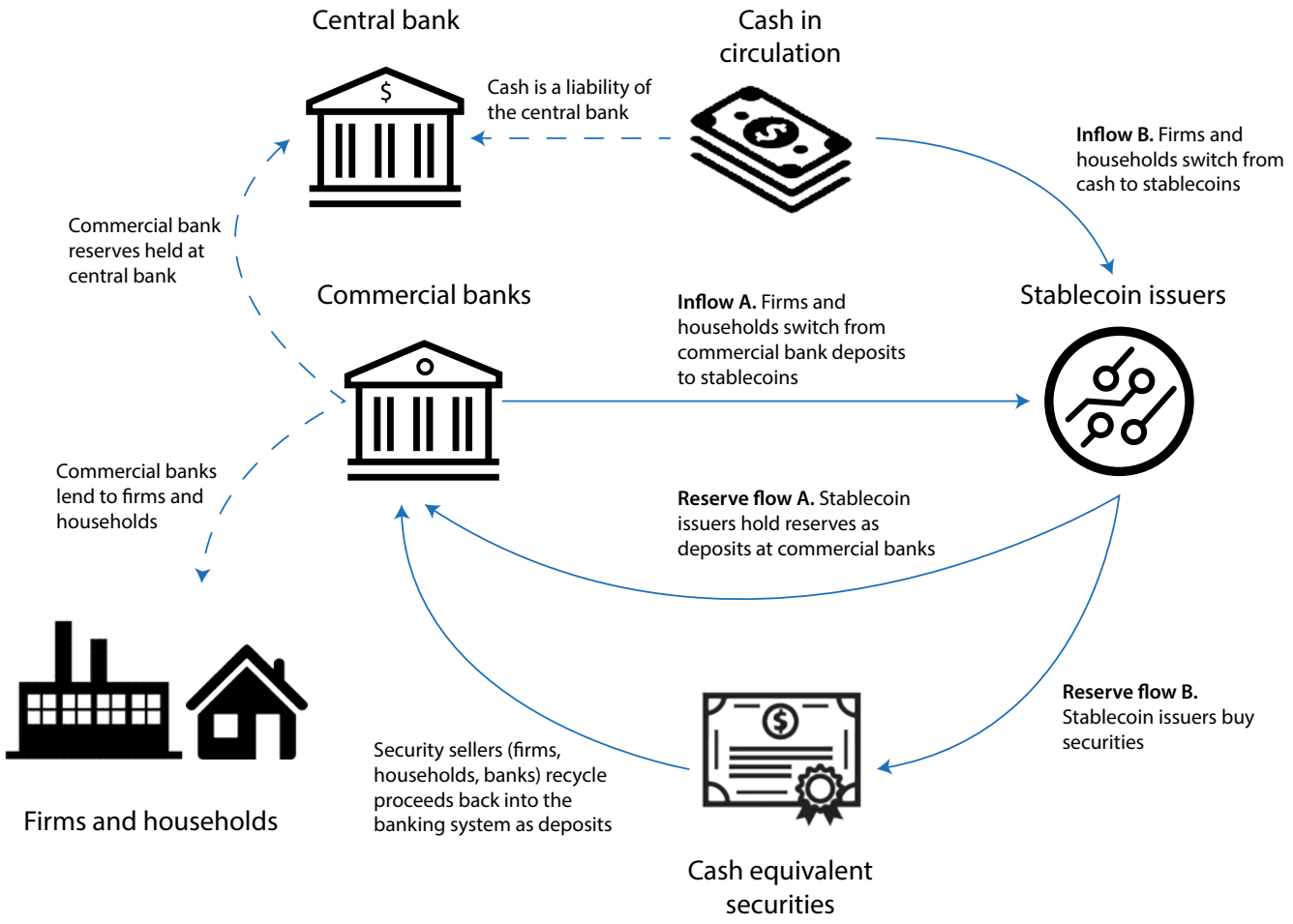
These security purchases also recycle funds back into the banking system, because the sellers of the securities ultimately take the proceeds of the security sales and deposit them back into the banking system.

As illustrated in Figure 3, these flows impact the central bank, which maintains cash and central bank reserves as liabilities, as well as firms and households, which receive loans from commercial banks. While this diagram does not capture the full set of flows between these entities, it is emblematic of

Table 4. Baseline balance sheet

Central bank				Commercial banks				Households/Firms			
Assets		Liabilities		Assets		Liabilities		Assets		Liabilities	
Securities	18	Reserves	8	Reserves	8	Deposits	80	Deposits	80	Debt & equity	200
		Physical cash	10	Loans & securities	92	Debt & equity	20	Physical cash	20		
								Securities & other	100		

Figure 3. Illustration of stablecoin inflows and reserves



how the widespread adoption of stablecoins could reshuffle complex financial relationships within the banking system.

Scenario analysis

Narrow bank framework

As discussed earlier, the narrow bank framework poses the largest risk to credit provision, depending on the source of inflow. In our narrow bank scenarios, depicted in Table 5, we find that physical cash inflows into narrow bank stablecoins would have a neutral effect on credit provision, while commercial bank deposits would disrupt credit provision.

In Panel A, the cash inflows scenario, we see stablecoins replacing cash on the household and firm balance sheet. This influx of cash results in a pass-through increase in the commercial bank balance sheet and the commercial bank's reserves. The central bank's balance sheet is reshuffled, with reserve liabilities replacing cash liabilities.

The net effect is that the commercial bank balance sheet expands, but there is no change in credit provision. This scenario assumes that banks are not balance-sheet size constrained. That is, narrow bank deposits and associated reserve holdings are exempt from leverage ratio calculation. This type of leverage ratio exemption for central bank reserve holdings has been previously applied by regulators in different jurisdictions[32].

Panel B presents the narrow bank scenario with deposits migrating into stablecoins. As stablecoin deposits are fully reserved on commercial banks' balance sheets, banks must reduce asset holdings to accommodate the decline in non-stablecoin deposit funding. The central bank balance sheet then expands to accommodate the increased demand for reserve balances without an offsetting decline in cash liabilities.

In this scenario, we assume the central bank will accommodate the increased demand for reserves by purchasing securities. This assumption of central bank accommodation is informed by previous Federal Reserve proposed rulings on narrow banks as discussed above relating to Regulation D: Reserve Requirements of Depository Institutions (2019).

However, should the central bank fix the size of its balance sheet, we present two alternative scenarios in Table A1 in the appendix.

In the first alternative scenario, the commercial banks significantly contract their balance sheets to compensate

Table 5. Changes from baseline for narrow bank stablecoins

Panel A: Physical cash inflows

Central bank		Commercial banks		Households/Firms	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
	Reserves +10	Reserves +10	Stablecoin deposits +10	Stablecoins +10	
	Physical cash -10			Physical cash -10	
Net 0		+10	+10	0	

Panel B: Commercial bank deposit inflows

Central bank		Commercial banks		Households/Firms	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Securities +9	Reserves +9	Reserves +9	Stablecoin deposits +10	Stablecoins +10	Debt (loans)* -9
		Loans -9	Retail deposits -10	Deposits -10	
				Securities† -9	
Net +9	+9	0	0	-9	-9

** The households and firms sector could possibly experience credit contraction as commercial banks' loan books are reduced.*
† Households would have to sell assets to meet repayment of loan obligations. These asset sales are illustrated as security sales, matching central bank security purchases. Though in reality, household assets could take other forms (eg. real estate) that are securitized as mortgages. A decline in the household sector's securities holdings is similar to a reduction in real assets under this example.

for the lack of deposit funding. In the second scenario, the commercial banks compensate for the lost deposit funding by issuing debt securities. The result is an even larger reduction in bank-led credit creation[33].

We do not visualize the scenario in which narrow bank stablecoins see large inflows from security holdings. In this scenario, the impact on credit provision would likely be neutral.

Under the same assumption as above in which the central bank accommodates the increased demand for reserves by purchasing securities (from households), the net impact on credit provision should be minimal.

Instead of holding securities directly, a migration to stablecoins would see households owning stablecoins backed by central bank reserves, which are in turn backed by securities. This scenario also makes the assumption that the added narrow bank reserves are exempted from leverage ratios as discussed earlier.

Two-tiered intermediation framework

For the two-tiered intermediation framework, presented in Table 6, we find that large inflows into stablecoins would have a neutral to positive impact on credit provision.

Panel A shows the case in which cash is exchanged for stablecoins. As commercial banks engage in fractional-reserve banking with stablecoin deposits, their balance sheet expands with expansions in credit and security holdings accounting for most of the expansion.

The central bank shrinks its balance sheet on the net, as reserves increase slightly while cash liabilities decrease significantly. Households accumulate more assets, funded by the expansion in bank loans. The effect on credit provision is positive.

Panel B shows the two-tiered intermediation scenario with deposit substitution. The overall balance sheets and asset holdings of commercial banks and the central bank are unchanged.

The only shift is in the composition of commercial bank liabilities, as regular deposits are shifted into stablecoin deposits. As noted earlier, this scenario assumes the treatment of stablecoin deposits is the same as non-stablecoin deposits in terms of the required reserve ratio, liquidity coverage, and other regulatory and self-imposed risk limits.

Security holdings framework

The impact of widespread adoption of security-backed stablecoins, presented in Table 7, is the most difficult to anticipate. Many scenarios are possible.

Table 6. Changes from baseline for two-tiered intermediation stablecoins

Panel A: Physical cash inflows

Central bank				Commercial banks				Households/Firms			
Assets		Liabilities		Assets		Liabilities		Assets		Liabilities	
Securities	-9	Reserves	+1	Reserves	+1	Stablecoin deposits	+10	Stablecoins	+10	Debt (loans)	+9
		Physical cash	-10	Loans	+9			Physical cash	-10		
								Securities & other*	+9		
Net	-9		-9		+10		+10		+9		+9

Panel B: Commercial bank deposit inflows

Central bank				Commercial banks				Households/Firms			
Assets		Liabilities		Assets		Liabilities		Assets		Liabilities	
						Stablecoin deposits	+10	Stablecoins	+10		
						Retail deposits	-10	Physical cash	-10		
Net							+10		0		

** Households/firms use the added bank loan funding to purchase more assets, possibly in the form of securities from the central bank. Alternatively, households/firms can increase real asset holdings (eg. houses and factories).*

Table 7. Changes from baseline for security-backed stablecoins

Panel A: Deposit substitution

Central bank				Commercial banks				Stablecoin issuers				Households/Firms			
Assets		Liabilities		Assets		Liabilities		Assets		Liabilities		Assets		Liabilities	
Securities	-1	Reserves	-1	Reserves	-1	Security issuance	+5	Securities	+10	Stablecoins	+10	Stablecoins	+10		
				Securities	-4	Retail deposits	-10					Deposits	-10		
Net	-1		-1		-5		-5		+10		+10		0		

Panel B: Household security substitution

Central bank				Commercial banks				Stablecoin issuers				Households/Firms			
Assets		Liabilities		Assets		Liabilities		Assets		Liabilities		Assets		Liabilities	
								Securities	+10	Stablecoins	+10	Stablecoins	+10		
												Securities	-10		
Net									+10		+10		0		

In Panel A, we present a scenario in which security-backed stablecoins see inflows from commercial bank deposits. We assume the stablecoin issuer is sourcing securities from the commercial banks, not the households and firms sector.

In this scenario, as households exchange deposits for stablecoins, commercial banks make up the lost deposit funding by conducting their own security issuance[34]. Additionally, commercial banks can reduce their security portfolio to accommodate the loss in deposit funding.

The size of banks' loan portfolios can possibly remain unchanged if banks adjust the asset side of the balance sheet primarily by changing security holdings. In this scenario, the central bank balance sheet also shrinks slightly due to loss in banking reserves.

Panel B of Table 7 presents a scenario in which households exchange holdings of cash-equivalent securities for stablecoins. This would lead to effective tokenization of cash-like securities without a direct impact on credit provision by the banking system.

We also consider an alternate scenario (not shown) in which security-backed stablecoins experience deposit inflows from households and firms sector that simultaneously sells security holdings to the commercial banks. The security seller is the households and firms sector instead of commercial banks as depicted in Table 7 Panel A.

The net impact on credit provision is neutral, as the commercial bank deposit balances held by the households and firms that purchase stablecoins are ultimately recycled back into the banking system by transferring them to other households and firms that sell securities to the stablecoin issuer.

This reshuffling of security holdings is illustrated in Figure 3 by Inflow A and Reserve flow B. The end result is a balance sheet shift that is the same as Table 7 Panel B.

Finally, we do not depict the scenario where security-backed stablecoins see inflows from physical cash. However, this could have a neutral or positive impact on credit creation. If the stablecoin issuers use the banknotes to purchase existing securities, and those banknotes are ultimately not deposited into the banking system, this would have no impact on credit provision as it would constitute a direct exchange of banknotes for securities.

However, if the banknotes from purchases of existing securities are deposited into the banking system, or if the banknotes are used to fund the issuance of new securities, this could increase credit provision by increasing loans and security purchases by commercial banks or by lowering the equilibrium cost of issuing securities. Altogether, the likely impact would be a modest increase in credit provision.

V. Conclusion

Stablecoins have grown tremendously over the past year as digital assets gain broader adoption and the use cases of programmable digital currencies are clarified. This rapid ascension has raised concerns that there might be negative impacts on banking activities and the traditional financial system.

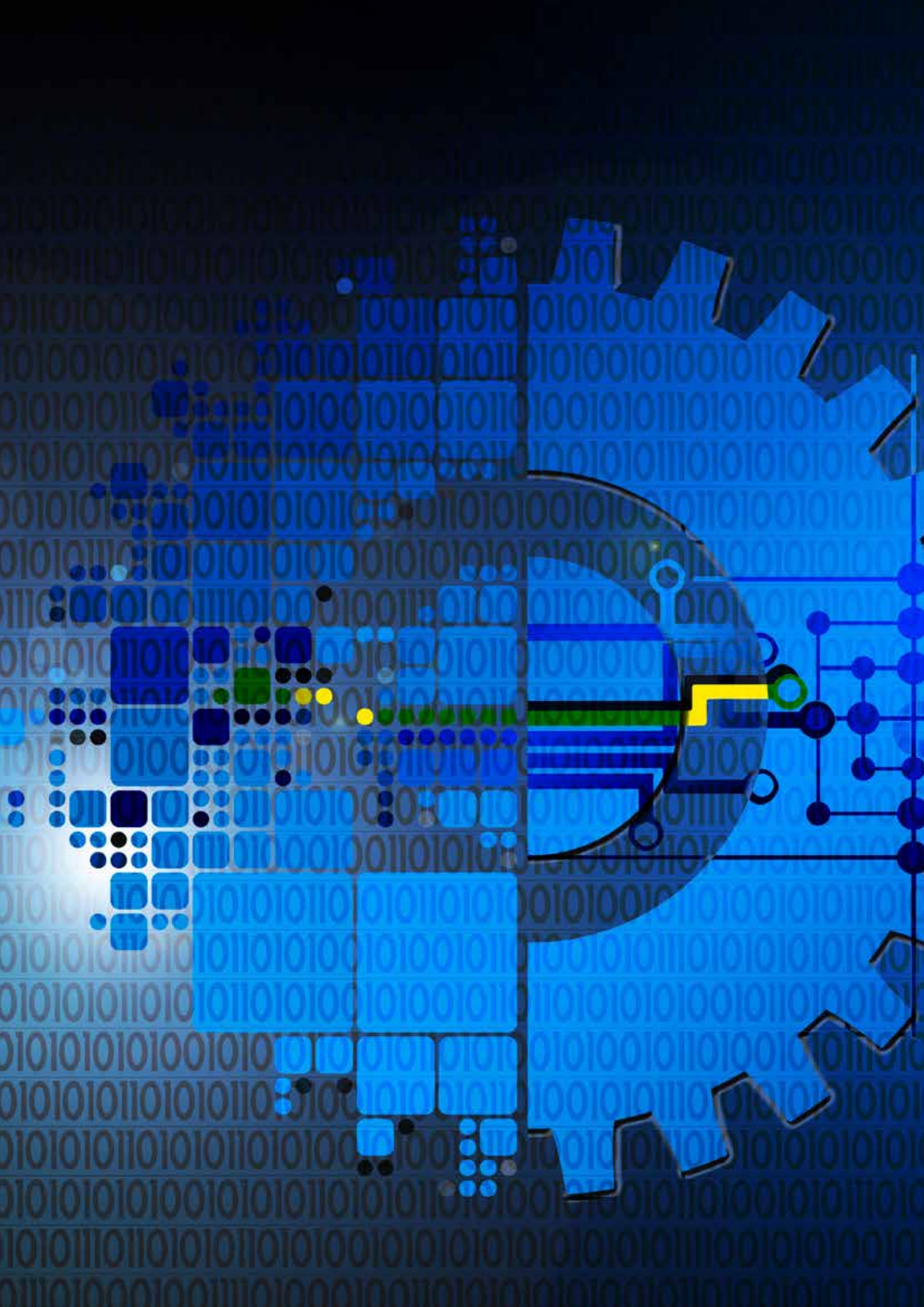
In this note, we discuss the current use cases and potential growth of stablecoins, analyze historical episodes of peg instability, and illustrate different scenarios of stablecoins' impact on the banking system.

As noted in the introduction, this paper does not consider all the potential impacts of stablecoins on financial stability, monetary policy, consumer protection, and other important unexplored issues. We focus on the balance sheet effects and credit intermediation under a set of plausible assumptions.

We examine reserve-backed stablecoins and find the impact of stablecoins' adoption on traditional banking and credit provision can vary depending on the source of inflow and the composition of stablecoin reserves.

Among the various scenarios, a two-tiered banking system can support both stablecoin issuance and maintain traditional forms of credit creation. In contrast, a narrow-bank stablecoin framework can bring the most stability but at the potential cost of credit disintermediation.

Finally, dollar-pegged stablecoins can serve as a safe haven relative to other cryptoassets during times of market distress if they are perceived to be sufficiently collateralized. ■



Endnotes

1. Among the various issues associated with stablecoin adoption and regulations, the stability and 'run risk' are of primary concern. See Gorton and Zhang (2021) for a discussion of regulatory safeguards surrounding stablecoins.

2. This paper does not consider all potential impacts of stablecoins on the banking system. For example, several key areas remain unexplored, such as changes to leverage ratios; liquidity coverage and the run rate of different forms of bank deposits; net stable funding ratios; the distribution of deposits and reserves across banks; the challenges of know-your-customer and anti-money laundering policies; and the transmission of monetary policy.

3. This necessarily assumes that stablecoin deposits are treated similarly as transactional deposits for liquidity management, depository insurance, and regulatory purposes.

4. A distributed ledger technology (DLT) is a decentralized database distributed across multiple nodes (devices). DLTs are cryptographically secured and use a consensus mechanism to synchronize the database across their nodes instead of relying on a centralized administrator. A blockchain is a form of DLT where lists of records, or blocks, are chained in sequence.

5. For discussions on DLTs in payments, clearing, and settlements, see Mills et al (2016).

6. Composability is a systems design principle emphasizing interoperability of individual components in forming a more complex system.

7. See Lee et al (2021) for a discussion of "What is programmable money?" and Szabo (1994) for a discussion of smart contracts.

8. See Prentice (2021). Tether has also been investigated by the New York Attorney General's office, and the US Department of Justice is reportedly investigating whether Tether committed bank fraud (Schoenberg, Robinson, & Faux, 2021).

9. In practice, Dai's collateral also includes public reserve-backed stablecoins such as USD Coin. In the future, the protocol may further diversify its collateral to perform liquidity transformation. Recently, a digital currency-focused subsidiary of Societe Generale submitted an application to receive $20 million in Dai in exchange for a tokenized AAA-rated euro-denominated bond.

10. This is roughly analagous to how a central bank might defend a currency peg by buying and selling its currency against foreign currency reserves. The key difference is that instead of another cryptocurrency as its 'foreign currency reserves', the algorithmic peg mechanism uses the governance token.

11. While these stablecoins are often described as 'tokenized deposits', they share many similarities. The main difference appears to be the private and closed nature of its network (JPMorgan, 2020).

12. In a recent earnings call, JPMorgan's CFO Jennifer Piepszak stated that JPM Coin is not a stablecoin, but rather a form of 'tokenizing deposits to make payments easier for clients' (4Q20 Financial Results: Earnings Call Transcript, 2021).

13. JPMorgan (2019) provides example usage of JPM Coin. See Correa, Du, and Liao (2020) and Copeland, Duffie, and Yang (2021) for in-depth discussions of internal liquidity constraints and intra-day liquidity needs in the banking sector.

14. Many exchanges do not allow users to convert their crypto holdings into a fiat currency balance, so the use of stablecoins on these exchanges is particularly important.

15. In this context, a non-intermediated transaction does not rely on a centralized intermediary to validate the transaction and prevent double-spending.

16. For an overview of developments in DeFi, see DeFi Beyond the Hype (2021).

17. Source: The Block.

18. Additionally, Wong and Maniff (2020) outline further use cases of a digital currency issued by a central bank.

19. As Governor Christopher Waller recently noted, "One can easily imagine that competition from stablecoins could pressure banks to reduce their markup for payment services" (Waller, 2021).

20. The World Bank estimated that in 2020, low- and middle-income countries received about $540 billion in remittances, with transaction fees averaging 6.5% – a loss of about $35 billion in financial support (Ratha, Kim, Plaza, & Seshan, 2021).

21. For a general discussion of Web 3 and the next generation of payments, see Dixon (2018) and Dixon and Haun (2020).

22. For discussion of the stability of stablecoins, see Lyons and Viswanath-Natraj (2020). Additionally, Gorton and Zhang (2021) outlines possible regulations that could mitigate concerns around stablecoin stability.

23. As a concrete example, a 'run' on Tether could conceivably force the issuer to sell off its purportedly sizable portfolio of commercial paper, which could cause distress in the short-term funding market.

24. One exception is that Binance USD temporarily de-pegged on the downside.

25. Griffin and Shams (2020) find an increase in Tether purchases and issuance following large declines in crypto prices through analysis of blockchain data.

26. Baba, McCauley, and Ramaswamy (2009); Eren, Schrimpf, Sushko, et al (2020)

27. For example, a recent Bank of England discussion paper posited a scenario in which outflows from commercial bank deposits into stablecoins led to higher interest rates (New forms of digital money, 2021).

28. Other studies have also analyzed balance sheet impacts from the introduction of digital currencies either issued by the central bank (Central bank digital currencies, 2018) or the private sector (Malloy & Lowe, 2021). Relative to these studies, we analyze a greater set of possible scenarios with more focus on the general equilibrium outcome and emphasis on the impact on credit intermediation.

29. STABLE Act of 2020 (HR 8827), for instance, sets forth a requirement for central bank reserve backing of stablecoins, "Any issuer of stablecoins shall deposit reserves with the applicable Federal reserve bank in a segregated account in an amount equal to the nominal redemption value of all outstanding stablecoins issued by the issuer, and such reserves shall serve as collateral for such stablecoins."

30. It is conceivable that deposits associated with stablecoin issuance are categorized as either transactional or brokered deposits. The former type has a lower assumed 'run rate' in assessments of liquidity coverage. To achieve full equivalence to retail deposits, stablecoins would also require FDIC insurance.

31. In Figure 3, we separate stablecoin issuers from commercial banks, but it is plausible that commercial banks directly issue stablecoins.

32. For instance, the Federal Reserve and the European Central Bank both exempted central bank reserves in the calculation of supplementary leverage ratio in 2020 due to the influx of deposits and expansion in bank balance sheets.

33. As illustrations, these scenarios might not capture the full spectrum of scenarios and secondary effects stemming from stablecoin growth. For instance, an expansion of the central bank balance sheet requires asset purchases that might spur security issuance by households or commercial banks. This could lead to a lower cost of financing and credit expansion. The central bank could also source the security purchases from the asset holdings of commercial banks leaving the banks' loan portfolios and household debt unchanged.

34. Issuing of debt securities by commercial banks might affect the banks' regulatory metrics such as Net Stable Funding Ratio. We assume here that these effects are second order.

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This article is based on the Board of Governors of the Federal Reserve System International Finance Discussion Papers, ISSN 1073-2500 (Print), ISSN 2767-4509 (Online), Number 1334, January 2022. We thank Shaghil Ahmed, Brett Berger, Jorge Herrada, Alex Lee, Peter Lone, Yi Sun, Frank Warnock, Mark Van Der Weide, Paul Wong, Jeff Zhang, members of the Federal Reserve Board Technology Lab in the Division of Reserve Bank Operations and Payment Systems, and participants at the Federal Reserve International Finance Workshop for helpful feedback. The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of any other person associated with the Federal Reserve System. First draft: May 2021. Final draft: September 2021.

Table A1. Alternate narrow bank scenarios

Panel A: Commercial bank balance sheet shrinks

Central bank		Commercial banks		Households/Firms	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
		Loans -45	Stablecoin deposits +5	Stablecoins +5	Debt (loans) -45
			Retail deposits -50	Deposits -50	
Net		-45	-45	-45	-45

Panel B: Commercial banks issue debt securities

Central bank		Commercial banks		Households/Firms	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
			Stablecoin deposits +5	Stablecoins +5	
			Retail deposits -50	Deposits -50	
			Debt securities +45	Securities +45	
Net			0	0	

Cryptocurrencies and the war in Ukraine

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The cryptocurrency exchanges have only done what is legally required of them when sanctioning Russia for its invasion of Ukraine, unlike the mainstream financial institutions whose restrictions on the Russians generally exceeds what is required by law.

The fundamental idea behind cryptocurrencies was the creation of a currency and a financial system that exist outside of the mainstream, motivated by libertarian visions of the world. The crypto advocates often say the mainstream system is corrupt, and the only way to fix it is technology that is pure. A lovely idea in theory, but what about practice?

The financial authorities don't like financial intermediation that bypasses their demands. Standards such as know your customer (KYC) and anti-money laundering become meaningless if the unsavoury elements of the financial world can do their business in crypto exchanges that refuse to comply with what the financial authorities see as legitimate demands and bypass any inconvenient rules (Bindseil *et al* 2022).

For the crypto exchanges, however, reality came knocking. The financial authorities were too powerful, and most crypto exchanges now comply with KYC and anti-money laundering demands.

After all, the alternative is being cut off from the rest of the financial system, which would not be good for business. If one cannot make a round trip from fiat to crypto back to

"Crypto has joined the mainstream. The war in Ukraine exposes the consequences. Exciting times for it"

fiat, most clients will allocate money elsewhere. Some rogue exchanges have refused, catering to the diehard libertarians (plus criminals and those subject to sanctions).

The crypto exchanges maintain their independent streak. When Russia invaded Ukraine, the governments in the West imposed sanctions, targeting a small set of individuals intimately connected with the Russian regime (Kwon *et al* 2022).

Many mainstream financial institutions, such as Visa and MasterCard, have gone above and beyond that to further limit Russian access to their firms' services.

Russian names find it very difficult to operate in the West, not usually for legal reasons but because the financial firms servicing them have opted not to do business with them. Whether legal or not, these firms act with the connivance of the financial authorities and the strong support of political leadership and popular opinion.

Not crypto. The crypto exchange Binance said, *"To unilaterally decide to ban people's access to their crypto would fly in the face of the reason why crypto exists."*

And its competitor Kraken was more explicit: *"Bitcoin is the embodiment of libertarian values, which strongly favour individualism and human rights."* It cited the law, saying it *"cannot freeze the accounts of our Russian clients without a legal requirement to do so."*

How important is crypto to Russia? I suspect the Russian government couldn't care less what the crypto exchanges do and that its longer-term goal is to prevent crypto use in Russia, as it gets in the way of social control.

Crypto is especially useful in countries where the government is most likely to dislike it, places where governments like to closely monitor and control citizens and/or extract significant rent from the financial system. Most legal restrictions on crypto use come from such countries (Danielsson 2021).

While the Russian government might not like crypto, that does not apply to the regular Russian citizen. On the contrary, they are enthusiastic crypto users, in the top 20 of crypto adoption and third in crypto transfers.

The difference in attitude between the crypto exchanges and mainstream financial institutions raises interesting questions that will continue to reverberate. For example, suppose the consensus is that Russian names should be punished for what the Russian government is doing, for whatever reason. In that case, those Western firms that refuse to do so are put under a difficult political spotlight.

The political attitude of the crypto experiences can only strengthen the hand of crypto opponents. Expect to see increased calls for restrictions on crypto activity in the West, motivated by the Ukraine innovation and the prevalence of bitcoin as ransomware payments.

The crypto exchanges do not want to engage with these issues and have remained neutral on the Russian sanctions, citing political ideology for only doing what is required by law. The reason is clear. The most vocal crypto advocates are the libertarians who want to keep their money outside the mainstream. The crypto exchanges need to be seen as echoing those views, regardless of what they do in reality. That political mission is key to crypto success.

Compliance with legal and political demands from financial and political authorities, as well those of the public, threatens crypto adoption and the price of cryptocurrencies, raising interesting questions about the future of crypto. The libertarian values, so dear to crypto advocates, are meaningless if the financial authorities can compel the crypto exchanges to comply with their demands.

The crypto exchanges will be in a particularly tricky situation if the Russians are seen to be using cryptocurrencies on a large scale to avoid Western financial sanctions, both legal and political.

The crypto exchanges might be damned if they do and damned if they don't.

Suppose they operate in a jurisdiction that complies with the demands of the mainstream system. In that case, the authorities can force them to cut off today those Russians that the governments put on their sanctions list and then to comply with whatever the authorities choose to demand in the future.

Some crypto exchanges will find a way to operate outside of the long arm of the Western financial authorities. Even then, it will be a struggle for them to maintain access to mainstream financial institutions that can provide fiat settlement.

When the crypto exchanges comply, they join the mainstream, taking cryptocurrencies with them. So, the ideology is flushed down the drain, and one of the main selling points, if not the main selling point, for crypto is gone. So, it would not be good for the price of bitcoin.

If the crypto exchanges do just the bare minimum and issue political statements justifying that, like Binance and Kraken, they are seen as favouring the opponent of the day – today Russia, tomorrow, who knows? That creates opposition, fuels calls for banning crypto and makes regular investors reluctant to invest in crypto. Not good for value either.

Crypto has joined the mainstream. The war in Ukraine exposes the consequences. Exciting times for it. ■

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